# Prehistorical and Historical Stages of Development of Lake Balkhash

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Lake Balkhash and in particular the Northern Pre-Balkhash territory is characterized by an arid landscape which hosted the early formation and development of human cultures. Here are found unique Stone Age campsites from the Ancient Paleolithic to the Neolithic periods (Aubekerov et al., 1992, 1997, Medoev, 1979, Derevianko, B.Z.Aubekerov, etc., 1993). The region was also populated during the Bronze Age with its metallurgical production (Aubekerov et al., 2007) and unique petroglyph archive (Medoev, 1979); during the Early Iron Age with Saka funerary monuments and animalistic art; and during the Middle Ages with their formidable nomadic confederations and unique skills for adaptation to the extreme life conditions of arid zones (Masanov 2001, Yerofeeva 2009).

Life in arid zones has always been difficult and has not become easy even during the present technological stage when the lake and its surrounding environment are at risk of sudden degradation. The deep study of the natural and cultural conditions of this territory by the joint efforts of the international scientific community will enable the prediction of change of climatic, hydrological and

ecological conditions in the region. These data will allow the elaboration of models of development of the agricultural and stockbreeding sectors and, more generally, pragmatic models of optimum organization and management of oases in arid zones.

## 1. Geography

*Lake Balkhash* is one of the world's largest landlocked intracontinental basins. It is located in the extensive Balkhash-Alakol depression and presents the following characteristics: altitude 342 m asl; total surface area 17-22,000 km²; length 605 km; width from 9-19 km in the eastern part to 74 km in the western; water volume 112 km³; area of the surrounding basin 50,000 km²; deepest point 26 m. The annual water inflow amounts to around 23.0 $km^3$.

Lake Balkhash is divided into two parts by a strait (Uzynaral) of 3-4 km in width. The water mineralization and the salt content in the western and eastern parts are rather different. In the western part the water is almost fresh (0.74 g/l), relatively muddy (transparency down to 1 m) with yellow-grey color; in the eastern part the water is saltish (5.21 g/l), transparent (up to 5.5 m), with bluish to greenish-blue color.

The shore line is indented, with numerous gulfs and bays. The largest islands are Basaral, Tasaral and Algazy.

The *Balkhash depression* is an accumulative plain gently sloping to the north with a minimal altitude of 340 m representing the average long-term level of Lake Balkhash. It is delimited in the north by the southern slopes of the Sary-Arka region, in the west and south by the Chu-Balkhash watershed plateau, and in the southeast by the Jungarian Alatau range.

The active part of the lake catchment area is located in its mountainous southern and southeastern parts. The northern and northwestern parts of the basin are plains consisting of stony and clay deserts.

The climate of the lake region is desertic. The average temperature in July is around 24°C, in January around -8°C. Precipitation reaches an average of 120 mm/year. The relative humidity of the air equals 55-60%. The lake freezes annually and ice usually remains from November to March. The wind currents in the western part are constantly circular.

## 2. Geological Structure of the Balkhash Depression

The prehistory of Lake Balkhash is connected with the peculiarities of the development of the Balkhash depression and with the geologo-geomorphological development of both the mountain region and the Balkhash-Irtysh watershed.

Four broad stages of geological development are distinguished: Paleozoic, Triassic-Jurassic,

Cretaceous-Paleogene and Neogene-Quaternary. The Paleozoic epoch represents the stage of formation of the basement of the subsequent Mesozoic-Cenozoic platforms and of the orogenesis of the epiplatform. The tectonic structures of the following stages (Mesozoic-Cenozoic epochs) are sharply superimposed on the paleozoids and belong to a new stage of development of the lithosphere belts during which the formation of the Pre-Balkhash depression takes place. The modern outlines of the Balkhash depression were established during the Neogene-Quaternary stage, and the modern form of Lake Balkhash during the latter half of the Quaternary period: so, for these last periods a more detailed analysis will be provided (par 2.4).

### 2.1. Pre-Mesozoic stage (248 m BP)

The Kazakhstan tectonic system constitutes a segment of the Central-Asian sliding (geosynclinal-folded) belt. It covers the modern territory of central, southern and, partly, eastern Kazakhstan. Its borders with the adjacent Ural-South Tienshan and Irtysh-Altai systems changed during the process of development of Paleozoic structures ("paleozoids").

The *Kazakhstan tectonic system of paleozoids* consists of four complexes: Early Caledonian, Late Caledonian, from Late Caledonian to Early Hercynian, from Late Caledonian to Late Hercynian.

Its tectonic structures, on the basis of their Caledonian elements, came from the east through the Jungar-Tienshan and Tarbagatai branches: by expanding, they formed the Tienshan-Central Kazakhstan sigmoid which, compressing again, ran northward to Western Siberia.

The morphology of the tectonic structures of paleozoids has been affected by the presence of blocks of the pre-Paleozoic consolidated complexes: median massifs ("micro-continents") combining formations of Achaean, Early, Mid and Late Proterozoic.

The geological development of paleozoids is expressed by a number of cycles of the active geotectogenesis, from their laying down in bands in deep rift structures up to the final stages of the formation of the consolidated granite-metamorphic crust at the end of the Permian and during the Early Triassic.

The *Pre-Balkhash-Jungarian-Northern Tienshan region* occupies the southern part of the Kazakhstan tectonic system of paleozoids and constitutes a complex geosynclinal-folded system created during the Caledonian and Hercynian tectonic cycles (phases).

As a regional tectonic zone, it constitutes a megastructure allocating the circum-Balkhash synclinorium region between the Chu-Ili caledonids and the Chingiz anticlinorium morphostructure. In the middle part of this region is located the Hercynian shelf, i.e. the Karasor-Sayak and the quasi-oceanic (geosynclinal) Jungarian-Balkhash trough of the Middle Ordovician-Late Carboniferous

age.

In the western and northern areas of modern Pre-Balkhash, genetically multi-type and multi-age tectonic structures of caledonids and hercynids are oriented to the north-west. In the south and east the northwestern strikes have a sublatitudinal and even a west-southwest direction and, as a result, an oval border appears of Meso-Cenozoic depressions with Paleozoic structures. (Fig 1)

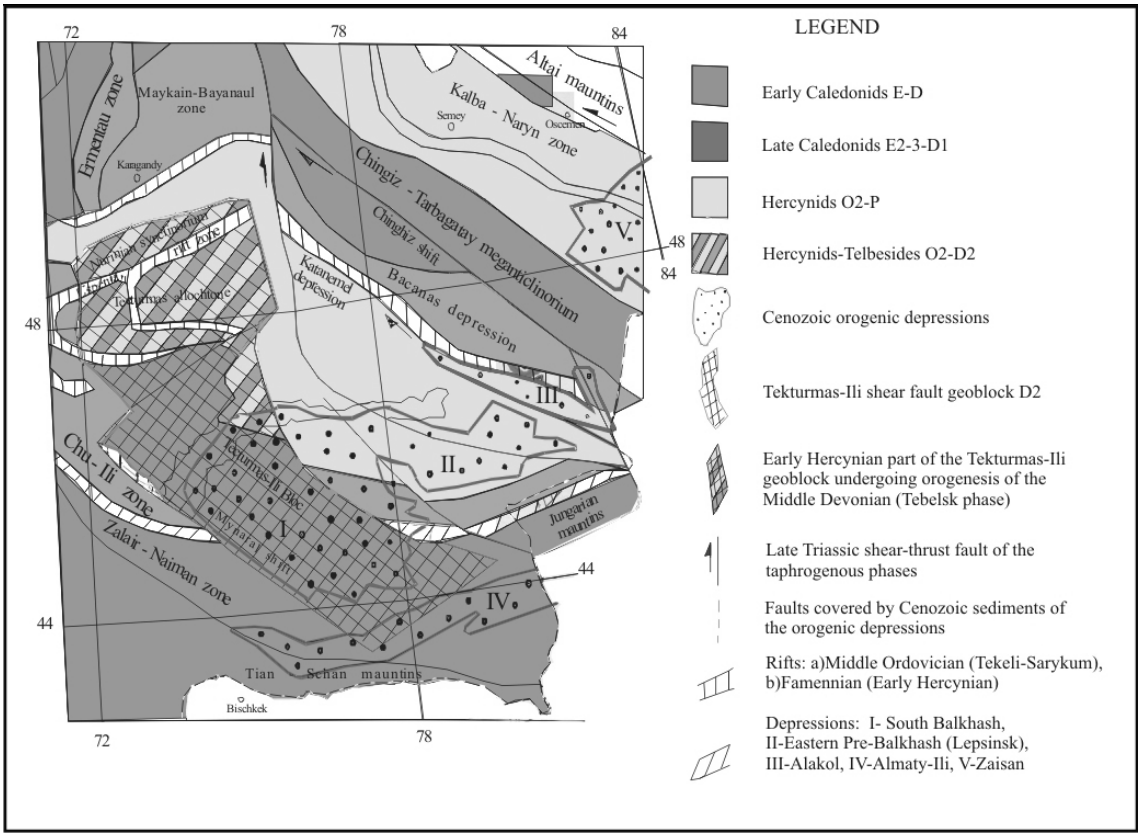


**Fig. 1 Tectonic scheme of Southeast Kazakhstan (V.Y. Koshkin)**

The *division of the Caledonian and Hercynian* geotectonic cycles is based on the time of destruction of the geoblocks of earlier consolidation, i.e. those of the Early Caledonian (Final Vendian-Early Cambrian) and Late Caledonian (Final-Mid Late Cambrian). The completion of both the Early and Late Caledonian stages occurred simultaneously at the end of the Silurian-Devonian, with the formation of folded-collisional structures and, after them, of terrestrial volcanic belts with molasses and granitoid intrusions.

The boundary between Caledonian and Hercynian structures ("caledonids" and "hercynids") is expressed in some cases by a sharp discrepancy in their structural and temporal formations, in other cases by a gradual transition. In a generalized view, each of the tectonic epochs began with the establishment of a riftogenic trough of quasi-oceanic and island-arc type together with basic-ultrabasic magmatism as an accumulation of underwater basalts mixed with siliceous and terrigenous deposits.

The *Hercynian tectonic structures* of the Pre-Balkhash region, replacing the Caledonian ones, repeat to a certain extent their morphostructural elements and the staging of their geotectonic evolution from the ophiolite formations of the initial stages to the final orogenic volcanogeno-molasses with intrusions of granitoids. The large eastern part of the Pre-Balkhash up to the Central-Jungarian range represents an area of early and late hercynids. It combines early hercynid with thick complexes of Late Ordovician-Carboniferous shelf deposits (Sayak-PreChingiz zone); and late hercynids with Middle Ordovician – Late Carboniferous deep-water flint-basalt-terrigenous deposits (Jungarian-Balkhash zone synclinorium). At the border of the Carboniferous and Permian periods a main complete folding occurred: as a result the layers of the Sayak zone became crumpled in a brachy-anticline system, and the Jungarian-Balkhash trough was crushed in the system of complex accretionary and deformative structures characteristic of the Paleozoic morphotectonics.

One of the major kinetic elements of the geodynamic process of the Balkhash-Jungarian Paleozoic region has been shift-tectonics.

An important shifting-overlapping structure newly formed during the Middle Devonian is represented by the Tekturmas-Ili geoblock, intersecting transformative sublatitudinal structures of the Atasu-Mointy-Jungarian Pre-Cambrian massif. This drifting-overlapping geoblock moved a distance of 200 kilometers to the north, forming the huge allochton Jaman-Sarysu anticlinorium, at this time constituted by the flint-basalt-terrigenous formation of the Middle-Orovician - Middle-Devonian period. The eastern part of this trough has been cut off by the meridional Tokrau shift. It is only at the end of the Carboniferous that the Jungarian–Balkhash quasi-oceanic geosynclinal became subjected to the deformation of the Sayak folding phase, with structural elements which are clearly defined by the observable tectonic structure and appeared in the inherited fault structure during the Mesozoic-Cenozoic newly formed dislocations. (Fig 1)

**2.2. Triassic-Jurassic stage (248-144 m BP)**

The Balkhash-Alakol depression consists of the piedmont Pre-Balkhash and Alakol troughs, which are first-order structures.

The Pre-Balkhash troughs include the second-order Southern Pre-Balkhash and the Pre-Jungarian depressions, divided by the Ushkol Mountains and the extension of the Northern Jungarian fault, as established by geophysical researches of its bed.

The Southern Pre-Balkhash trough is characterized by its asymmetric structure: the gently sloping and immersed northern wing and the more abrupt southern part are complicated by tectonic fault zones. The maximal flexure is of 1400 m (Fig 2) (Fig 5-6-7).

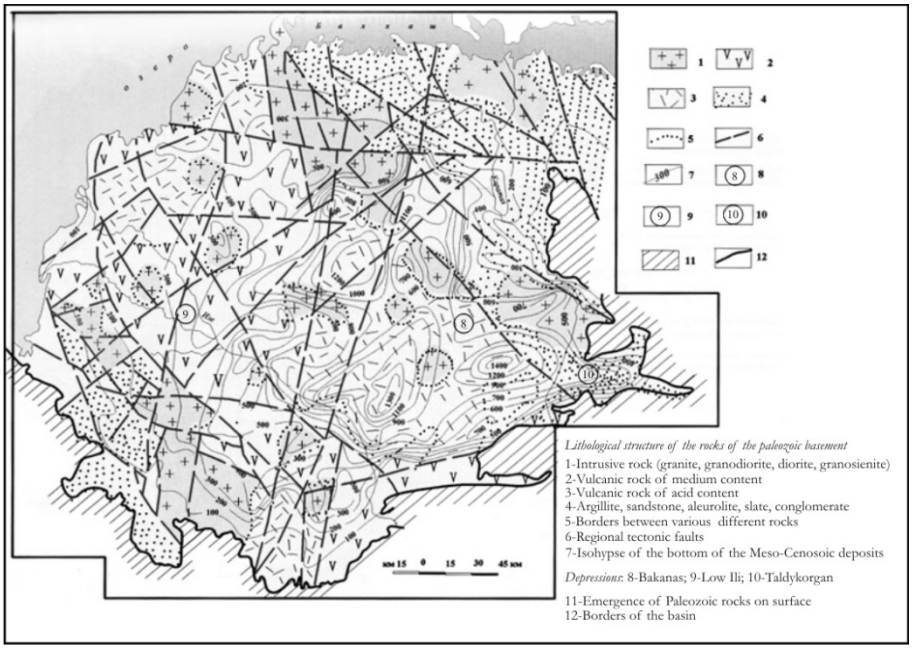


**Fig. 2 Structural-tectonic map of the Paleozoic basement of the Southern Pre-Balkhash depression**

The Pre-Jungarian trough is enclosed between the North-Jungarian and the Lepsy fault zones. The structure of the depression is asymmetric: the maximal immersion of the Paleozoic basement (of 1400 m) is displaced closer to the North-Jungarian fault zone. The Paleozoic basement of the depression is broken into a number of separate grabens.

Some spatial coincidences of the Southern Pre-Balkhash Meso-Cenozoic depressions with the structural-tectonic contours of the Caledonids and Hercynids of the Jungar-Balkhash region are not an inheritance of the Paleozoic tectonic structures (Fig 2-3). The tectonic structure formed by multi-age and multi-type caledonids and hercynids is hidden, generated and completed in consolidation, under the Meso-Cenozoic cover. However in certain cases a young pole of pressure arrived to reactivate some older "inhibited" breaks of Paleozoic tectonic phases, but it could not rebuild completely the ancient morphostructure and even less the genetic types of tectogenesis.

Instead, the position of the depression and its structure are first of all connected with new Mesozoic and especially Cenozoic tectonics. The most significant is the morphogenetic relation with the paragenesis “mountain-lift - depressions” of the Quaternary period. The Balkhash depression resulted from the sharp rise of the central-Kazakhstan (Balkhash-Irtysh) watershed shield, located almost across the Paleozoic tectonic structures and delimiting from the north the orogenous neotectonic depression of the Pre-Balkhash. A maximal trough of the Paleozoic basement, reaching 1400 m, is observed in the central part of the southern Pre-Balkhash and in the southern part of the Pre-Jungarian depressions.

A greater role in the structural-tectonic complex of the Pre-Balkhash is played by Late Triassic

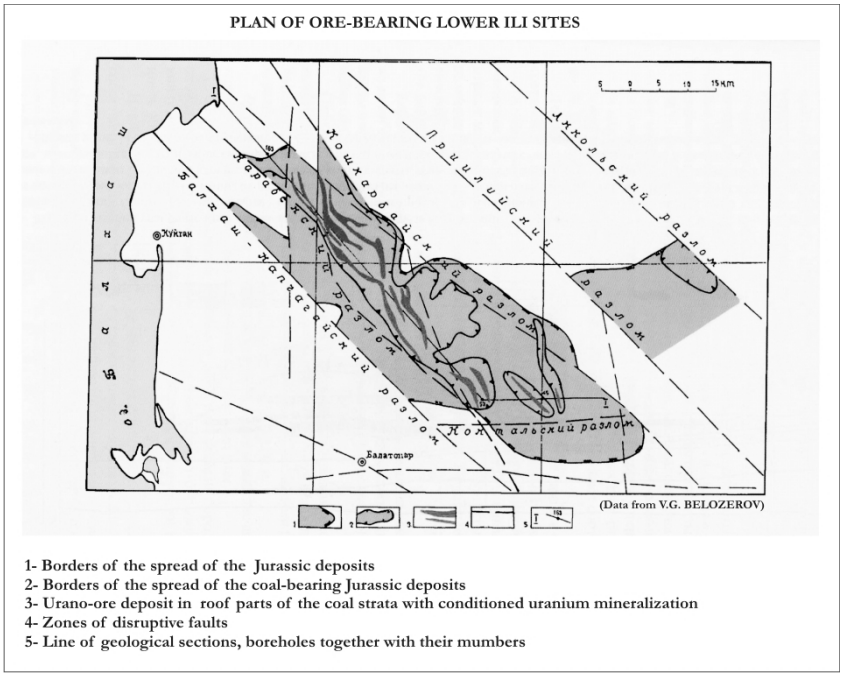


**Fig 3 Position of Jurassic deposits in lowered blocks of the western part of the Pre-Balkhash depression.**

The Balkhash-Kapchagai, Pre-Ili and other faults became renewed during the Early Alpine and during later tectonic stages, affecting the subsequent spatial orientation of the Ili River delta.

right-side shifts. These shifts are not connected with the Hercynian tectogenesis but form an autonomous independent group of structures which can be considered as a postfolded stage of taphrogenesis, anticipating the platform of the Cretaceous-Paleogene periods of the territory of Central Kazakhstan (Fig 1). To those shifts is connected the formation of Jurassic grabens constituting pre-shift basins of pull-apart type (Chingiz shift).

The entire Pre-Balkhash depression is filled by Mesozoic-Cenozoic deposits, the lowermost strata of which are represented by Pre-Jurassic (Triassic?) residual soil and Jurassic deposits. The Pre-Jurassic (conventionally Triassic) crust of weathering residual soil belongs to the laterite type and contains bauxites. Their thickness does not exceed 10 m and is preserved on uplifted blocks.

During the Jurassic period most of the territory of the Balkhash depression was still land and here allite crust of weathering residual soil was formed. Small lakes existed in the lowest places of the depression.

According to drilling data, Jurassic deposits have been preserved in lowered tectonic blocks on many sites of the western part of the Balkhash depression. In the lower half, they combine, in rhythmical layers, gravel-pebble and sand deposits, lenses of brown coals, lenses and layers of clay with lenses of pebbles and sandstone. The brown coals form a deposit with significant stocks. The upper part of the section is made primarily of layers of red clay and belongs to a zone of red soil oxidation. Jurassic deposits in different sites lie on the crust of weathering residual soil and are covered by Cretaceous, Paleogene and Neogene deposits (Fig 3-4).

Especially interesting are faults that, during the Jurassic stage, formed grabens where carboniferous

strata had accumulated. This information, collected during the study of coal deposits, allows essentially pushing back the beginning of the formation of the negative structures of the Pre-Balkhash depression to Jurassic instead of Cretaceous times (Dzhurkashev, 1965).

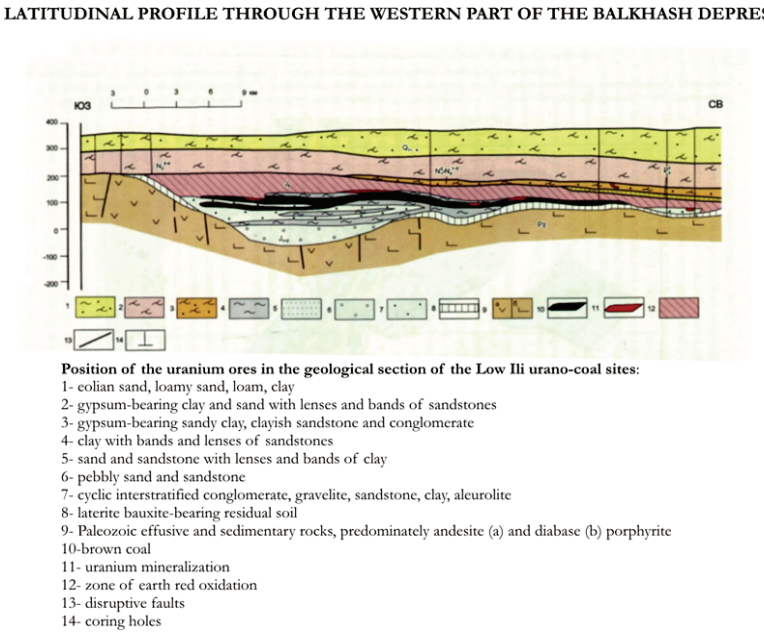


**Fig. 4 Position of Jurassic-Carboniferous deposits in geological section**

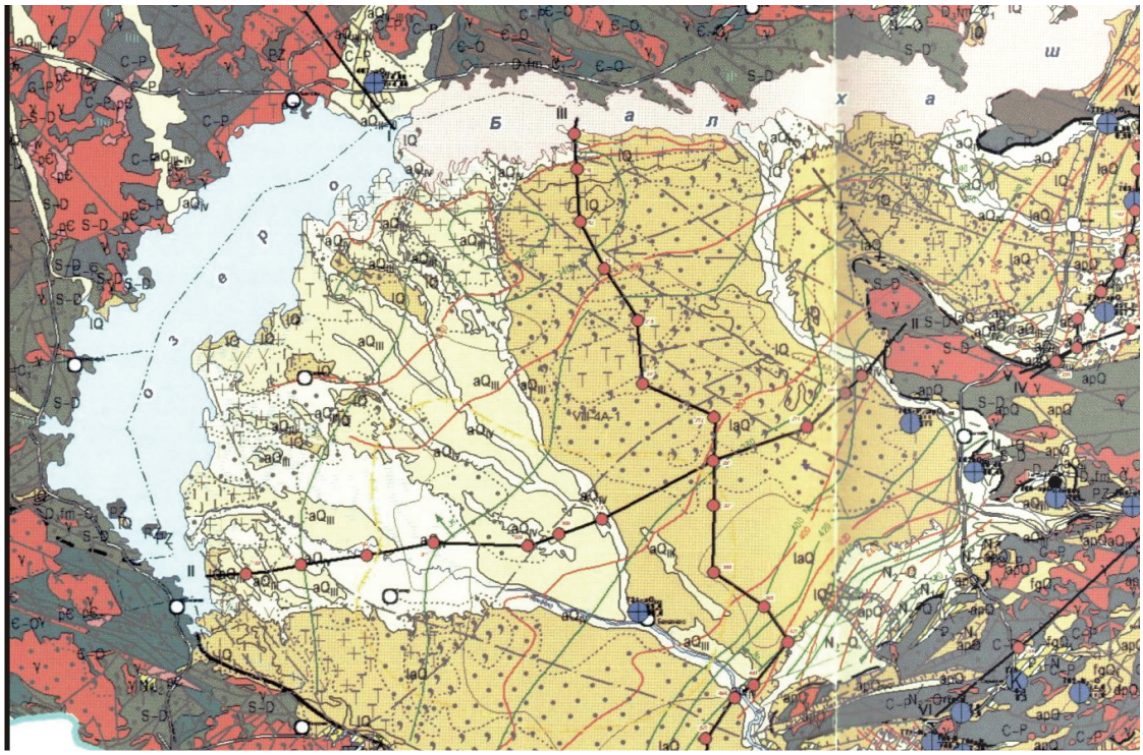

**Fig. 5 Geological map of the Pre-Balkhash depression with the location of geological sections**
(from: Smolyar, Mustafaev (2007) Hydrogeology of the basin of Lake Balkhash)

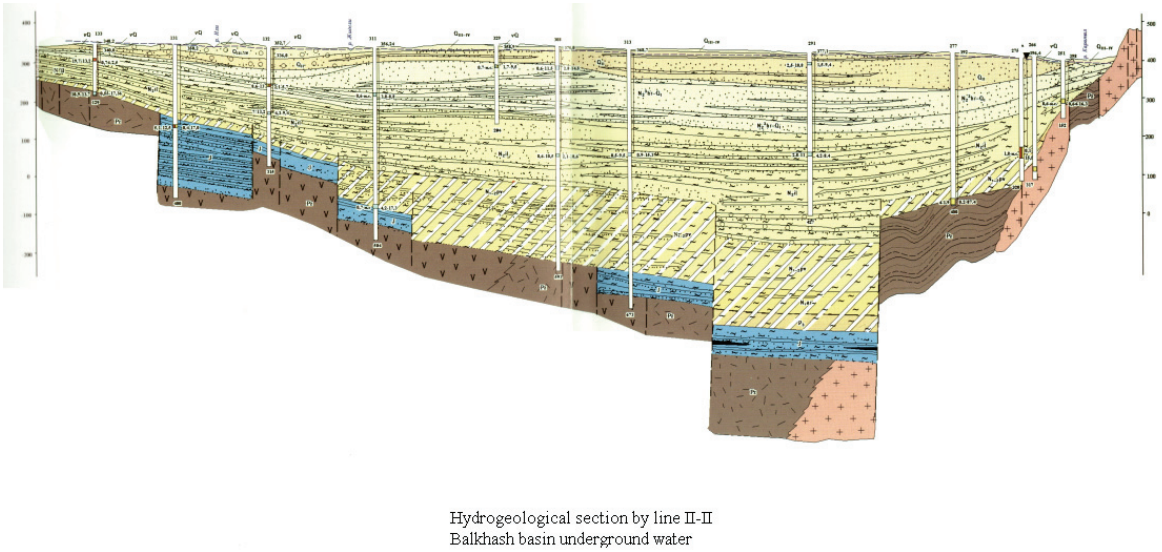


**Fig. 6 Geological map of geological section II-II (west-east) of the Pre-Balkhash depression**
(from: Smolyar, Mustafaev (2007) Hydrogeology of the basin of Lake Balkhash)

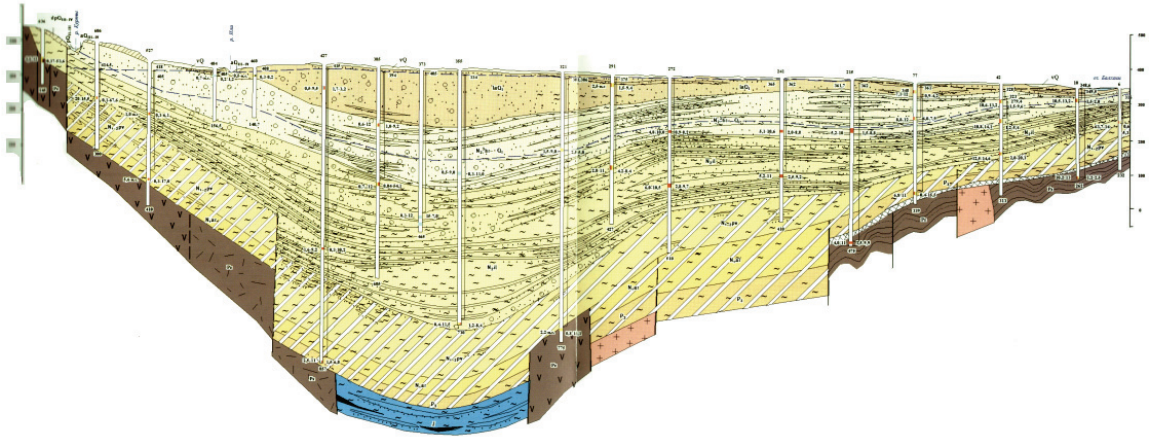


**Fig. 7 Geological map of section III-III (south-north) of the Pre-Balkhash depression**
(from: Smolyar, Mustafaev (2007) Hydrogeology of the basin of Lake Balkhash)

## 2.3. Cretaceous-Paleogene stage (144-24 m BP)

We consider the Triassic-Jurassic and Cretaceous (Mesozoic) stages to be the time of formation of the initial pre-morphological surfaces, i.e. deformations which during the later Alpine and neo-tectonic stages led to the constitution of the modern relief.

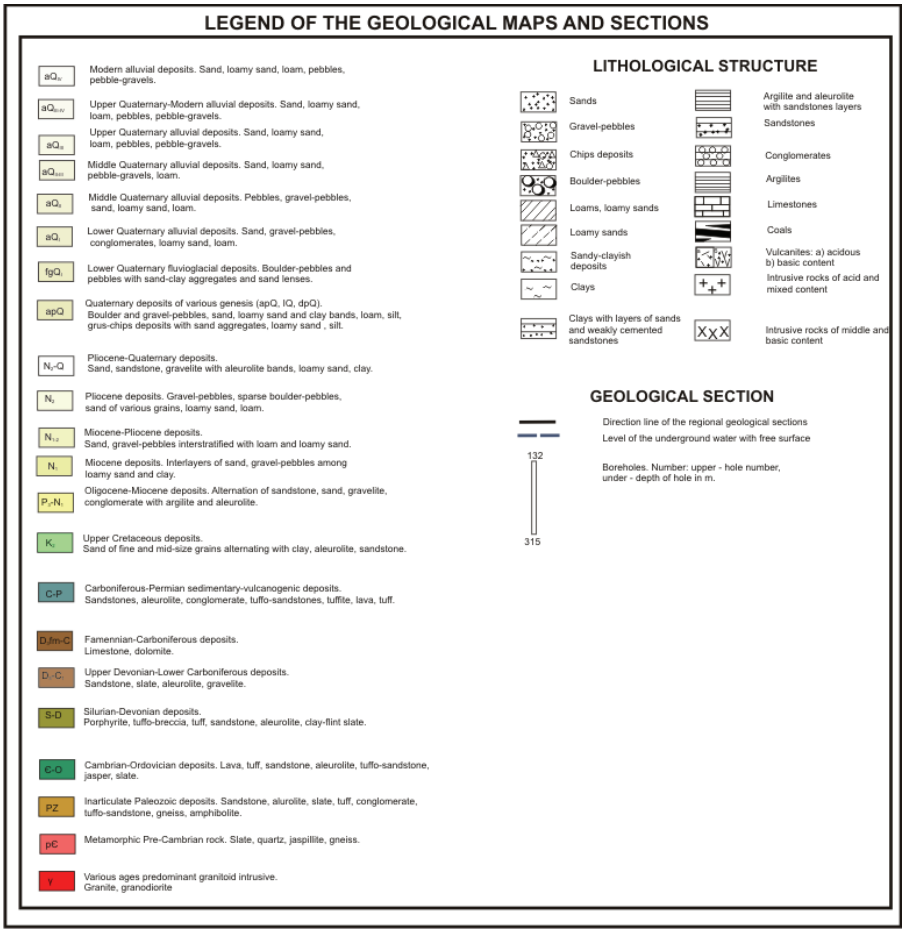


**Fig. 8 Legend of the geological maps and sections**

Tectonic movements breaking the ancient denudation plain started during the Laramide stage, at the border of the Mesozoic and Cenozoic. The hydrographic network started to form at that time because the ancient valleys have an almost meridional direction and are mainly filled by red clay, product of the accumulation of residual soil. Red Paleogene clay is also found at the bottom of the Balkhash depression. This circumstance allows us to consider that, during the Paleogene, the Balkhash depression already existed in the form of an area of accumulation of material carried down from both northern Pre-Balkhash and the southern areas.

During the upper Cretaceous period an extensive water transgression significantly filled the territories of the Betpak-Dala, of the Mointy-Sarysu watershed and of northwest Pre-Balkhash. Traces of this probably short-term transgression are the numerous spots of pebbly watersheds conditionally attributed to the upper-Cretaceous. But, as specified by D.G. Sapozhnikov, the upper-Cretaceous sea included only the western Pre-Balkhash because the Balkhash depression with its modern outlines did not yet exist (Svarichevskaya, 1952).

The subsequent formation of the peneplain is connected with the Cretaceous stage, which is vis-

ible on almost the entire territory of Kazakhstan

During the Cretaceous stage the western part of the Balkhash-Alakol depression had a positive relief and, together with the region of Betpak-Dala, was located in the present peneplain zone. The central parts of the depression were a zone of accumulation, collecting quartzy sand and sandstones to a thickness of 5-15 m. By genesis they are alluvial and lacustrine-alluvial deposits formed by successive accumulation of residual soils.

The long stage of formation of the peneplain took place from the Cretaceous almost up to the second half of the Paleogene when the region of the Balkhash depression became an area of demolition, and this is why here can be observed a long break in sedimentation. It is only during the Oligocene that the trough of the central parts of the depression conditioned the accumulation of shallow gypsiferous sandy clay, clay sandstones and conglomerates preserved in the form of shallow layers with thickness up to 5-12 m.

## 2.4. Neogene-Quaternary stage (24 m BP, to the present)

The basic features of the modern relief of the Balkhash-Alakol depression and of its surrounding territories were created by tectonic movements continuing from the Oligocene till today, basically during the newest phase of Alpine tectogenesis and especially during the neotectonic stage when, in comparison with earlier stages, tectonic movements and sedimentation speed increased substantially. The newest tectonic movements affected the development of the coasts of Lake Balkhash; and the orogenic process increased the river transport of materials and the entity of sub-aerial and sub-aquatic sedimentation.

### *2.4.1. Newest tectonics*

*2.4.1.1. Neotectonic structures and orogenic subsystems of the Balkhash-Alakol depression*

The studied territory can be divided in *four neotectonic structures* of first order, matching with geomorphological areas:

- Northern Pre-Balkhash (part of the Kazakhstan platform), with constant tendency to rise.
- Chu-Balkhash horst (elevated fault-block), with anticlinal suborogenic rising.
- Jungarian Alatau, Western Tarbagatai and Barlyk orogenic fold-block risings
- Balkhash-Alakol depression, at the center of the other three structures

The Jungarian Alatau adjoining the southern Balkhash depression is a horst-anticlinorium, made of latitudinally oriented horst-anticlines and graben-synclines. The northern part of the range is di-

vided in the graben-synclines Tunkuruzskaya and Kolpakovskaya, with the dividing horst-anticlines expressed in the relief of the Chibyndy, Bulanbai, Tamchily and Sarymsakty, Djabyk Mountains. On all the horst-anticlines are conserved fragments of domes, remains of the Mesozoic surface leveling. The amplitude of the faults varies from 500 to 1000 m. In these areas all the Paleogene and Neogene deposits have been dislocated with an angle of incidence going from 5º to 45° and sometimes as much as 80°.

The interface between the Jungarian Alatau and the Alakol depression occurs along the deep Main Jungarian fault. This fault extends for 500 km from the border of Jungaria to the Eastern Pre-Balkhash, and is accompanied by faults refreshed during the newest tectogenic phase. According to V.S. Voitovich (1964), the amplitude of the newest shifts of the Jungarian Gates varies from a few tens of meters to 2 km. The amplitude of the late Pliocene-Quaternary faulting movements reached 1800 m and, during the whole newest stage, 2000 m.

In the northern part of the Jungarian Alatau, four phases of the most recent movements are manifested: during the Oligocene, at the beginning of late Pliocene, before the Middle Quaternary and at the border between the Middle and Late Quaternary. The rising amplitudes by phase are approximately distributed as follows: 200 m, 800 m, and 500 m.

Lake Balkhash and the Pre-Balkhash as a whole are an integral part of the *Late Alpine newly formed orogenic system*. This system, as part of all the neotectonic megasystems of Central Asia-Eurasia, can be outlined with the inclusion of: the mountain regions of Chu-Ili, Jungaria, Northern Tienshan; the foothill depressions of the Pre-Balkhash-Alakol-Jungarian regions (China); the extensive low hills of Central Kazakhstan, including the uplands of the Balkhash-Irtysh watershed.

These three groups of structures belonging to the same paragenetic sequence can be divided, on the basis of the tectonic-geomorphological elements of their historical-geological development, into two subsystems:

- The southern mountain regions together with the Pre-Balkhash-Alakol foothill depressions
- The low hills of Central Kazakhstan.

*Lake Balkhash, in its modern shape, is situated at the junction of these two subsystems*, i.e. in a "cicatricial" zone. In fact the northern and southern Pre-Balkhash regions are divided by a longitudinal fault along the median part of lake.

From a general point of view, basically from the Cretaceous to the end of the Neogene, the whole region represented an area of peneplainization, integrating raised parts and isolated depressions by

an accumulation of alluvial, proluvial and lacustrine deposits. The contrast of relief and the completeness of profiles usually increased in the area of future Alpine mountain lifting of the Jungarian and Tienshan mountains (i.e. in Kolpakov, Ili and other depressions). As a first approximation, all the area of Central Kazakhstan, Pre-Balkhash and Jungarian-Tienshan can be considered as a uniform tectonic-orographic system in which, from the Paleogene throughout its entire growth, the regions to the north and south of Lake Balkhash were separated by a border coinciding approximately with the modern axial line of the lake. Ignoring the still weak tectonic movements of the Middle Late Oligocene, we see that the tectonic opposition of these areas occurs in abrupt form only in the Eopleistocene - Early Quaternary time (Khorgoss, Upper-Gobi sequences). The cover of the peneplain structure is made of Cenozoic deposits practically undeformed, and its total thickness, at the south of Lake Balkhash, is 100-500 m.

*2.4.1.2. Coasts of Lake Balkhash*

On the basis of tectonic and geomorphological considerations the coastal development of Lake Balkhash is divided into 3 regions: western-northern, southern, and southwestern.

The *western and northern* coasts of the lake represent the Paleozoic basis of Northern Pre-Balkhash uplifted by neotectonic faults.

To the north and west of the axial fault along the centre of the lake are located the lower, still submerged, steps of the North Balkhash uplift on which emerge some tectonic or residual small elevations, forming separate or, more often, groups of islands made of Paleozoic rocks.

The external Western and Northern borders of Lake Balkhash are formed by three integral uplifted blocks:

- A zone extending northwest for 100 km from the southwestern end of the lake (Alakol gulf) to the Karakamys-Mynaral Gulf
- The Targyl zone extending northeast for 150 km from the Kashkenteniz Gulf to the Chubartobek-Kashkenteniz gulf.
- The Northern Balkhash sublatitudinal zone extending for 350 km from the Chubartobek Gulf to the eastern end of the lake (Chaukar Peninsula).

Along these zones are found many young and modern faults of rather small amplitude, of lifting-shifting character, contoured down to details by morphostructures of the western and northern external frame of Lake Balkhash.

The boundary system of contoured lakeside faults is superimposed on earlier and also rejuve-

nated breaks dominating the northwestern extension and constituting the continuation of the Alpine faults of the mountain orogeny of the Jungarian and Zailiski Alatau. In the territory of the Central-Kazakhstan low hills these faults are visible on aerial-satellite images and on geological maps in the form of clear structural lines.

The external western and northern coastal frame of the lake constitutes a sharply uplifted periphery of the southern termination of Northern Pre-Balkhash.

The northern coastal uplift develops in numerous tectonic blocks formed by neotectonic modern faults. The set of faults can be divided in two main zones: the Jungarian-Eastern Pre-Balkhash zone and Ili-Western Pre-Balkhash zone. The coast of sharpest tectonic type is found in the eastern part in connection with the location of faults intersecting the coastal line, and mainly because of their proximity to the young growing ranges of the Northern Jungarian Mountains.

The scarp of the lake coast, made of horsts and more often of abrupt, stony, steep slopes, sometimes rises vertically 15-20 m above the shoreline. As a rule, two thrust faults are combined to form a horst, i.e. a peninsula (Balaitobek, Baigabyl etc.). In numerous places, on the vertical uplift of the block-horsts, are preserved terrace-shaped surfaces leveled during the Pre-Neogene or Late Quaternary period (Ortasai, Chaukar Peninsula, Baigabyl, etc.). The height of the uplift above the modern water level varies from 5 to 50 m (Chaukar Peninsula).

The interhorst lowerings established in the lake do not consist of grabens, but should be considered accumulative down to deltaic morphostructures (Aschiozek, Torkau rivers), or as a smooth transition in the submerged part of the lake. An example of the latter case is the Balyktykul Gulf between the Baigabyl and Karatass (Balai) peninsulas where, almost without deepening, at a distance of 12 km, there departs the southern extension of the Susyskarin granite intrusive, protruding from the water in the form of tens of small rocky islands. Actually they represent a surface (denudation plain) leveled by washed-off residual soil, which can be considered as the first tectonic surface of the uplifted Middle Quaternary Pre-Balkhash block at the north of the fault of the median part of the lake, on the background of which occurred the formation of horst raisings sharply delimited by faults. Vertical precipices of the horst coasts are cut by gullies and small canyons witnessing modern upthrust movements (Balaitobek, Ortasai, Chaukar).

The modern surface of the southern part of the Pre-Balkhash depression is strongly leveled, revealing an inclined plain with clearly marked discharge lines only on the northern and western shores of Lake Balkhash. If we compare the average and greatest depths (in m) in separate reaches of the depression and the occupied area of each of them (in km2), we shall see that the reach facing the mouth of the Ili River is the shallowest.

The southern and western borders between the lake basin and the raised Balkhash-Ili watershed (the southern barrier edge of the lake) constitute a system of faults juxtaposed on the totally formed

horst-shaped uplifted block of western and northern Pre-Balkhash.

In the southern and eastern Pre-Balkhash depressions superimposed by the thickness of young Cenozoic deposit, the faults appear in river elements, or reflected in the forms of surficial relief, or in zones of ground flooding, or by other indirect, and sometimes direct, attributes.

The alluvial-proluvial plain (delta-shaped piedmont trail) of the Southern Pre-Balkhash and Lepsy depressions forms the almost flat and submerged southern coast of the lake, and also the rather flat shallow lake bottom covered by a thin layer of carbonate-clay sediments. It is limited, from the north and the west, by the longitudinal fault along the median part of Lake Balkhash.

The *southwestern part of the Balkhash* consists of a stable and long flexure marked by small modern risings and characterized by the following elements:

- The widest spaces are made of hilly sand flooded by the River Ili in its lower course
- Old streams (bakanas) oriented to the north have been formed, and more recently abandoned, by the lower course of the River Ili; and new streams have been formed in a northwest direction. In this area the flexure axis parallels the Chu-Ili Mountains as a band oriented from the southeast to the northwest, including the southern and western coasts of Western Balkhash.
- Some dry channels (bakanas) are also visible for some distance at the bottom of the lake.
- The coastal line in the area of the Myn-Aral Islands consists of well preserved rocky hills, recently turned into islands by subsequent flexure and flooding of the extremely indented coast.

### *2.4.2. Neogene (23.7-1.64 m BP) and Quaternary deposits*

In the Pre-Balkhash depression, the layers made of interstratified clays, aleurolites and marl of various colors, including grey and brown sandstone prolayers, belong to the Neogene. The thickness of the Neogene layers varies from 90 up to 150 m. By lithological content this structure matches very well the structure of the Miocene-Pliocene thickness of the Ili depression. The bottom part of the section is made of clay and marl with predominant grey-green color, witnessing a lacustrine genesis: by stratigraphic schema it belongs to the Chuladyr (ex-Aral) sequence and its age corresponds to the Miocene-Lower Pliocene. Above it, red clay lies predominantly, sometimes with layers of green lacustrine clay belonging to the Pliocene (ex Pavlodar sequence): its thickness reaches up to 50 m.

The upper Pliocene is represented in this region by deposits pertaining to the Ili sequence. They are predominantly made of pale-yellow clay matching similar deposits of the Ili depression characterized by the Ili faunal complex (Upper Middle-Pliocene - Upper Pliocene).

Above the Ili sequence lie analogues of the Khorgoss sequence (Eopleistocene), made of clay with lenses of sand and sandstone (Stratigraphic schemes, 1990) and, on the periphery of the de-

pression, there are also lenses of crushed stones and badly rounded pebbles.

The color of the Ili sequence is greenish-brownish (pale-yellow), while that of the Khorgoss sequence is lighter and grey. The Ili and Khorgoss sequences lie at depths from 130 down to 375 m and their total thickness varies from 50 up to 140 m.

Lithology; Quaternary layers of younger age are developed widely and differ by the variety of lithological and genetic types (Vladimirov, Aubekerov et al., 1985).

- Early Quaternary layers of conglomerates with clay-carbonate cement (similar in age to the Upper-Gobi conglomerates) have been conserved at the base of the deltas of the Northern Pre-Balkhash valleys and can be traced under lake-bottom deposits further to the south. To Early Quaternary deposits are attributed the alluvial-proluvial deposits which, as result of successive aeolian convection, generated the huge sandy ridges of the sandy Taukum desert. The orientation and the size of the aeolian forms reveal that, at the time of their formation, the predominant winds had a different direction (Aubekerov, 2000)
- Middle Quaternary lacustrine deposits occupy the largest areas of the Balkhash depression. At the north of the Karakum massif are located deposits covered by 10-15 m thick lacustrine Upper Quaternary sediments, differing from the previous ones by a higher degree of sand cementation.
- To the Upper Pleistocene belong a series of deposits of interconnected genetic types: alluvial, alluvial-proluvial, lacustrine and alluvial-lacustrine. The lacustrine deposits of the Upper Pleistocene compose the second terraces of Lake Balkhash, united under the name of “Ancient Balkhash terrace”.

Genetic type: By geomorphological position and lithological content, the Upper Pleistocene deposits are subdivided into two genetic complexes: subaerial, formed above the shoreline and represented by beaches and off-shore bars; and subaquatic (lake bottom), forming mainly plains.

*Subaerial* are the ancient off-shore bars found on the western, northern and eastern coasts of Lake Balkhash and consisting of well rounded pebbles, interspersed gravel and multi-grained sand: on their bases sometimes lie conglomerates similar to those of the Upper Gobi, made of gravelite and sandstone on carbonate-clay cement. On the northern shore of the Balkhash, in sites located between the ruins of Tulenshapkan and the Korzhun peninsula, we identify a deposit 2-12 m thick covering yellow-grey and green-grey silt of lagoonal origin, containing fossils of mollusks and ostracods.

*Subaquatic* are the dusty multi-grained sands alternating with prolayers of sandy loams and loams with a total thickness up to 25 m, which developed on large surfaces of the northern and southern coasts of lake Sassykkol. They lie on more or less cemented sand of the Middle Quaternary, and, on the coast, in some places they enclose the contemporary deposits of the first lake terraces.

### *2.4.2.1. Subaerial deposits*

Within the name "Lake Balkhash" can be differentiated "Ancient Lake Balkhash" and "Modern Lake Balkhash". Similarly within the name "*Balkhash terrace*" we must differentiate "Ancient Balkhash terrace" and "Modern Balkhash terrace".

The Ancient and Modern Balkhash terraces consist of a series of off-shore bars varying in number from 1 to 4, and found in quite numerous places. Their height depends on their order and usually does not exceed 3-4 m: the first bar has a height of 1, the second of 2 and the third of 3-4 m. In the gulf of Tarangalyk the off-shore bars are located about 2-3 m above the lake level and have a width of 25 to 40 m. Their inclination is towards the lake, flatter than the slopes and turned to the matrix. The width of these bars, taken together, comes to more than 60 m. In most of the cases the off-shore bars combine weakly rounded pebbles, fine chips and coarse sand. Sometimes on them are seen rounded stones with a diameter of about 1 meter.

The series of off-shore bars of the Ancient Balkhash terrace diminish in height from the eastern to the western shores, from about 10-12 m down to 1.5 m. However, the off-shore bars of the Modern Balkhash terrace maintain the same height of 0.7 m to 5.0 m along the entire extension of the lake shore. This fact testifies to the raising of the eastern part of the lake at the end of the Quaternary, gradually extending to the west. The more ingressive character of the western coast gives indirect evidence of that, although it is disputable.

The off-shore bars of the Modern Balkhash terraces are formations contemporary with the changing of the hydrodynamic currents. Between the time of formation of the Ancient and Modern Balkhash terraces, a distinct tectonic impulse provoked a non-uniform contemporary rising by several meters of separate coastal sites, as evidenced by the cutting of streams and ravines, which also caused the formation of canyon-shaped ravines and gullies (the peninsulas of Balaitobek, Ortasai, etc.).

In favor of the attribution of the off-shore bars of the Ancient Balkhash terraces to the Late Quaternary, we can adduce the following arguments:

- In one site of the northern Balkhash coast, an Ancient Balkhash terrace merges with the first terrace of the River Ortasu: it rests against the Lower-Middle Quaternary proluvial deposits and at the same time is cut by a modern stream. Ancient bars are also superimposed at the mouth of Late Quaternary-modern valleys, but are cut by the modern streams of the succeeding humid phase at the end of Late Quaternary which predisposed the soil for their washout.
- In the Middle-Late Quaternary delta of the River Torkau, only the upper pack of the sand-and-shingle alluvium is interstratified with lacustrine clay, while the bottom horizons of the

alluvium, conditionally belonging to the Middle Quaternary, are found under the lake bottom further to the south.

- Paleolithic and Neolithic flint tools (microliths) were collected in thirteen places on the northern Balkhash coast, from the mouth of the River Mointy to the Kentyubek Peninsula, as well as on the surface of ancient bars. According to the conclusions of A.G. Medoev, they belong to 3 complexes: a) late or final Mousterian, smoothed and rounded, occasionally not rounded; b) Late Paleolithic, not rounded, in rare cases poorly rounded; c) microlithic, absolutely fresh, not rounded. Also on the bar deposits of Ulken-Araltobe Island lie Paleolithic stone tools clearly divided into two excellent complexes: a) ancient, pre-Mousterian or Early Mousterian (spalls and chopper type tools), rounded and strongly patinated; b) Late Paleolithic, not rounded and not patinated (Dzhurkashev, 1965).

Thus, the geologo-geomorphological features of the ancient bars of the Balkhash confirm their Upper Quaternary age, in correspondence with archeological data (Kostenko, Ranov, 1966).
On the northern Balkhash shore, in the Tekturmas-Maikamys group of residual lakes, is found a significant accumulation of thenardite-mirabilite salts.

Lake deposits not dismembered during the upper Quaternary and modern age are widely developed at the southern coast of the Balkhash where they are represented by clay and sandy silts, poorly salted. These sediments of coastal shoals are embedded in the land by inter-ridge depressions of aeolian relief.

The southern Balkhash coast is made of spade-shaped deltas (bakanas) of today's dry river courses, basically consisting of greenish-grey fine-grained silty sand with a thickness of up to 10 m. Here the fossil deposit is not identified and is therefore only conventionally recognized as Upper Quaternary-modern. However, due to the discovery of irrigation networks and medieval towns, the building-up of "bakanas deltas" during historical times is beyond doubt.

*2.4.2.2. Subaquatic deposits*

The modern deposits of Lake Balkhash are correlated with the river valleys and lake coasts. Among them can be differentiated the following genetic types: alluvial, alluvial-proluvial, alluvial-lacustrine, lacustrine, lacustrine-marshy (lagoon), aeolian and chemogenic.

- Alluvial deposits consist of floodplain terraces and river channels
- Alluvial-lacustrine deposits consist of the modern deltas of the Rivers Ili and Karatal. They are mainly composed of sandy-clay sediments covered by the Upper Quaternary deltas or by lacustrine deposits.

- Modern lacustrine deposits border the Balkhash coasts in a narrow strip. They consist of sediments, lake terraces and a series of modern bars, sand-bars, bay-head bars, and the bottoms of dry and flooded lagoons.
- The first lake terraces are locally widespread and each one encloses the lake separately. As a rule, they are built of thin-fine-grained dusty sand of yellow and ochre-grey color, often micaceous, and at the surface are usually covered by sandy loams of a thickness of about 0.5 m. The visible thickness of their deposits does not exceed 3 m.
- Lagoon deposits are represented by greenish-grey and yellow clay, lying behind modern bay-head bars and sometimes under them. To the west of Balkhash town has been found the phalanx of a kulan (wild ass) which died in modern times, and on the coast of the Chimiek Gulf the jaw of a wolf.
- Aeolian deposits have been formed together with the coast of Lake Balkhash, produced by the aeolian processing of sandy beaches and forming of the coastal dune relief. Basically they consist of fine-grained quartz-feldspar sand, insignificantly enriched by minerals of heavy fraction. Their thickness does not exceed 2-3 m.

The organic content in the modern Balkhash deposits is insignificant. The average organic content in 56 samples of Balkhash deposits is 14% of the total, with a minimum of 0.4% in sand and of 3.4% in white silts. From the point of view of the enrichment of bottom deposits by organic substances, Lake Balkhash occupies one of the last places among lakes of the arid zones (Chernousov, 1982).

In Lake Balkhash, as in other lakes of arid zones, the bottom ground deposits have been formed under the action of five factors:

1. Destruction of the coastal bedrock and of the lake bed;
2. Accumulation in the lake depression of fragmentary, chemogenic and biogenic particles, brought by rivers from neighboring mountains and deserts;
3. Aeolian transport of dust and sand from deserts and facilitated accumulation of deposits of terrigenous origins;
4. Chemical loads of salts resulting from continuous water evaporation and from river and underground water inflow, which in arid zones constitutes a significant part of the lake sediments;
5. Vegetal and animal remains of organisms living in the lake and filling the bottom after their death (Chernousov, etc.).

## 3. The Formation of Lake Balkhash and of the Delta of the River Ili

Lake Balkhash took its modern shape during the latter half of the Quaternary period. However, its final formation was preceded by events that predetermined both the modern shape of the lake and the form and relief of the Balkhash basin as a whole, and that indirectly conditioned also the forms and chronology of the Ili delta.

### 3.1 Geological history of Ancient and Modern Lake Balkhash

The eight stages of the formation of Lake Balkhash are analyzed below in chronological order.

1 - At the end of the *Neogene* the Balkhash depression constituted an extensive lacustrine-alluvial plain.

2 - During the *Eopleistocene* there started the active neotectonic movements that led to the clear contour of the northern and western edge of the Balkhash basin. Intensive orogenic movements in the area of the Jungarian Alatau and of the Chu-Ili mountains determined the relevant discharge of deluvial-proluvial material in the basin. In some sections of the basin are visible the raised thicknesses of Khorgoss deposits (Fig. 6-7).

To this time is also assigned the formation of intensive negative movements along the piedmonts of the Jungarian Alatau and in the central parts of the basin. Neotectonic movements often occurred on renewed ancient faults.

3 - During the *Early Pleistocene*, mountain areas had already been generated: high mountain relief like the Jungarian Alatau, and the low mountains and low hills of the Chu-Ili range, endowed with significant relief energy and rapid-flowing mountain rivers. The intensive discharge of material changed essentially the structure of the Balkhash depression. Its southern periphery gradually started to prevail in absolute height above its central and northern parts where a lake became established. Concerning this time it is necessary to devote special attention to the activity of such rivers as Karatal, Aksu, and Kurty, and also to the activity of the Northern Pre-Balkhash valleys, such as Tokray, Aschiozek, Mointy, Kentyrlau, etc.: they brought a considerable volume of fragmentary material into the Balkhash depression, as testified in the sections (Fig. 6-7). However, since on the southern periphery of the Balkhash depression the discharge was more concentrated and accumulated materials in the form of detrital cones or trails have been conserved till now, as a consequence on the northern periphery the ancient deltas of the Tokrau and other rivers were buried under younger quaternary deposits. Today these old deltas can be detected in the geophysical profiles of segments of the

northern coast, where clearly visible terraced valleys are buried below the modern bottom layers of Lake Balkhash (Haraguchi, 2008).

The Early Pleistocene formation of accumulative structures on the southern periphery ended with some events quite important for the understanding of the conditions of the formation of the head and the direction of the future Ili delta.

- The first event was the formation in the northeast periphery of the Chu-Ili Mountains of the detrital cone of the Kurty River together with its trail of debris cones, which subsequently were transformed by aeolian processes into the sandy massif of the Taukum Desert.
- The same kind of event happened a little to the east of the first, in the periphery of the Arkharly Mountains and of the Karaoi Plateau, where had been formed a trail of debris cones considerably smaller in size than the Kurty ones, adjoined on the south by a zone of development of Neogene deposits lifted to the surface as result of neotectonic movements.

  Together these two objects determined the location of the starting point of the basic delta of the Ili River, not at the exit of the Karaoi Plateau but lower and closer to Bakanas.
- If in that way the problem of the structure of the southern periphery of the depression is sufficiently solved, it still does not totally clarify the problem concerning the sandy central parts of the depression, which is also related to the formation of the Ili delta. In Saryishikatrau raised thicknesses of Quaternary layers are observed. Probably, during the Early and Middle Pleistocene, this part of the depression was filled by a joint discharge of material in the area of the lacustrine-alluvial plain, both from Northern Pre-Balkhash and from the southern mountains. Moreover, a substantial influence on the increase in absolute height has been played by aeolian processes generating a system of rather large barchan massifs. The structural features of this site are important for understanding that the Ili delta could not form in this place but only to the west of it.

4 - Thus, between the *Late-Early* and the *Middle Pleistocene*, extensive lacustrine-alluvial plains were established in the central part of the depression; and to these plains were joined the deltas of the Northern Pre-Balkhash rivers, the deluvial-proluvial deposits of the northeastern periphery of the Chu-Ili mountains, the delta of the Kurty River and, along the northern periphery of the Jungarian Alatau, the extensive deluvial-proluvial trail of debris cones, the formation of which has continued until now. Possibly, the more ancient delta of the Karatal River was formed during this time.

The same condition existed during the Middle Pleistocene, at least during its first half when the central part of the depression was gradually filled with alluvial-proluvial deposits and the meridional profile through the Balkhash depression gradually changed through increasing its inclination to the north.

5 - In the middle Ili Valley, during the late-Early and Middle Pleistocene, two lakes were established in the Middle Ili Valley: the Ili Lake, located in the present basin of the Kapchagai reservoir; and the Bakanas Lake, located in the Pre-Balkhash depression to the north.

During the *second half of the Middle Pleistocene* (300,000-100,000 BP) an important event occurred: the breaching of the banks of the Ili Lake (Kostenko, 1968, Platonova, 1965, and others). In size this lake was almost comparable to the main part of the modern Lake Balkhash, so that the outfall of such a huge quantity of water substantially changed the conditions of the Balkhash depression. The northwestern banks of the Ili Lake broke through the Karaoi Plateau, the water rushed as a powerful stream forming the deep gorge of Kapchagai, entered Lake Bakanas and filled a huge area of the plain. In that way a new lake was formed: the *Ancient Balkhash*.

In order to understand the morphology of the Ancient Lake Balkhash, the following circumstance should be taken into consideration: the border between the uplifted plains of the Northern and the Southern Balkhash depressions passes almost exactly through the axial line of the western and northern parts of the modern lake. The modern form of the lake is located precisely on this border and replicates its form. The northern coast was possibly located on the contact zone, i.e. on the tectonic suture. The southern coast in its western part had a quite rounded form; and in its eastern part had a form similar to the modern one, where neotectonic movements created lake sites of different depth and several islands. At the same time, the form of the southern Balkhash coast had been certainly influenced by the advance of the Ili Delta.

The intensive growth of the Terskei, Kungei, Zailiskii, Jungarian Alatau and the Chu-Ili mountain structures is also dated to the Middle Pleistocene. This process increased considerably the water volume of the River Ili and the discharge of fragmentary material by the Rivers Kurty, Ili, Karatal, Aksu, Lepsy, Ayaguz and other main rivers of Northern Pre-Balkhash. During the maximal Middle Quaternary glaciation, which was one of the most powerful of the Quaternary period, the discharge of fragmentary material was so great that it led to the essential increase in the thickness of Quaternary deposits. These transfers raised the absolute altitudes of the southern and central parts of the Balkhash depression; and the continuing negative movements along the contact zones of the Northern Pre-Balkhash and the Balkhash depression determined the final location of the modern Lake Balkhash.

After the rupture of the Ili Lake during the Middle Pleistocene, the western part of the depression became the lowest point, and here the River Ili formed its deltas. The most ancient delta deposits have been washed away, and parts of them are buried under later deposits.

6 - At the beginning of the *Late Pleistocene*, the Main Jungarian fault rose noticeably and the Pre-Balkhash lost a part of its reservoir, i.e. the entire Alakol basin. The division of the Alakol and

the Balkhash basins determined a consistent reduction of the water level and surface of Lake Balkhash.

Moreover, intensive discharge of terrigenous material from the south gradually changed the inclination of the surface of the Balkhash depression, while deltas and debris cones developed forward to the north, gradually pushing with them the existing lake reservoirs. According to the data of Dzhurkashev (1965), Late Pleistocene Balkhash terraces are recorded along the entire coast, so that we can possibly connect the final formation of the modern water surface of Lake Balkhash with this period.

Finally, the reservoirs of the central part of the Balkhash depression were incorporated into one single continental reservoir having a configuration reminiscent of the modern lake, but larger in size: the Modern Lake Balkhash (Fig. 9).

Under arid climatic conditions, the lacustrine-alluvial deposits of the interfluvial space had become intertwined with the formation of aeolian sandy deserts.

Together with the lake contraction to the north, the delta of the river Ili was prolonged forward as well. Its numerous branches drained a wider territory at the southwest of the Balkhash, depositing alluvial material and forming the Batpaktinsk Delta.

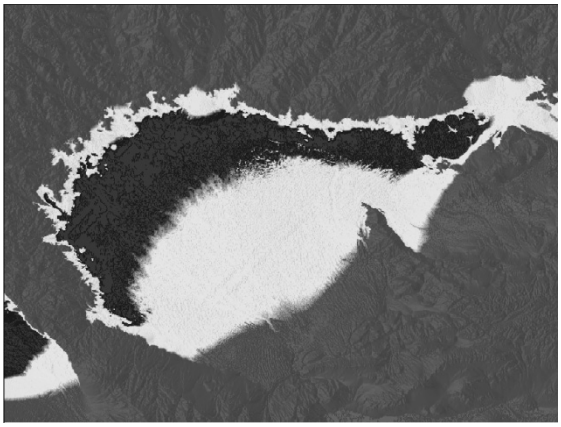

**Fig. 9 Reconstruction of the size of the water surface of the Modern Balkhash lake during the existence of the Batpaktinsk delta (Post-Glacial period). Red-yellow border at 400 m asl; lake shore at 360 m asl (transgressive stage) (Haraguchi, 2009)**

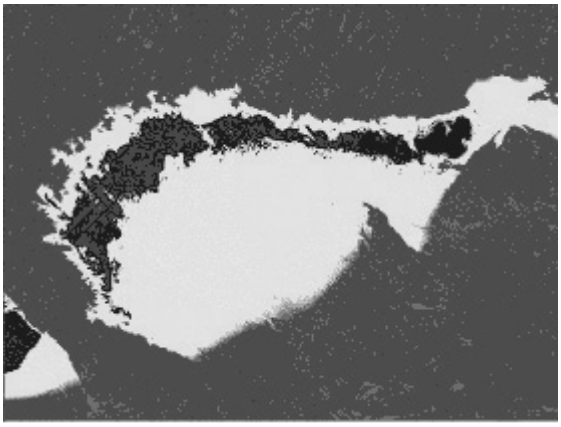

**Fig. 10 Reconstruction of the size of the water surface of the Modern Balkhash lake at the end of Late Pleistocene-beginning of Holocene. Red-yellow border at 400 m asl; lake shore at 336 m asl (regressive stage) (Haraguchi, 2009)**

7 - During the postglacial and modern periods, rivers still transported plenty of fragmentary material, forming new detritus cones in piedmonts and new river terraces in valleys. The abundant flow and deposits of the Ili River displaced Lake Balkhash to the northwest where it finally occupied its modern borders.

The *Late Pleistocene* phase of the final formation of Modern Balkhash was preceded by one of

the brightest periods of the Quaternary history – the cryogenic stage, of which the importance as a Quaternary climatic phenomenon has been underlined by A. Velichko (1973) and dated to the last glacial maximum (20,000 BP). To this stage are also connected some important processes that occurred in the Northern Pre-Balkhash, which caused the reorganization of the hydrographic network and changed the processes of sedimentation. The first to pay attention to the degradation of the hydrographic network was N.G. Kassin (1947) who discovered that the river network of Central Kazakhstan (Sary-Arka) was partially degraded already during the Riss-Wurm period and did not recover during Wurm times. In Northern Pre-Balkhash the degradation of the hydronetwork occurred in connection with a stage of neotectonic movements that changed the equilibrium profiles of the valleys (Aubekerov 1990, pp. 303-308). Today many valleys have no water, and in their lower course are characterized by Late Pleistocene-Holocene terraces of superposed type.

Later, in view of these data and in consideration of the establishment of a long hiatus in the development of Paleolithic cultures of Central Kazakhstan during that period, A.G. Medoev established that the cause of the hiatus must have been cryogenesis and degradation of the hydrological network. Late Paleolithic cultures had their camps on river terraces while “the tribes of the microlithic culture who appeared on the southern slope of Saryarka (Northern Pre-Balkhash) not earlier than the fifth and more likely during the fourth millennium BC, found a dead hydronetwork and settled near springs” (Medoev, 1979 pp. 7-8)

8 - Even if Late Pleistocene and Holocene tectonic and climatic events changed the configuration and the size of the water surface, no further essential shift of the lake occurred so that, from this time on, it is possible to limit our analysis to lake transgressions and regressions.

The shape of the lake that is close to the modern one is generally dated to the beginning of the Holocene. Its establishment happened through a complex history across phases of transgressions and regressions. The fall or rise of water level led to the basic increase or decrease of the size of the water surface of the lake.

The following six sub-phases can be differentiated:

1. Late Glacial phase (12,000 -10,300 BP): the year 10,300±200 (transgression) represents the final build-up of Modern Balkhash and the formation of the Ancient Balkhash terraces with the largest off-shore bars all along the lake coast (Dzhurkashev, 1972) (Fig 10).
2. The first half of the Holocene, i.e. the Boreal period characterized by a cool dry climate, determined a drop in the water level of the lake and a reduction of its size, and can be regarded as a regressive phase. Radiocarbon dating fixes this stage at 8,300±100 BP (Chernousov, 1982).
3. The Atlantic period is characterized by favorable climatic conditions that positively affected the rise of water level and the increase of lake surface. The climatic optimum of the Holocene coin-

cides with the second half of the Atlantic period, a phase dated by radiocarbon to 5,600±200 BP (Chernousov, 1982).

4. The Atlantic high water level is followed, during the Sub-Boreal period, by a phase that can be considered as a regressive stage. The dating for this period corresponds to 4,380±150 BP (Chernousov, 1982).
5. With the following Sub-Atlantic period, a further decrease of water level is observed. The radiocarbon dating attributes it to 2,690±120 BP (Chernousov, 1982)
6. The last 2 millennia are referred to as the historical phase, characterized by both natural large fluctuations and technogenic forcing. During this period two significant water level regressions and two transgressions are recorded. General climatic fluctuations are characteristic for all the arid zones, and are well correlated with the changes of water level and surface of Lake Balkhash as well as of the Aral Sea (Endo 2009, Borovka 2006, Sorel 2006).

### 3.2. Formation of the delta of the Ili River

The stages of development of the Ili delta and of its movement from south to north are connected with climatic fluctuations causing development or degradation of glaciers and corresponding changes of water input into the lake from rivers flowing down from the mountains.

The postglacial phase was characterized by an essential reduction of the water surface of Lake Balkhash which then reached a dimension close to the modern one. In that process the Ili River expanded its lower course, forming three successive main deltas (Fig 9-10). The interfluvial borders of the Ili valley are circumscribed on the west by the deposit of the ancient Kurty Delta and on the east by Middle Quaternary lacustrine alluvial and proluvial deposits. Because of the barrier formed by the Kurty Delta, the Ili River formed a straight channel from the Kapchagai Canyon down to Bakanas village and all its deltas could start forming only to the south of Batpak Village (and not from the exit of the Karaoi Plateau as considered previously). The three deltas of the Ili River are the following.

- Batpaktinsk Delta. During post-glacial times, the River Ili ran into the middle part of the lake in the form of the ancient River Ortasu. The reduction of the lake water surface caused the formation of a new advanced delta, the Batpaktinsk Delta (from the name of the location where it starts) which, moving ahead, formed the Uzunaral River and peninsula and pushed the lake further to the north (Zhurkachev, 1964) (Fig 9-10). However, due to the rapid and substantial reduction of the water surface of the lake, today the Batpaktinsk Delta does not reach the Modern Balkhash coast but remains as a hanging delta, something that did not occur with the other subsequent deltas.

- Bakanas Delta. According to E.V. Maksimova, the first significant humidification of the climate occurred with the start of the Holocene period (11,400-10,000 BP) and lasted 100-300 years. The River Ili and its branches wandered to the west of Uzunaral and there formed a new delta: the younger superimposed Bakanas Delta (from the name of the location where it starts). The streams of the former Uzunaral River were destroyed during this time and today do not appear in the relief (Zhurkachev, 1972); instead traces of the Bakanas Delta remain in the form of dry streams: Shettybakanas, Ortasu, Karabakanas, Naryn, etc. The Bakanas Delta begins at Bakanas village and develops for 200 km. Ruins of medieval towns and artificial canals, attributed to the period from the 8th to the 13th century AD, are aligned along the Ortasu distributary, witnessing to a persistent activity of that course; and A.I. Mushketov in 1886 describes some settlements and irrigation canals connected with "bakanas".
- Ili Delta. Mushketov also remarks that the "bakanas" died off between the years 1733 and 1785, a period of relevant humidity during which the water flow concentrated in the Ili course, and the

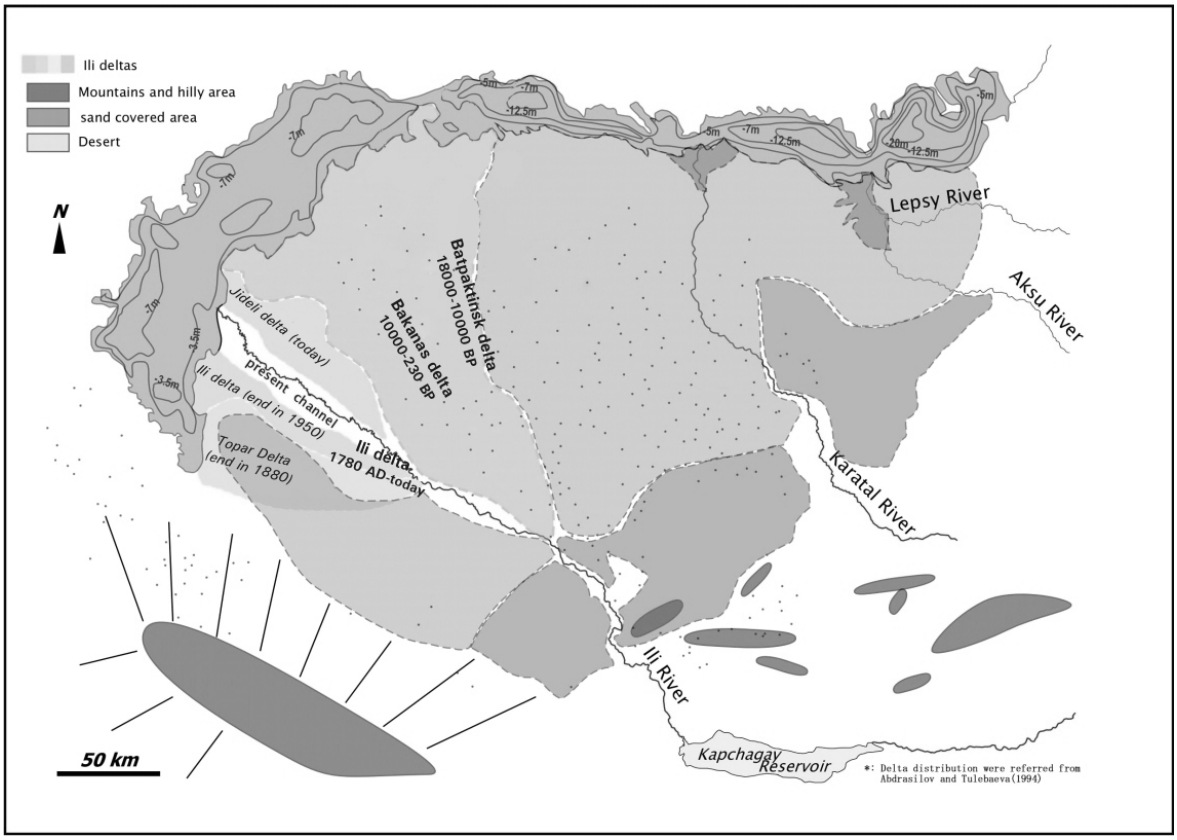


**Fig. 11 Modern Lake Balkhash and the 3 main deltas of the River Ili: Batpaktinsk, Bakanas, Ili. The eastern part of the Bakanas Delta is superimposed on the oldest Batpaktinsk Delta. The Ili Delta is formed in succession by the Topar, Ili and Jideli Deltas (from Abdrasilov, Tulebaeva 1994)**

Ili Delta started to be formed. This means that the age of the Ili delta is about 200-250 years; and

that the formation of the Bakanas Delta went on during the whole Holocene period. The modern Ili delta has a much reduced dimension, beginning just 125 km from the shore of Lake Balkhash, at the village of Araltobe. Here the river ramifies into many branches, from west to east: Topar, Ili, Jideli, etc. These branches and their respective deltas have been successively active in the order quoted above: the Topar branch became less active during the second part of the XIX century; the Ili branch collapsed and became shallow halfway through the XX century; and from 1957 onwards 90% of the Ili river flow goes through the Jideli branch. Consequently, a new Jideli Delta is now emerging. (Fig 11)

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# Complex Analysis of the Development of Lake Balkhash During The Last 2000 Years

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**CONTENTS**



The present article reports the preliminary results of laboratory analyses of samples of bottom sediments of Lake Balkhash collected from a 6 m core collected near the Tarasal Peninsula and chronologically attributed to the last 2000 years. The first chapter summarizes the results of coastal surveys and complex laboratory analyses of core samples focusing on lithology, granulometry, soil color, magnetic susceptibility, diatoms and salinity ratios. The second chapter reports in detail the results of palynological analyses with the distinction of eight palynozones. All together, these various proxy data allow the reconstruction of changes in the climate and water level of Lake Balkhash during the last 2000 years.

# 1. Complex analysis of the evolution of coasts and bottom deposits of the New[1] Lake Balkhash

The solution of the problem of the structure and formation of the coasts and sedimentary layers of Lake Balkhash has a huge value for the understanding of the conditions and history of the formation of the lake itself. This fact lies at the basis of a new wave of scientific studies of the coasts and bottom of Lake Balkhash, which were started in the years 2007 - 2008 by a scientific team putting into cooperation experts of Kazakhstan and Japan.

## 1.1. Sedimentary structure of coasts and bottom

The study of the geomorphological structure of the coast and bottom of Lake Balkhash was implemented though reading of existing scientific literature, land surveys of the coast (lead by Profs. Endo, Nakayama, and Aubekerov) and through a geophysical survey of the lake bottom (lead by Prof. Haraguchi).

### *1.1.1. Geomorphological structure of the coasts*

The joint Kazakhstan-Japan studies of the structure of the coasts verified the validity of the scientific records concerning macrostructural elements and processes provided by Soviet geologists; and implemented a detailed study of terraces in three coastal sites of Northern Balkhash by analysis of satellite images and a land survey. The preliminary results of the general survey of terraces are included in par. 2.4.2, sub-aerial deposits; the results of the specific analysis of three cases of coasts in Endo et alia 2009.

Referring to Lake Balkhash, M.P. Rusakov (1933) differentiates three types of coasts.

- Low alluvial coast. This covers the entire southern lake depression and also the mouths of some rivers of the northern coast like the Mointy on the west, the Torkau in the center, the Bakanas in the west, and others. These coasts consist of lowlands covered by reeds.
- Coast of cross-sectional type. This prevails on the western coast where the shoreline is generally cut obliquely by rock folds.
- Coast of longitudinal type. This is more characteristic of the northern coast where the shoreline quite often runs parallel to the total extension of the sedimentary thicknesses (peninsulas of Tasaral, Shaukar), or parallel to their border with effusive rocks, or according with the line of dislocation of these parts occurring in dry areas of the coast. By the degree of incised bays, the northern coast stays considerably behind the western.

According to L.S. Berg's definition, the southern Balkhash coast consists of a sandy desert, the western coast a stony desert, and the northern coast a clay desert (Rusakov, 1933). The formation of the southern coast is due to the action of lake regression, the formation of the Ili deltas, and the

[1] for the definition of the Old and New Balkhash, see the article of Aubekerov *et alt*., Prehistorical and Historical Stages of Development of Lake Balkhash in this volume.

formation of the aeolian inter-fluvial relief.

The formation of the western, northwestern and northern coasts is different, and is basically the consequence of lake level changes and of neotectonic movements. Everywhere a major role is also played by wind activity. Changes in the water level of the lake and wave-cutting activity created lagoons that, because of water evaporation, turned first into separate lakes and later into solonchak (saline soils).

- Western Pre-Balkhash, which occupies the coastal territories from the Saryshagan to the Chimpek Gulf, belongs to the northeastern slope of the Chu-Balkhash watershed plateau. Here the plateau consists of a denudated sculptural surface that has been substantially eroded, represented by sharply dismembered low lakeside low-hills with relative altitude anomalies of 20 - 40 m. This part of the coast has an ingressive character with numerous islands. (Fig.1)
- The northwestern parts of the coast tend to rise, causing the formation of flat valley bottoms and superimposed valley terraces. (Fig.2) This part of the coast is complicated by breaks, therefore we can observe here the existence of a steep rocky coast and a rather small number of lagoons. Moreover, in this coastal site a tendency to flexure existed, as reflected by its geomorphological structure, and contributed to the stabilization of the location of the delta of the river Ili.
- An important role has been also played by the formation of water-flow in the valleys of Northern Pre-Balkhash. These valleys determined the intensity of the discharge of fragmentary material and formed the low coast in their delta areas. During the existence of the modern aquatorium of Lake Balkhash, the water flow from the Northern Pre-Balkhash valleys has been congested and its share does not exceed 8 - 10 % of the general inflow to the lake.

**Fig.1 The ingressive character of the southwestern Balkhash coast, with numerous islands.**

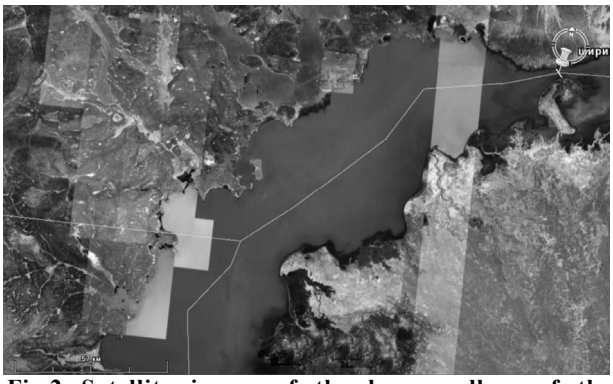

**Fig.2 Satellite image of the large valleys of the northwest coast of Lake Balkhash, with flat bottoms and superimposed terraces**

### *1.1.2 Geophysics of the lake bottom*

The profiles sorted out by geophysical studies conducted in the eastern part of Lake Balkhash ascertained that the larger eastern part of the lake depression is shallow with a depth rarely exceeding 10 m, and that the thickness of the friable bottom deposits is 0 - 10 m.

Under the bottom deposit, buried valleys with erosive terraces are quite visible “at 325 m, 330 m, and 335 m, being 5 m to 15 m lower than the present level of 340 m above sea level asl” (Endo et alia, 2009). Their presence suggests that at the time of their formation, the lake most probably did not exist and the plains at the north of the Balkhash depression were located at the above altitudes.

In several locations at the bottom of the modern lake the speed of the undercurrent is so high that the contemporary bottom deposit is almost absent and only rough material remains.

## 1.2. Stratigraphy of bottom deposits

A complex study of the stratigraphy of the bottom deposits was conducted by means of geophysical scanning of the bottom of the lake and analysis of a core drilled near the Tasaral Peninsula (Tarasal core). The core was six meters long, with its bottom preliminarily dated to 2000 BP. Japanese experts led complex analyses of the core: lithological and granulometric structure, magnetic susceptibility (residual magnetization), color and salinity of bottom deposits, diatom species, and absolute dating (AMS-method of radiocarbon dating, $^{210}$Pb and $^{137}$Cs dating). (Endo *et alia*, 2007, 2009).

Kazakhstan specialists led the drilling tasks and palynological analyses of core samples of which a preliminary report is given below. (Fig.5)

### *1.2.1. Lithology, granulometry and soil color*

The lithologic and granulometric structure of the core is quite homogeneous, consisting of dark and light greenish-grey silty clay and clayish silt.

The sequence of sediment colors shows a yellowish anomaly between the core depths of -3 and -2 m, in correspondence with the IV and III palynozones and the most abrupt transgression of lake water level.

### *1.2.2. Magnetic susceptibility*

Paramagnetic susceptibility is inversely proportional to the value of the absolute temperature. The length of the Tarasal core shows variations between 0.2 and 0.4 Si/g, with minimum peaks at core depths of -5.9, 5.5 and 2.9 m; and maximum peaks at -5, -2.5 and 0 m. The maximum peaks are consistent with the results of palynological analyses and the individuation of transgressive stages of lake water levels; the minimum peaks deserve further investigation.

### *1.2.3. Palynology*

To reconstruct and correlate landscape and climatic changes, percentage variations in groups of grassy plants were examined. It has been established that the content of the spore-pollen spectrum depends on ecological conditions at both the coastal line and in the territory of the catchment basin of the lake, and also on the morphology of the bottom which defines the speed of reaction of the coastal line to increases or decreases of reservoir depth. In conditions of shallow water depth, 3 - 7 m or less, gently sloping costal areas will react to the establishment of an arid phase (i.e., reduction of river inflow and lake water level) by drainage of part of the bottom, expansion of the coastal zone, overgrowth of the coastal zone with aquatic vegetation (canes, reeds, thickets, sedges, etc.), and an increase of pollen of coastal water vegetation in lake bottom deposits. By contrast, the steep banks of western Balkhash will react to a pluvial phase and related increase of water level with a reduction of the shallow coastal zone, a reduction of the water vegetation cover of the coastal zone, and a re-

duction of coastal pollens in bottom deposits. Referring to the entire lake, a net increase of pollen of various coastal water plants, a relative prevalence of chenopodiaceae over artemisiae, and a constant content and percentage of arborous remains are observed in the palynospectrum related to an arid phase.

In the region where the samples of bottom deposits were collected, modern vegetation is represented by northern and middle desert vegetation consisting of hemipetrophyte complexes, with communities of Artemisia terrae-albae, Salsola arbusculaeformis, Anabasis salsa and Atriplex cana (Fig 3).

Palynological analyses of 106 samples from the 6 m long Tasaral core revealed that the palynospectrum was of rather homogeneous content, reflecting the vegetation typical of northern and central deserts.

A detailed report of the results of the palynological analyses is given in the second half of this article.

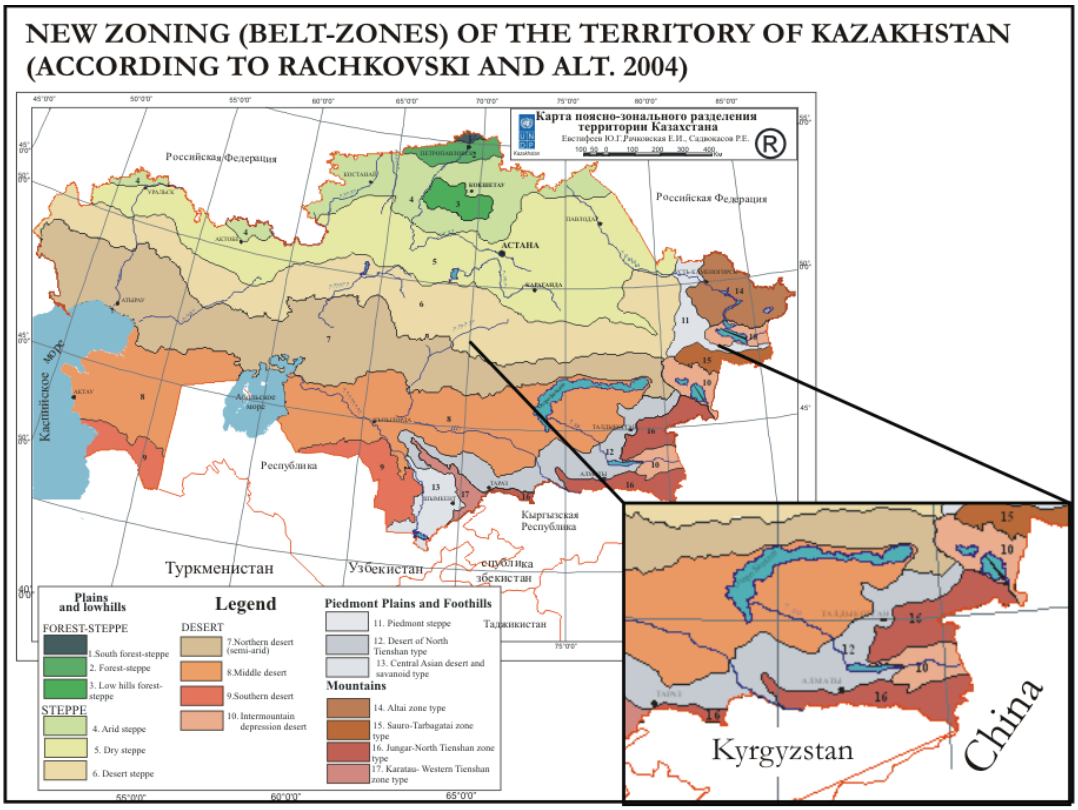


**Fig. 3 New zoning (belt-zones) of the territory of Kazakhstan (Rachkovskaya and alia, 2004)**

### *1.2.4. Diatom algae*

Diatomaceous algae (Bacillariophyta) living in various ecological conditions are good indicators of the quality of the water (salinity), its depth, and other ecological factors. Their type and number depend on water depth and salinity, and in closed lakes, can be successfully used for the reconstruction of changes of water level.

Japanese experts have analyzed the development during the last 2000 years of percentages of

planktonic species, epiphytes, and benthic and brackish diatom species in samples collected from the Tarasal core at an interval of 2.4 cm (Endo *et alia*, 2009). Benthic and brackish species develop with rising levels of salinity, and planktonic species and epiphytes develop in fresh water environments. Preliminary results show (Fig.4):

- significant changes at core depths of -580 and -280 cm, indicating a rapid drop of lake level and increase in salinity. Above these horizons the quantity of fresh-water plankton increases, indicating a rapid increase of lake level and desalinization
- similar changes but of smaller amplitude at core depths of -150 and -500 cm.

Consequently, the analyses of diatom algae reveal to be a good indicator of salinity and therefore of level changes in the Balkhash lake.

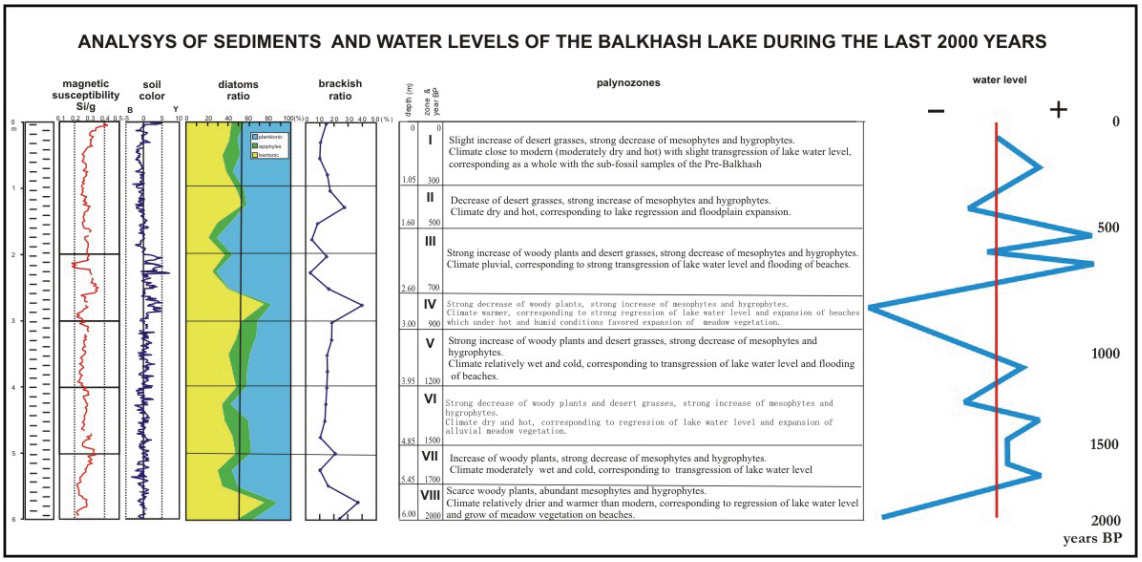


**Fig 4 Reconstruction of relative changes of water level of Lake Balkhash during the last 2000 years based on different proxies;** from left to right: magnetic susceptibility, soil deposit color (B-blue, Y-yellow), percentages of diatom species (yellow-benthic, green-epiphytes, blue-planktonic), percentage of brackish species, palynozones, and lake water levels.

### 1.3. Multi-proxy reconstruction of changes of water level of Lake Balkhash during the last 2000 years

A combination of the magnetic susceptibility (residual magnetization), soil deposit color, percentages of diatom species, percentage of brackish species, content of the palynospectrum of coastal epiphytic plants, and absolute dating allows a preliminary reconstruction of the relative fluctuations of the depth of Lake Balkhash during the last 2000 years. (Fig.4)

## 2. Scientific report on palynological analyses of the Tarasal core

The palynological analysis, based on the study of plant pollens and spores, represents the most important part of the paleogeographical and paleoclimatological reconstruction. It allows not only

the establishment of the type of vegetation existing in a given territory at a given period of time and the allocation of minor climatic changes reflected in the redistribution of separate groups of plants, but also the determination of well-marked climatic parameters.

### 2.1. Contemporary vegetation of the region

The territory under study is located on the borders of the Sahara-Gobi Desert province and in the Irano-Turanian sub-province (Botanical Geography 2003). Here two climatic conditionally sub-zonal types of desert replace each other from north to south: middle ("real") deserts and piedmont deserts (Map of vegetation 1995). They are followed in the south by the Zailiski Mountain sub-province. Lake Balkhash is located in the zone of middle deserts. (Fig.3, Fig.5)

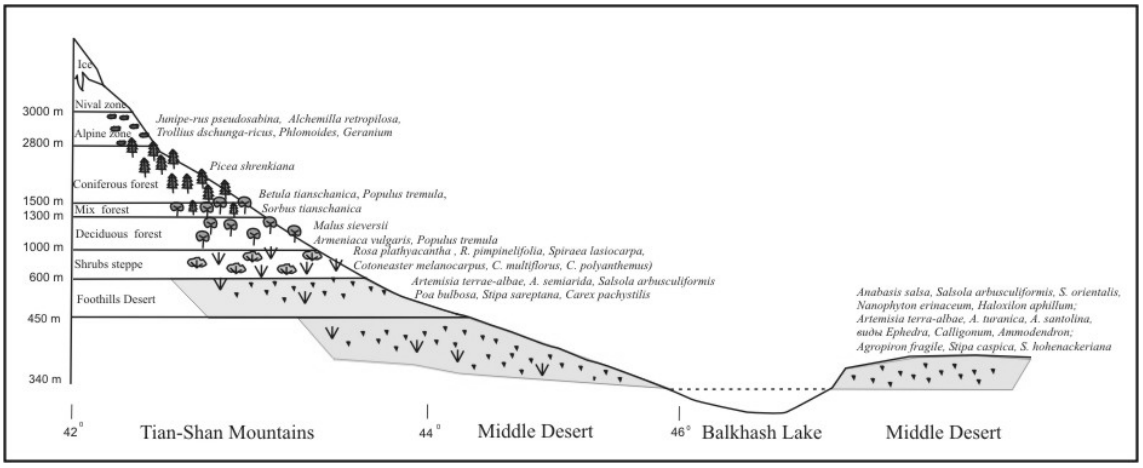


**Fig. 5 Distribution of vegetation by vertical zones from middle deserts to Northern Tienshan high mountains**

#### *2.1.1. Middle deserts*

In middle deserts the general climatic conditions testify to a significant increase of aridization. The soil type of this zone consists of gray-brown frozen desert soil.
Here perennial glasswort (*Salsola*) prevails, up to 62 % of total vegetation. Botanical Geography 2003 quotes the presence of *Anabasis salsa, Salsola, arbusculiformis, Nanophyton erinaceum,* and *Salsola orientalis;* and from pollen analyses, *Artemisia terrae-albae,* and *A. turanica.* Saksaul *(Haloxylon aphyllum, H. persica)* is very widespread on sand, as well as psammophilous shrubs and sub-shrubs *(Calligonum, Ephedra, Ammodendron, Ceratoides papposa, Salsola arbuscula)*, and from pollens, *Artemisia santolina, A. kelleri, A. songarica,* and *A. terrae-albae.* Synusia of graminoids *(Agropyron fragile, Stipa caspia, S. hohenackeriana)* is only found as a community in sands and pits.

#### *2.1.2. Piedmont deserts*

Piedmont deserts are located more to the south and embrace all piedmont plains bordering the Northern Tienshan (from East Tienshan to the NE slopes of the Syrdaryan Karatau) and the Junga-

rian Alatau. Here are characteristic dwarf sub-shrubs and desert shrubs with ephemeroids *(Catobrosella humilis, Poa bulbosa*) varying with elevation, in proximity to mountains, and in steppe-deserts with the addition of cereals *(Stipa sareptana, S. richteriana*) and ephemeroids (*Poa bulbosa, Carex pachystilis* of *Gagea* and *Tulipa* type). Northern Turanian pollens are dominant *(Artemisia terrae-albae, A. semiarida, A. sublessingiana)*, and in the eastern parts, *A. heptapotamica* and black saltwort (*Salsola arbusculiformis*). In piedmont deserts the most active role is played by communities of wheatgrass.

### *2.1.3. Zailiski mountain sub-province*

The Zailiski mountain sub-province embraces the chain of the Zailiski Alatau, located in the central-northern part of the Tienshan range. The vegetation is of Zailiski-Northern Djungarian zone type. (Rachkovskaya *et alia* 2003). The piedmonts consist of feather-grass-wormwood deserts with ephemeroids. In the steppes of the entire low-mountain band (dry and desertic) a significant role is played by ephemeroids. This is particularly true of the steppe zone of the Zailiski Alatau (which is clearly divided into 3 sub-zones): spring ephemeroids play a significant role in the sub-zones of the desertic and dry steppes. In Northern Tienshan scrubs are characteristic of the steppe zone and are represented basically by rosaceae, but other species are also present. The basic dominants are roses *(Rosa plathyacantha, R. pimpinelifolia)*, spiraea (*Spiraea lasiocarpa)* and species of cotoneasters *(Cotoneaster melanocarpus, C. multiflorus, C. polyanthemus)*.

The woody vegetation in Northern Tienshan is mainly distributed on slopes with northern exposure:

- at the bases of the mountains (700 - 900 m asl), various kinds of bushes grow
- at 1000 - 1200 m asl, bushes are replaced by deciduous forest
- at 1300 m asl, the Tienshan fur-tree is added to the deciduous forest. A characteristic feature of this sub-province is the presence of deciduous woods of apple-trees (*Malus sieversii*), apricots (*Armeniaca vulgaris* of Zailisky Alatau), and aspen (*Populus tremula*)
- from 1500 up to 2800 m pure fur-tree forests grow
- above 2800 asl the fur-tree is replaced by prostrate-type juniper.

These changes are reflected in the sub-fossil palynospectrum, which by further interpretation allows precise division and classification of mineral spectra. Our database of surface sub-fossil spectra helped to differentiate several stages of climatic and vegetation changes and to connect them with water levels of Lake Balkhash.

## 2.2. Methods and materials

For the implementation of the palynological study of the 6 m Tarasal core of the bottom deposits of Lake Balkhash, 112 sediment samples were collected at 5 cm intervals. Pollens and spores were extracted by methods successfully developed and implemented over a long period of time by the palynological group of the Institute of Geology of Almaty. The basic steps for the preparation of sediment samples are as follows:

1. The sediment samples are processed by a 10 % solution of hydrochloric acid (HCl) and subsequently washed (cleaned).
2. The sediments are cooked in a caustic solution (KOH) and subsequently washed.
3. The sediments are processed by a 10 % solution of nitric pyrophosphate, followed by prolonged decantation by distilled water until a transparent water column above the rock is attained.
4. Triple centrifugation of the sediments in heavy liquid is performed for separation of organic and inorganic fractions, and then the last fractions are washed out.
5. The organic deposit cleared by distilled water is collected and processed by iced acetic acid.
6. Acetolysis is performed, followed by a subsequent washing by distilled water.
7. The sample is processed by spirits and silicate oil or glycerin is added.

The calculation of pollens and spores is preceded by not less than 3 rounds of preparation in order to provide samples with a high pollen saturation.

To obtain significant data, sub-fossil samples were also collected and studied along the whole profile of the Pre-Balkhash region, from the Zailiski Alatau to Northern Pre-Balkhash. This made it possible to obtain reliable material concerning the formation of the palynospectrum in this region and to reconstruct the vegetation of different climatic phases of the Holocene.

### 2.3. Basic results

The study of 112 samples from the bottom deposits of Lake Balkhash individuated 30 species of pollen and spores (Fig.6), the chronological sequence of which was provided by absolute dating based on micro-radiocarbon analyses.

Due to the stability and low reactivity of the middle desert environment surrounding Lake Balkhash, additional samples of palynological sequences must be collected and analyzed from the lake bottom and from the coastal area in order to provide a sound reconstruction of average yearly precipitation and temperature.

The novelty represented by the Balkhash site is the fact that the lake environment supports some hydrophytic and mesophytic plants that are highly reactive not so much to climate but to changes of lake water level. Based on this fact, the palynological studies referenced by this article allowed the reconstruction of water level changes during the last 2000 years (Fig.4).

2.3.1 - Examining the entire content of the spectra, we differentiated pollens and spores. Among pollens we differentiated four kinds related to four zones of origin: woody plants, desert grasses, mesophytic herbs, and hydrophytic herbs. Positive and negative variations of pollen ratio of woody plants and desert grasses are related respectively to wetter or dryer phases. Positive and negative variations of pollen ratios of mesophytic and hydrophytic herbs are related respectively to negative and positive changes of water level of the lake, which respectively expose or flood fertile subaquatic soils. These categories of plants are listed below in order of distance of their habitat from the shore of Lake Balkhash, together with their significance for paleo-environmental and paleoclimatic reconstructions.

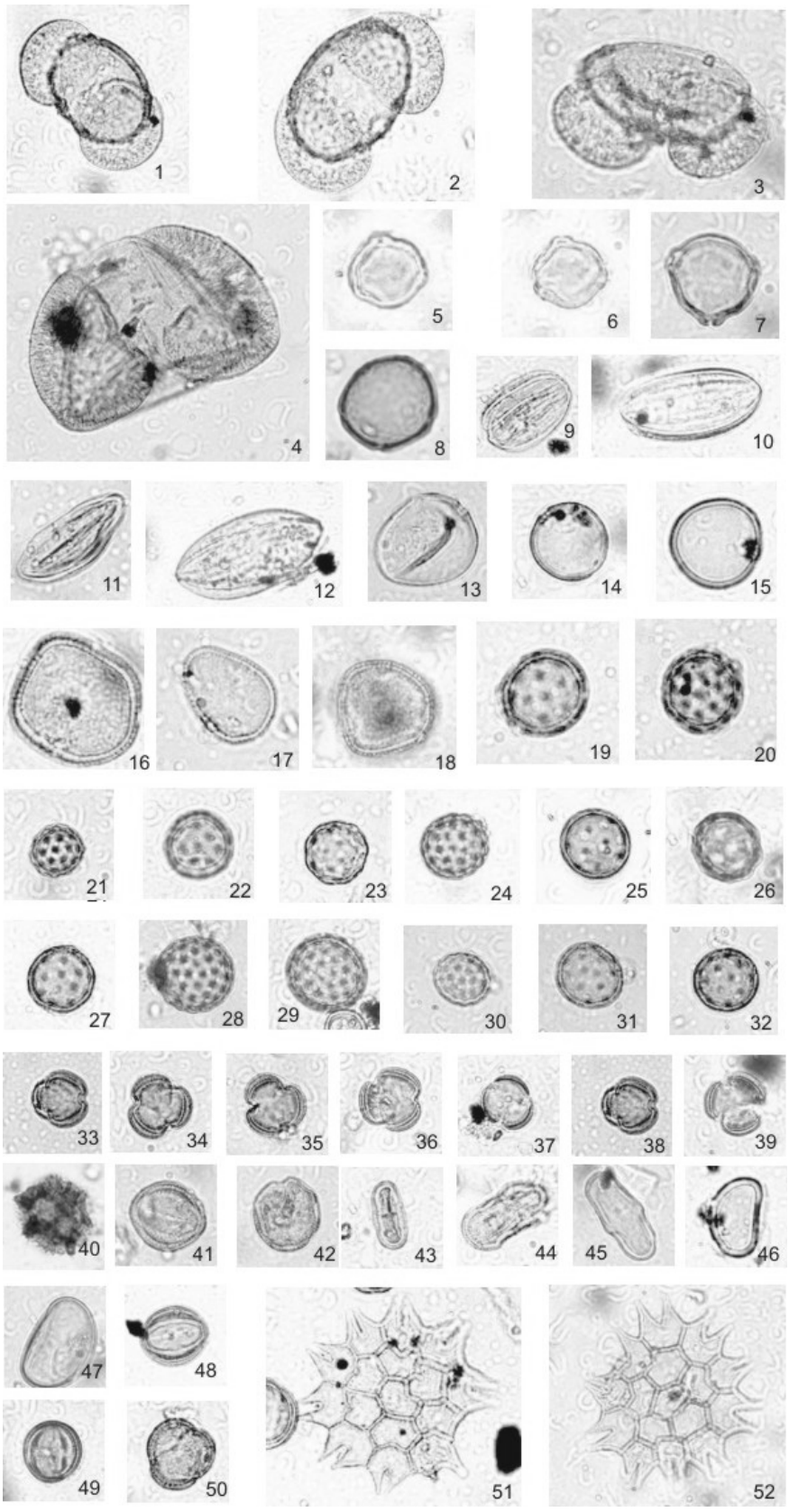


**Fig. 6 Photo-table of 20 of the most relevant species and types of pollens and spores from the Late Holocene bottom deposits of Lake Balkhash, ordered as in the palynogram of Fig 7.**

1-3 *Pinus sp. (type P. silvestris)*
4 *Picea shrenkiana*
5-7 *Betula sp.*
8 *Ulmus sp;*
9-11 *Ephedra sp.1*
12 *Ephedra sp.2*
13-15 *Poaceae*
16 *Sparganium sp*
17-18 *Typha sp*
19-32 *Chenopodiaceae*
[ 19-24 *Eurotia type*]
25-26 *Salsola type*
27 *Nanophyton type*
28-29 *Anabasis type*
30 *Atriplex type*
31-32 *Suaeda type ]*
33-39 *Artemisia sp.*
40 *Cichoriaceae*
41-42 *Brassicaeae*
43-45 *Apiaceae*
46-50 *Polypodiaceae*
51-52 *alga Pediastrum sp.*

- Woody plants that do not grow in proximity to the lake and could be brought both by wind and river water: pollen of alien species, mainly conifers (*Pinus, Picea*). Also found are pollens of some herbs and shrubs characteristic of distant regions and brought by the Ili river to the southern coast of Lake Balkhash. The number of this class of pollens increases during wet-cold climatic phases and strong winds.
- Desert grasses: pollen of middle desert herbs and shrubs *(Chenopodiaceae, Artemisia)*. Their number increases during wet-cold climatic phases.
- Mesophytic herbs from coastal meadows and riverbeds: Poaceae and various kinds of forbs (*Cychoriaceae, Brassicaceae, Lamiaceae*, etc). Their number increases during dry-hot climatic phases and recession of lake water levels.
- Hygrophytic plants of order *Cyperales* (*Carex)* and *Typhales* (reeds like *Sparganium, Typha)*. Their number increases during dry-hot climatic phases and recession of lake water levels.
- Spores of ferns and algae

2.3.2 - Relative ratio of different species:

- The pollen of herbal plants is 91% of the total, constituting the basis of the palynospectrum.
  - Pollens of salt tolerant desert plants are dominant, with the percentage varying between 73 - 95% among samples: the grass families of Chenopodiaceae (*Atriplex, Salsola, Eurotia, Kochia*, *Anabasis,* etc.) are 35 - 45%, and Asteraceae (*Artemisia terra-albae, A. lessingiana*) is 35 - 42%.
  - An appreciable proportion of 5 - 17% comes from mesophytic plants from coastal meadows: cereals (*Poacea*) 3.5 - 10%, sedges 1 - 8%
  - The 0.5 - 12% proportion of hygrophytic coastal water plants like sedges is also significant, *Carex*, *Sparganium*, and reed-mace (*Typha*).
  - Pollens of various herbs and shrubs (Ephedra) brought by the Ili river to the southern shore of Lake Balkhash lake in proportions not exceeding 3 - 5 % are found in practically all spectra.

- Pollen of arborous plants are scarcer, constituting 7 - 9% of the total number of grain and spore pollens: pine (*Pinus silvestris*) 3.5 - 5%, fur-trees (*Picea sp*.) 2%, birches (*Betula*) 3.5 - 5%, as well as individual cases of willows, alder and linden (*Salix, Alnus, Tilia*). The rather stable and insignificant percentage of arborous pollens points to transport as a formative factor of this part of the palynospectrum.

- Sporous plants are very scarce, represented by individual ferns *(*genus *Polypodium* and *Lycopodium)*. The presence of spores of the seaweed *Pediastrum* was found in all samples.

2.3.3 - A palynogram of the sequence of pollen ratios of the 30 species which have been individuated is shown below.

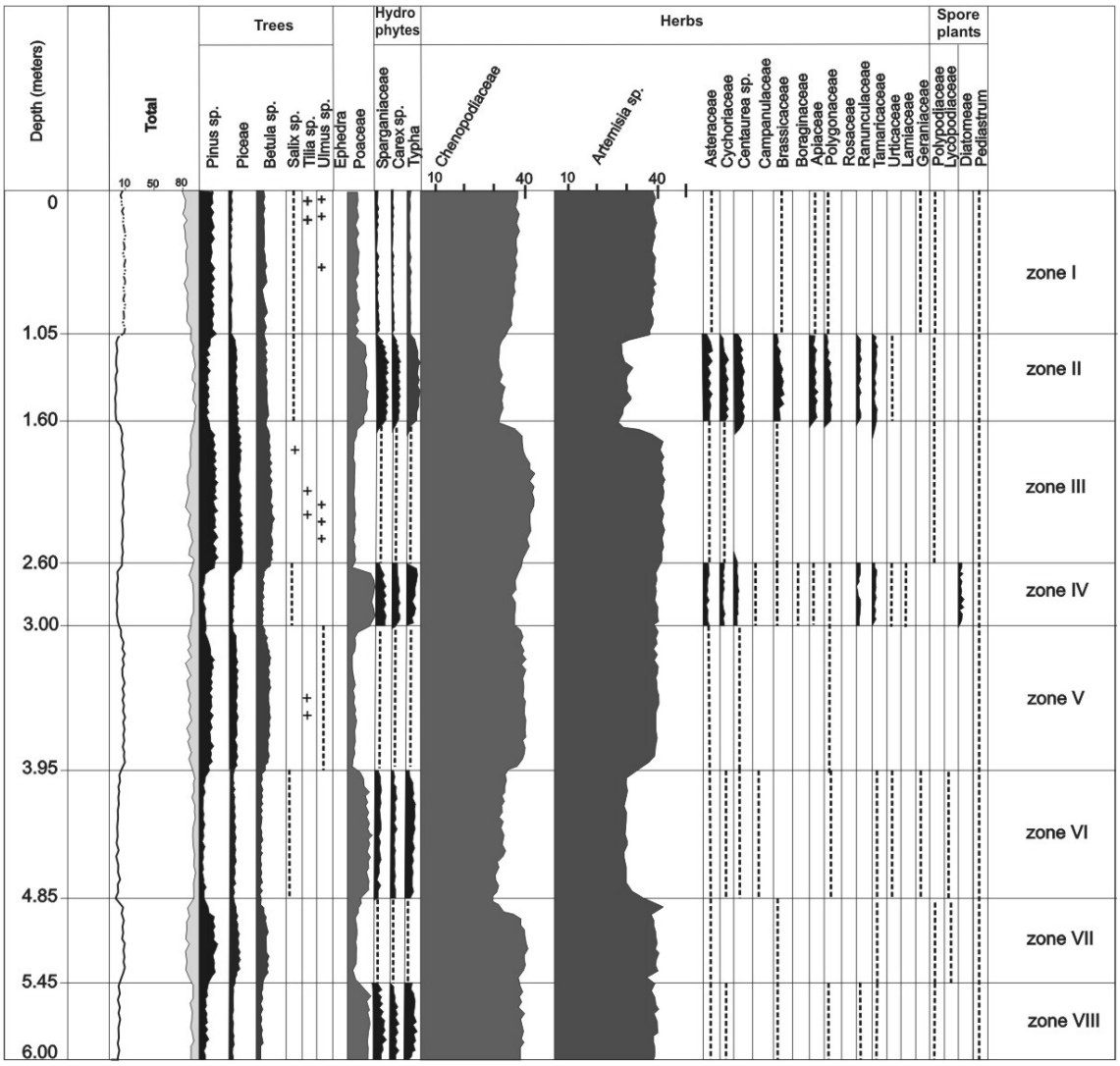


**Fig 7 Palynogram of the palynological analysis of the Tarasal core**

2.3.4 - Considering the spectra content of different samples of the core, the palynological sequence shows a relatively quiet formation process. We can differentiate, from top to bottom, eight superposed palyno-zones corresponding to eight climatic stages and lake water level fluctuations.

| **ZONE** *(depth in m)* & **STAGE** *(years BP)* | **POLLEN RATIO & *COMMENTARY*** |
|---|---|
| 0 BP<br><br><br><br>**Zone 1**<br>0 - 1,00 | – Woody plants 9% : Pinus silvestris 4.8-5.2%, Piceae individuals, Betula sp. 2-3.2%;<br>– Desert grasses increase* to 75-80%: Artemisia terra-albae & Artemisia lessingiana 38-42%, Chenopodiaceae (Atriplex, Kochia, Salsola, Anabasis and others) 37-38%;<br>– Mesophytes sharp decrease to 3%: Poaceae 2-3%; forbs and others less than 1%;<br>– Hygrophytes sharp decrease to 1.5-2%: Sparganium 1.5-2%, Carex & Typha individuals;<br>– Algae (Pediastrum); |

| | |
|---|---|
| 300 BP | *Slight increase of desert grasses, sharp decrease of mesophytes and hygrophytes.*<br>*Climate close to modern climate (moderately dry and hot) with slight transgression of lake water level, corresponding as a whole to the sub-fossil samples of the Pre-Balkhash* |
| **Zone 2**<br>1,05 - 1,60 | – Woody plants decrease to 8%: Pinus silvestris 2%; Piceae 2.5%; Betula sp. 3%;<br>– Desert grasses decrease to 68-70%: Artemisia 35-38%, Chenopodiaceae (30-35%);<br>– Mesophytes sharp increase to 12-14%: Poaceae 7 %; forbs and others 5-7% (Cychoriaceae, Brassicaceae, Lamiaceae);<br>– Hygrophytes sharp increase to 8%: Sparganium 2.5-3%, Carex 1,5-3%, Typha 3-5%;<br>– Algae: Pediastrum; |
| 500 BP | *Decrease of desert grasses, sharp increase of mesophytes and hygrophytes.*<br>*Climate dry and hot, corresponding to lake regression and floodplain expansion.* |
| **Zone 3**<br>1,65 - 2,60 | – Woody plants sharp increase to 9,5-10 %: Pinus silvestris 4.8-5.5%, Piceae 3%, Betula sp. 3.2-4%;<br>– Desert grasses increase to 90-95%: Chenopodiaceae (Atriplex, Kochia, Salsola, Anabasis and others) 38-45%, Artemisia 38-42%;<br>– Mesophytes sharp decrease to 3.5%: Poaceae 3.5%; forbs and others: individuals;<br>– Hygrophytes sharp decrease to insignificant quantity: Sparganium, Carex & Typha individuals;<br>– Algae: Pediastrum; |
| 700 BP | *Sharp increase of woody plants and desert grasses, sharp decrease of mesophytes and hygrophytes.*<br>*Climate pluvial, corresponding to strong transgression of lake water level and flooding of beaches.* |
| **Zone 4**<br>2,65 - 3,00 | – Woody plants sharp decrease to 5%: Pinus silvestris 2%, Piceae 1%, Betula sp. 2%;<br>– Desert grasses 73-80%: Artemisia 38-40 %, Chenopodiaceae 35-40 %;<br>– Mesophytes sharp increase to 13-17%: Poaceae 8-10%; forbs and others 5-7% (Ranunculaceae, Apiaceae, Lamiaceae, Brassicaceae, Polygonaceae);<br>– Hygrophytes sharp increase to 7 %: Sparganium-2.5-3%, Carex 2,5%, Typha 3%;<br>– Algae: Pediastrum; diatomic algae (Bacillariophyta) from families of Coscinodiscaceae, Tabellariaceae, Melosiraceae; |
| 900 BP | *Sharp decrease of woody plants, sharp increase of mesophytes and hygrophytes.*<br>*Climate warmer, corresponding to sharp regression of lake water level and expansion of beaches which under hot and humid conditions favored expansion of meadow vegetation* |
| **Zone 5**<br>3,05 - 3,95 | – Woody plants sharp increase to 11-13%: Pinus silvestris 4.8-5.5%, Piceae 3%, Betula sp. 3,2-4,5%;<br>– Desert grasses increase to 78-84%: Chenopodiaceae (Atriplex, Kochia, Salsola, Anabasis and others) 38-42%, Artemisia terra-albae & Artemisia lessingiana 38-42%;<br>– Mesophytes sharp decrease to 3.5%: Poaceae 3.5% (various graminoids individuals); forbs and others less than 1%;<br>– Hygrophytes sharp decrease to 0.5-1.5%: Sparganium & Carex & Typha individuals;<br>– Algae: Pediastrum; |
| 1200 BP | *Sharp increase of woody plants and desert grasses, sharp decrease of mesophytes and hygrophytes.*<br>*Climate relatively wet and cold, corresponding to transgression of lake water level and flood-* |

| | |
|---|---|
| | *ing of beaches.* |
| **Zone 6**<br><br>4,00 - 4,85 | – Woody plants sharp decrease to 6%: Pinus silvestris 2 %, Piceae 2%, Betula sp. 2%;<br>– Desert grasses decrease to 58-70%: Chenopodiaceae (30-35%), Artemisia (28-35%);<br>– Mesophytes sharp increase to 14%: Poaceae 6%; forbs and others 8% (Cychoriaceae, Brassicae, Lamiaceae);<br>– Hygrophytes sharp increase to 7%: Sparganium 2-2,5%, Carex 1,5-3%, Typha 3%;<br>– Algae: Pediastrum; |
| 1500 BP | *Sharp decrease of woody plants and desert grasses, sharp increase of mesophytes and hygrophytes.*<br>*Climate dry and hot, corresponding to regression of lake water level and expansion of alluvial meadow vegetation.* |
| **Zone 7**<br>4,90 - 5,45<br><br>1700 BP | – Woody plants increase to 10-12%: Pinus silvestris 4,5-5,5%, Piceae 3 %, Betula sp. 4 %;<br>– Desert grasses 73-82%: Chenopodiaceae 38-42%, Artemisia 35-40%;<br>– Mesophytes sharp decrease to 4.5% : Poaceae 3,5-4 %; forbs and others: less than 1%<br>– Hygrophytes sharp decrease to 2%: Sparganium & Carex & Typha;<br>– Spores: Polypodiaceae;<br>– Algae: Pediastrum; |
| | *Increase of woody plants, sharp decrease of mesophytes and hygrophytes.*<br>*Climate moderately wet and cold, corresponding to transgression of lake water level* |
| **Zone 8**<br>5,50 - 6,05 | – Woody plants scarce 7%: Pinus silvestris 2-3.5%, Piceae 2%, Betula sp. 2-2.5%;<br>– Desert grasses average 76-80,5%: Chenopodiaceae 38-40%, Artemisia 38.5- 40.5%;<br>– Mesophytes abundant 15%: Poaceae 8%; forbs and others: 7% (Ranunculaceae, Apiaceae, Lamiaceae, Brassicaceae, Polygonaceae);<br>– Hygrophytes abundant 8,5-12%: Sparganium 2.5-4 %, Carex 2,5-3%, Typha 3,5-5%;<br>– Algae: Pediastrum; |
| 2000 BP | *Scarce woody plants, abundant mesophytes and hygrophytes.*<br>*Climate relatively drier and warmer than modern climate, corresponding to regression of lake water level and growth of meadow vegetation on beaches.* |

* The terms "increase" and "decrease" refer to ratio variations of more than ±10%, with differences evaluated in chronological order from bottom to upper zones. The term "sharp" applies to variations ≥50% and always characterizes changes of Poaceae and Hygrophytes pollen ratios.

The highest total ratio is represented by pollens of desert grasses, followed by woody plants, mesophytic plants and hygrophytes.

The highest differential ratios between stages are those of mesophytic plants (always very sharp variations of 2.5 to 3 times) and hygrophytes (sharp variations averaging more than 50%), followed by that of woody plants (10 - 50%) and desert grasses (10 - 20%). The sharpest variations occur in stages 6, 5, 4 and 3.

Variations of ratios of pollens of woody plants and desert grasses (and spores) occur in the same direction; and those of pollens of mesophytes and hygrophytes occur in the opposite direction. The increase of pollen ratios of woody plants and desert grasses is in general correlated with changes to a wetter, cooler climate and transgression of lake water level; their decrease is correlated with

changes to a drier and warmer climate and regression of lake water level. The opposite is true of mesophytes and hygrophytes.

The series of data of the palynozones (palynospectrum) bears witness to the establishment, during the late Holocene, of rhythmical climatic fluctuations in eight zones-stages, alternating drier-warmer and wetter-cooler phases and, correspondingly, regression and transgression of lake water level.

These data confirm and enhance the resolution of the previous reconstruction of late Holocene climate implemented within the study of archeological sites of the Southern Pre-Balkhash region (Aubekerov et alia 2003).

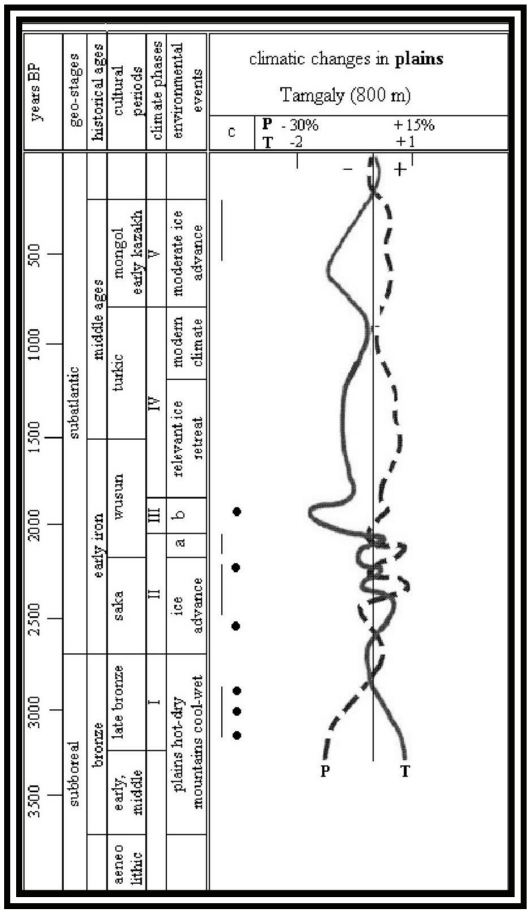


**Fig 8 Reconstruction of average fluctuations of temperature and precipitation in the Semirechie plains during the last 3200 yrs (150-yr temporal resolution), based on palynological analyses.**

Temperature (T) is shown in solid lines; Precipitation (P) in dashed lines; (a) fires; (b) cryolitic formations; (c) chronological attribution provided by EPR and $C^{14}$ analyses (dots) and archaeological correlation (segments) (Aubekerov, Sala, Nigmatova 2003).

2.3.4 - The bi-millenary variation of water level of Lake Balkhash, which today is at 340 m asl and during the last 2000 years may have varied by ±3 to ±4 m, matches quite well with the average variations of the Aral sea. The sharpest recession of the Balkhash water level happened in zone-stage 4 (900 - 700 years BP) and is well correlated with the building and abandonment of the medieval town of Koktuma (IX - XIII AD), today submerged 3 - 4 m deep in Lake Alakol.

The sharpest regression of water level, which occurred during the XI - XIII centuries AD, is common to both Lake Balkhash and the Aral sea, and in both cases is correlated with natural and anthropogenic factors, i.e., with a dry-hot climatic phase and the highest peak of urbanization and

water use in the two basins (Sala 2009). Evidently anthropogenic water use increases during arid phases, and in Medieval times as well as today, acts as positive feedback to the regression naturally induced by the establishment of a dry climatic phase.

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# Reconstruction of Lake Level and Paleoenvironmental Changes from a Core from Balkhash Lake, Kazakhstan

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**CONTENTS**



## 1. Introduction

Using results from previous seismic and topographical surveys, we analyzed core samples taken in 2007 to investigate lake level and sedimentary environmental changes in and around Balkhash Lake, Kazakhstan, during the last 2000 years. In Sections 2 and 3, we summarize the results and

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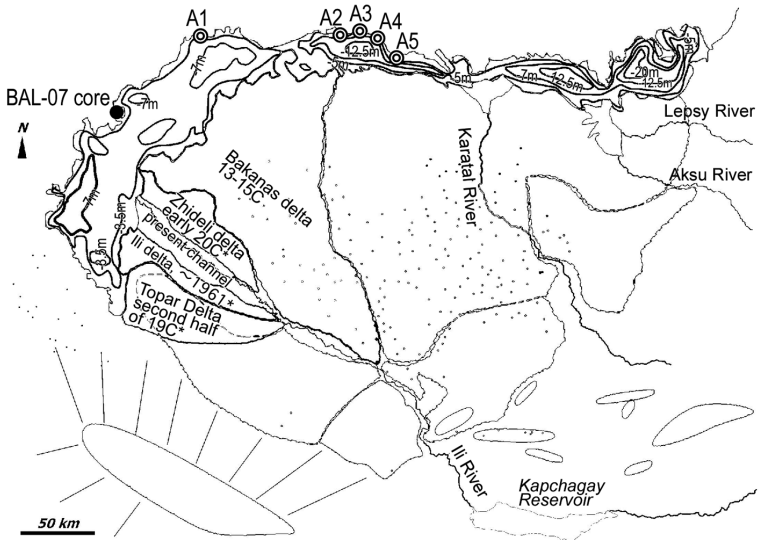


**Fig.1 Map of the Balkhash Lake area.**
The delta distribution is from Abdrasilov and Tulebaeva (1994).

conclusions of several previous studies of Balkhash Lake. Then, in Section 4, we present results of core analyses of magnetic susceptibility, soil color, grain size, chemical properties, accelerater mass spectrometry (AMS) $^{14}C$ and $^{137}Cs$ ages, and diatom and ostracod fossils. In Section 5, we compare our results with corresponding results from the Aral Sea and discuss environmental changes in this area over the past 2000 years.

## 2. Sedimentary condition in Balkhash Lake based on acoustic survey

To clarify the sedimentary structure of lake sediments in Balkhash Lake (Fig.1), and also to de-

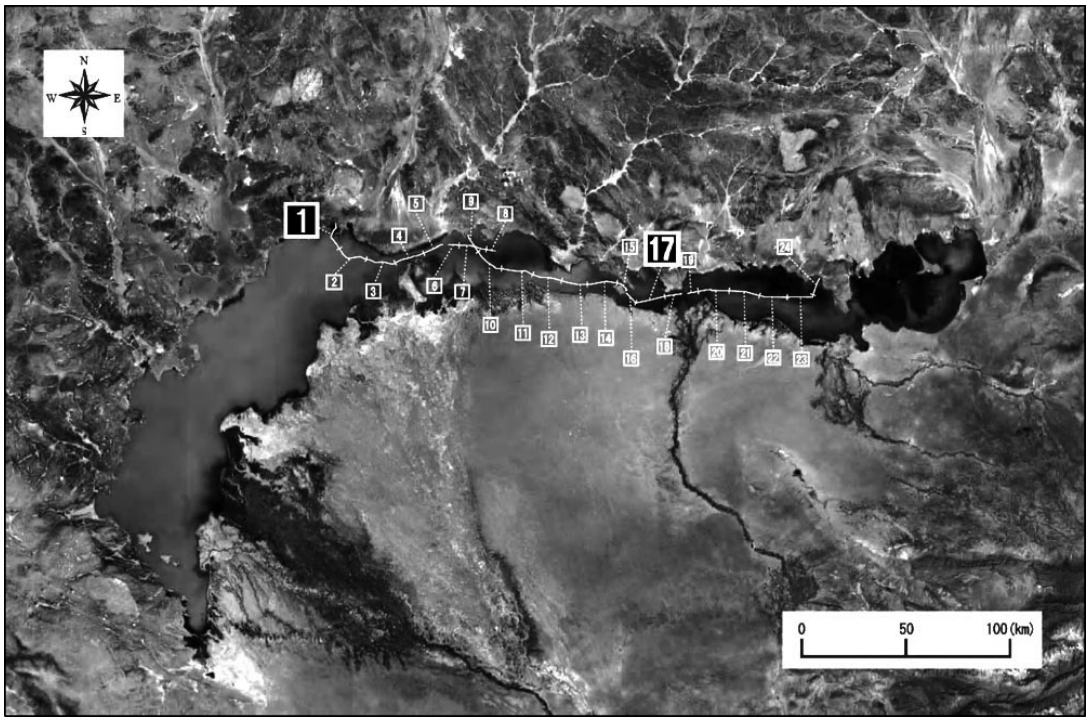


**Fig.2 Seismic survey lines and locations of the profiles (Haraguchi *et al.*, 2009; base map from Google map satellite image).**

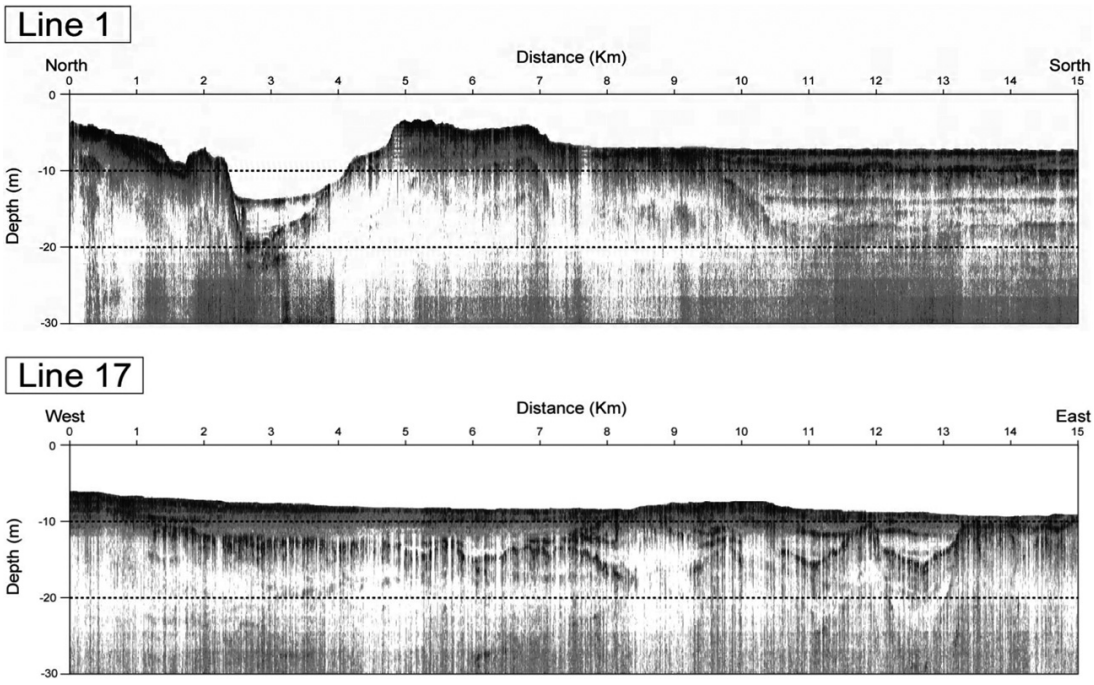


**Fig.3 Seismic profiles along survey lines 1 and 17 (Haraguchi *et al*., 2009). Locations of the survey lines are shown in Fig.2.**

termine suitable coring sites, a substratum seismic survey was conducted along a survey line about 290 km long in the eastern part of the lake with a StrataBox (3.5KHz; SyQwest Inc., Rhode Island, USA) seismic profiler (Fig.2). Positions of the boat were measured by GPS every second, and the boat was navigated using a map generated by Kashimir 3D software, Landsat images, and DEM （Digital Elevation Model) data derived from the SRTM(Shuttle Radar Topography Mission).

The topography of the Balkhash Lake basin shows that the elongated lake is located along the northern margin of the basin as a result of the progradation of deltas. The clastic materials of the delta area were supplied mainly by the Ili River but also by the Karatal, Aksu and Lepsi rivers.

Haraguchi *et al*. (2009) conducted a survey in which they determined that most of the lake is less than 10 m deep, and that the soft sediment has a maximum thickness of about 10 m. They also identified several buried valleys. The elevations of the buried valleys and erosional terraces suggest probable paleo-lake levels of 325 m, 330 m, and 335 m, or about 5 to 15 m lower than the present level of 340 m asl (Fig. 3).

In some narrow parts, flow velocity is so high that the bottom is eroded, and only coarse materials are deposited by the segregation of finer materials.

Coring sites for reconstruction of environmental changes must be stable and have continuous sedimentation. The survey of the eastern part of the lake, where it is deepest (about 20 to 25 m), showed that some inlets along the northern coast have thick deposits of soft sediment, and sites there are also suitable because wave action is weak and the inflow of terrestrial materials is low.

The same type of survey must be conducted for the western part of the lake as well to obtain a better idea of the sedimentary conditions in the entire Lake.

## 3. Lakeshore topography relating to past lake-level changes

On the basis of satellite data analyses in the past 30 years and high-spatial -resolution satellite data, topographies relating to the lake level have been distinguished and mapped on the images chiefly along the northern coast of Balkhash Lake (Fig.4; Nakayama *et al*., 2009).

In a 2008 survey of the northern coast, some shorelines indicated by coastal bars mapped on the high-spatial-resolution satellite images were recognized within a height of 3 to 4 m above the 2008 lake level (Fig.5). Behind the shorelines, additional bars and some lake terrace-like topographies are distributed about 6 to 12 m higher than the present lake level.

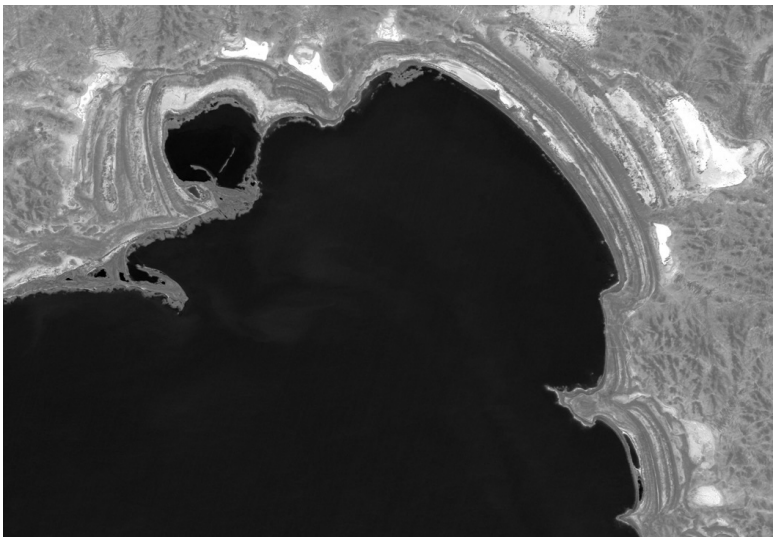

**Fig.4 Satellite image of typical bar topography along the northeastern shore of Balkhash Lake (Nakayama *et al*., 2009)**

A record of lake-level changes from 1880 to 1988 was published by Kipshakbaer and Abdrasilov (1994). Using their observations and data on lake area change based on satellite data during the last 30 years (Nakayama *et al*., 2007), Nakayama *et al*. (2009) created a lake level change curve of the last 128 years (1880－2007 ; Fig.6).

The high lake level around 1908 (about 3 m higher than the 2008 level), and the high lake level

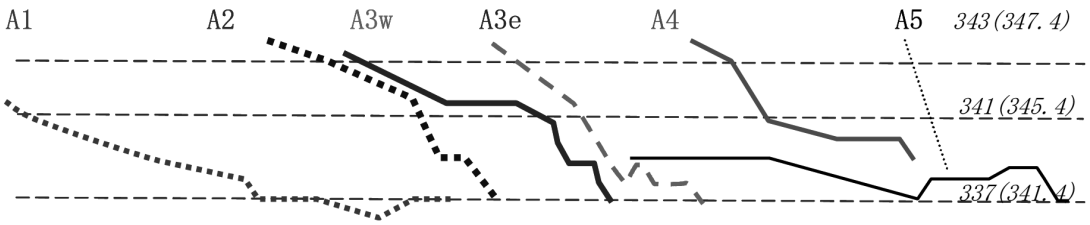


**Fig.5 Topographical survey of older shorelines along the northern shore of Balkhash Lake (locations are shown in Fig.1)**

from 1960 to 1972 (2－2.5 m higher than the 2008 level) probably correspond to the second and first shorelines (bars) from the present shore. Both are very well preserved and appear to be the youngest shorelines.

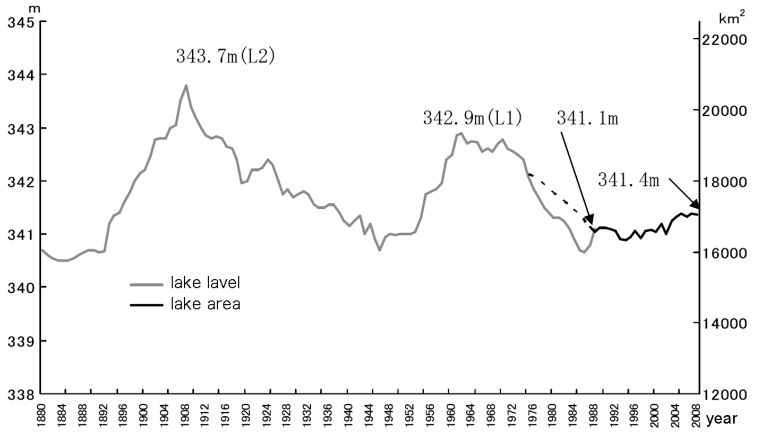


**Fig.6 Balkhash Lake level and area from 1880 to 2007 (Nakayama *et al*., 2009)**
1880-1988: Kipshakbaer and Abdrasilov, 1994
1988-2008 area change: Nakayama *et al.,* 2007

In a future investigation, we expect to use a highly precise Digital Elevation Model (DEM) derived from the ALOS/PRISM data with a 2.5-m spatial resolution to extract a detailed topography and a relative height survey.

It is important to determine the ages of the higher lake levels, which are suggested by higher bars and terrace-like topographies, using the optically stimulated luminescence (OSL) dating method.

## 4. Analysis of the Balkhash 2007 core

### 4.1. Lithology, soil color, and magnetic susceptibility

A core (Balkhash 2007 core) was taken from the western part of Balkhash Lake ( 46°17’ 21.2″N ; 74°00’ 33.6″E) in summer 2007 by Kazakhstan members. The site is just west of Tasaral island (Fig.1), at the shadow of the main part of the lake. The core is approximately 6 m long and is composed of dark to pale greenish gray, homogeneous silty clay to clayey silt. The magnetic susceptibility and soil color were measured at each 2.4-cm intervals, and the results are shown in Fig.7.

### 4.2. Age model

To establish the age model of Balkhash 2007 core, AMS-method radiocarbon dating and $^{210}$Pb and $^{137}$Cs measurements were conducted. For the AMS datings, fossil ostracod valves were collected from six core horizons with peak ostracod abundance and dated in a laboratory at PLD (Paleo-Labo Co., Gifu Prefecture, Japan). Those six dates are plotted in Fig.8. Three preliminary bulk samples were dated in the same laboratory previously (Endo *et al*., 2009). The age of the ostracod sample from -550cm shows the similar age of one bulk sample from -585cm, which is near the bottom of the core and has the most ostracod fossils. The other two bulk samples were older than the trend shown by six ostracod samples.

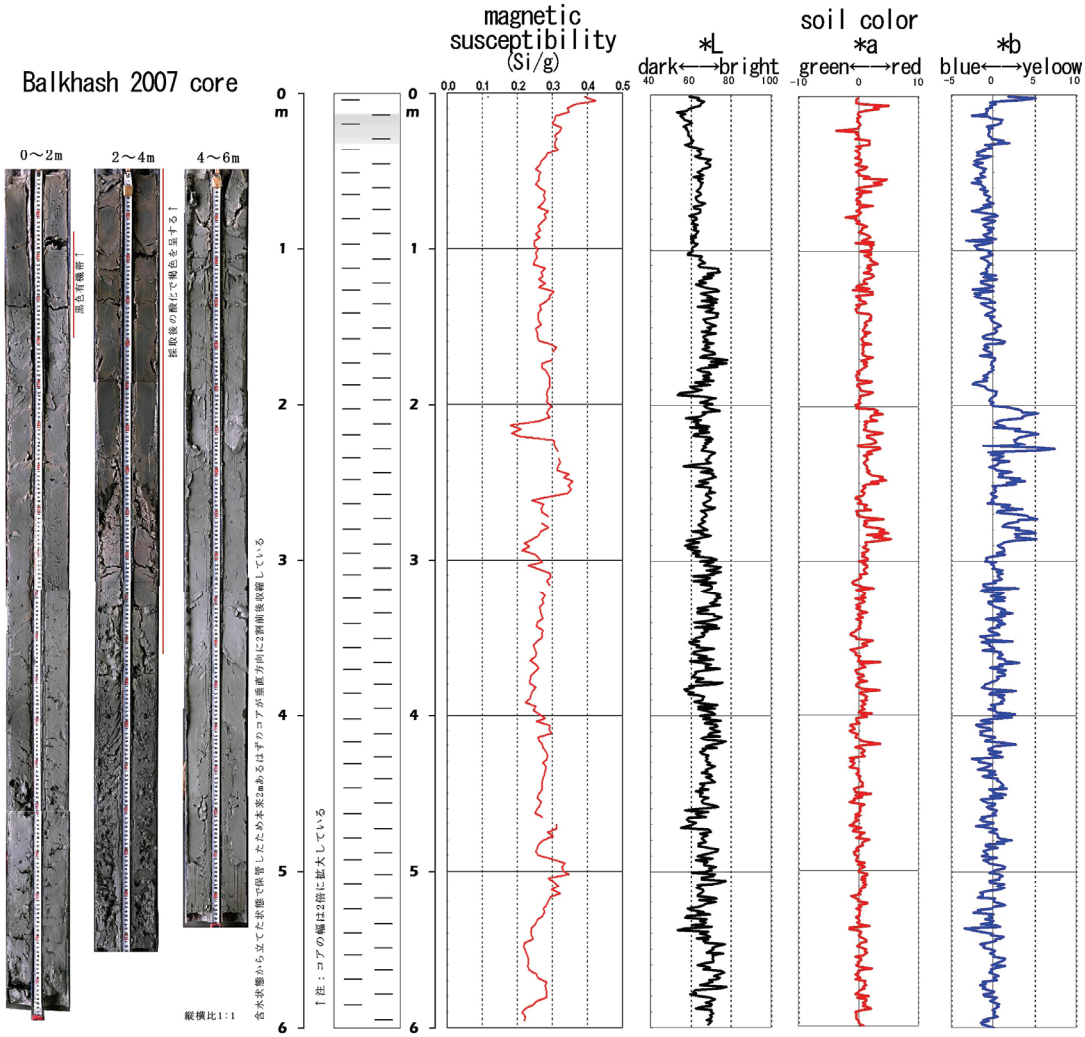


**Fig.7 Columnar section, magnetic susceptibility, and soil color (*L, *a, *b) of the Balkhash 2007 core.**
Photos of the top, middle and bottom of the core are shown from left to right respectively.

$^{210}$Pb and $^{137}$Cs measurements were carried out on 14 samples from -3.6 cm to -44.4 cm, in a laboratory at Kinki University in Osaka. According to $^{137}$Cs measurements, the lowest horizon in which $^{137}$Cs was detected was deposited in 1950 and the peak horizon was deposited in 1963.

On the basis of these age data including AMS ages for 6 ostracod samples and the two by $^{137}$Cs, 1950 and 1963, the age model shown in Fig.8 was estimated.

The average sedimentation rate was about 3.4 mm/year, but it decreased to about 1.1mm/year in the top 1 m. There are no sedimentation anomalies or boundaries, however, and the sediment looks continuous.

### 4.3 Diatom and ostracod analyses

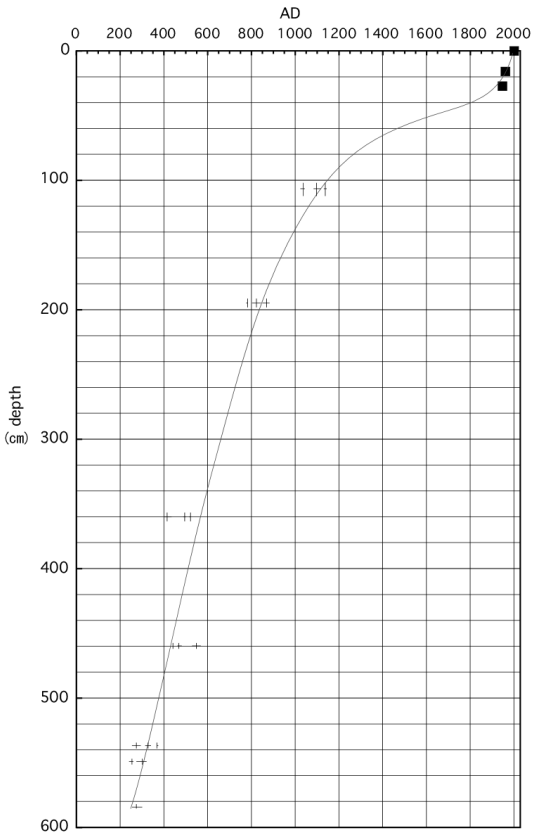


**Fig.8 Age model of the 2007 core**
+: $^{14}C$ age (calibrated) using ostracods
▪: $^{137}Cs$

Diatoms living in various aquatic and partly terrestrial environments are good indicators of water quality, water depth, and other environmental factors. In this study, we used diatom flora to reconstruct lake-level changes in Balkhash Lake. Generally speaking, lake level and water depth changes are reflected in salinity changes in closed lakes. The diatom analysis of Balkhash 2007 core was carried out at 12-cm intervals, although the preliminary results presented in Endo *et al*. (2009) were for 24-cm intervals.

Fresh water planktonic diatoms of *Aulacoseira granulate* are dominant in almost all samples except in the horizons at -585 cm (the bottom of the core), -280 cm, -200 cm and -10 cm, where they decreased remarkably and abruptly and were replaced by saline benthic diatoms such as *Thalassiosira lacustris, Rhopalodia gibba*, *Scoliopleura peisonis*. In the horizons at -540 cm and -430 to -480 cm, freshwater planktonic diatoms also decreased but not as remarkably, and saline benthic diatoms increased.

These results suggest that a rapid decrease in lake level and an increase in salinity occurred, especially at the depths of -280 cm and -585 cm, because a very high percentage of brackish species occurs at these depths. Those are similar to benthic species in coastal sea water. However, just above these horizons, the abundance of freshwater and planktonic species increased abruptly. This change suggests a quick rise in the lake level at this time. Salinity change inferred from the diatom flora therefore appears to be a good indicator of frequent lake level changes in Balkhash Lake.

A fossil ostracod analysis was also conducted for the same core. As shown in Fig.10, the number of fossil ostracod was relatively high in only six horizons: -550 cm, -540 cm, -480 to -460 cm, -370 cm, -200 cm, and -100 cm. The horizon at -585 cm, at the bottom of the core, had the most fossil ostracod valves, but we could not include this horizon in our analysis because we had used the bottom sample for the AMS dating and an insufficient amount remained for analysis. Around -280 cm, where saline diatoms are abundant, ostracods show only small peaks. Almost all the major ostracod peaks, however, correspond to lowered lake level horizons as deduced from higher percentages of saline diatoms. They include abundant saline water species as *Cyprideis torosa* and *Cy-*

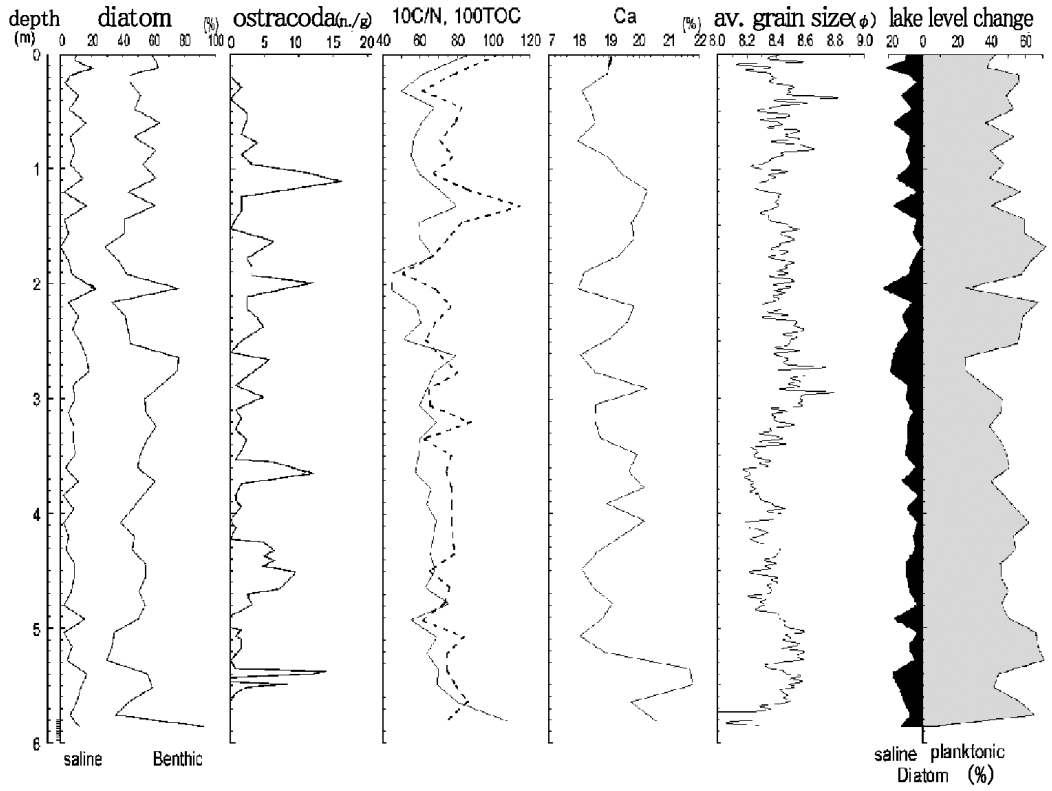


**Fig.9 Results of diatom, ostracod, C/N, TOC, Ca, and grain-size analyses of the Balkhash 2007 core. Lake- level changes inferred from the diatom assemblages are also shown.**

*prideis* spp. along with minor amount of freshwater species as *Darwinula* sp. and *Ilyocypris* spp. Especially, *Cyprideis torosa* is known to be tolerable in hyperhaline environment (e.g. Meisch, 2000). Only one peak (-370 cm) includes abundant amounts of saline and freshwater ostracods, indicating a rising lake level, although not a major peak (Fig.9). We attributed this peak to increased inflow of freshwater from the Ili River.

## 5. Discussion

According to our diatom and ostracod analysis result, decreasing lake levels are indicated at depths of -585 cm, -550 to -540 cm, -480 to -460 cm, -280 cm, -200 cm, and -100 cm, as mentioned previously. At -280 cm, ostracod data do not show a peak. However, the diatom data from all these horizons show an abrupt decrease in freshwater planktonic species and dominance of benthic and brackish species. Conversely, the high, wide ostracod peak of -100 cm suggests minor low lake level in diatom data.

We compared the age model of the Balkhash Lake core with one from Aral Sea core (after Boroffka *et al.*, 2006; Fig.11). Environmental changes in the Aral Sea have been reconstructed primarily by analyses of dinoflagellate cyst, ostracods and pollen, but also archaeological and historical records (Boroffka *et al*., 2006; Sorrel *et al*., 2006, 2007; Boomer, 1993; Boomer et al., 2009). During the Medieval Warm Period (MWP) and AD 0 to 400, the level of the Aral Sea decreased and its surface area was greatly reduced. Soon after the MWP (around AD 1200 to AD 1400), the water changed from brackish to freshwater by increased precipitation. After AD 1400, the water became brackish again, corresponding to the beginning of the Little Ice Age.

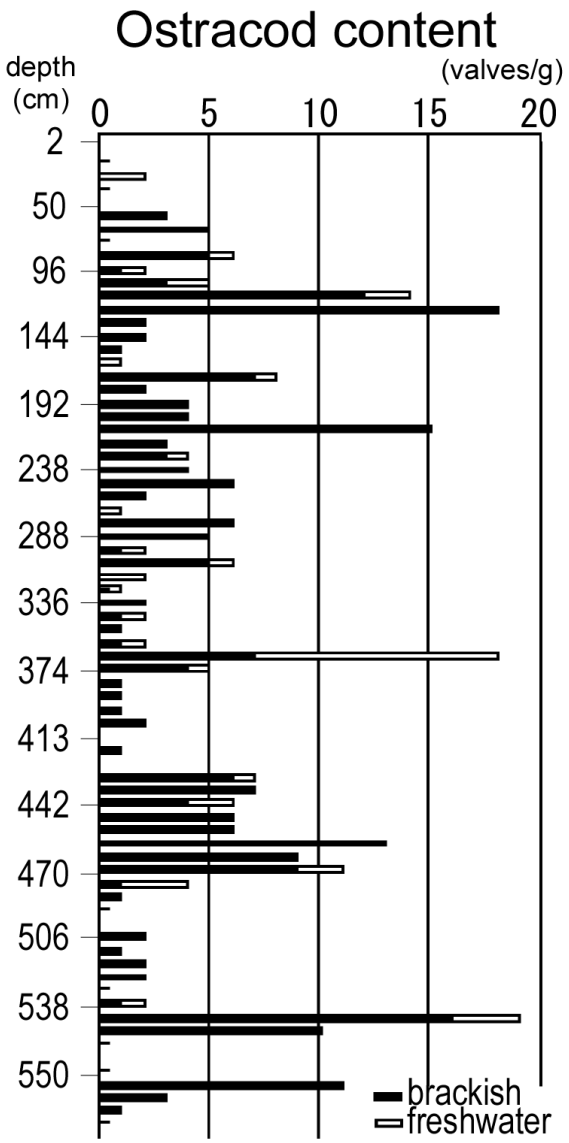


**Fig.10 Proportion of brackish and freshwater ostracod species in the Balkhash 2007 core. (number / gram)**

The results from the Balkhash 2007 core indicate that Balkhash Lake probably experienced similar environmental changes in Aral Sea (Boroffka *et al*., 2006; Sorrel *et al*., 2006, 2007; Boomer *et al*., 2009). For example, the low stage at -100 cm in Balkhash Lake probably corresponds to that of AD 1200 in Aral Sea core, which was characterized by a rich occurrence of gypsum crystals. In the Balkhash core, the diatom flora around -100cm (corresponding to AD 1050-1200) do not clearly show a low lake level, but the high, wide ostracod peak is conspicuous and occupied with only brackish species. Above this horizon, ostracods are rare. Consequently, a larger environmental change probably occurred just after AD 1200, which may be related to the change from the MWP to the Little Ice Age.

Below -100 cm, lake level changed frequently but at shorter intervals (about 50－100 years). In future research, it will be important to clarify the cause of these short intervals.

The low stages at -585 cm and -540 cm may also correspond to the horizon of approximately 2000 years ago in Aral Sea (Boroffka *et al*., 2006) .

During the MWP, the lake level must have decreased in both Aral sea and Balkhash Lake. Even

if the supply of water increased, evaporation increased more than enough under the warm climate to lower the lake levels. Currently, Balkhash Lake freezes from November to April. The length of freeze season is related to the amount of evaporation. Even if the supply of water to the lake decreased during the Little Ice Age, the lake level might still have risen if evaporation also greatly decreased. To clarify this question at Balkhash Lake, we need more detailed data especially for the period encompassing the Little Ice Age, the cause of the shorter interval changes, the source of water, e.g. the relation to the Mediterranean Low transporting moisture and North Atlantic Oscillation (NAO) (Yamakawa, 2005; Sorrel *et al*., 2007), and their influence to the inland China (Endo *et al*., 2006, 2007).

Central Asia is an important region for the study of environmental changes, but more types of data and higher resolution data are needed to better understand of environmental changes in this area.

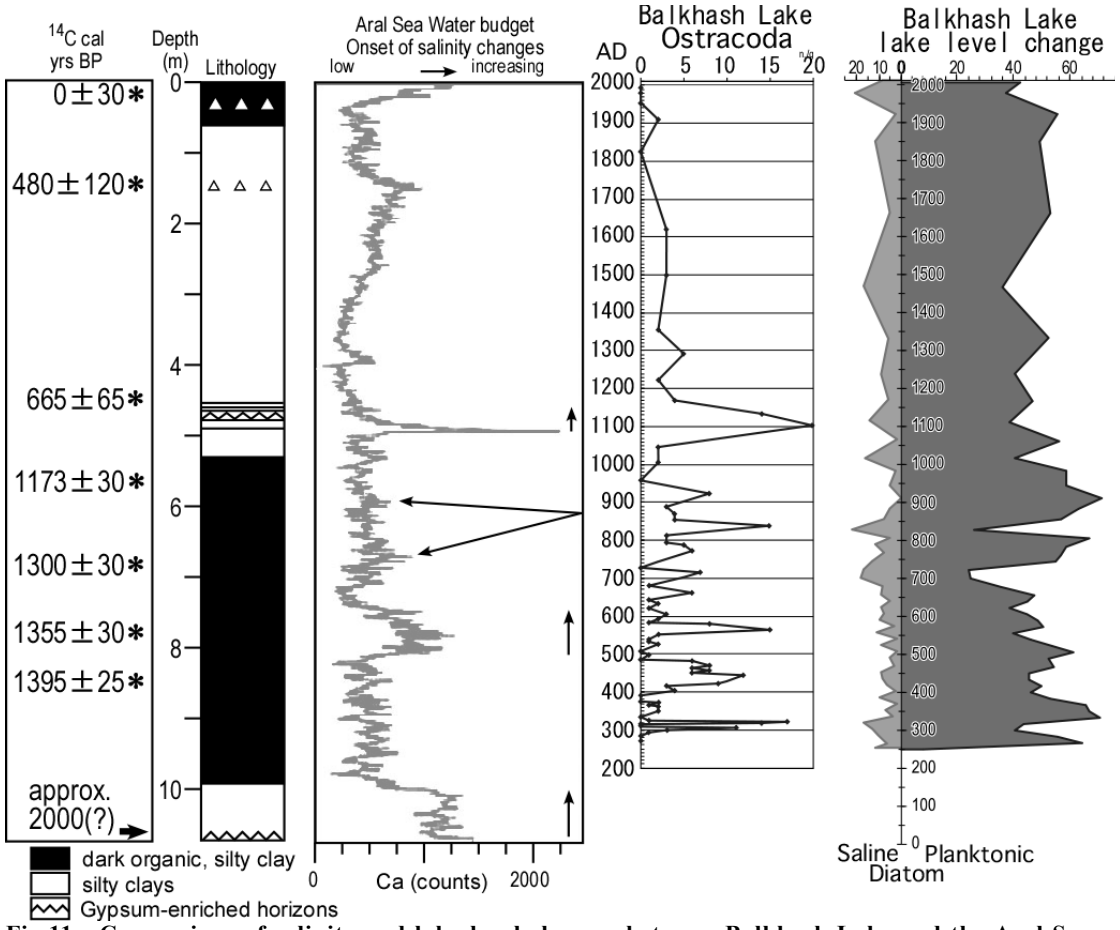


**Fig.11 Comparison of salinity and lake-level changes between Balkhash Lake and the Aral Sea. Balkhash Lake data are from our diatom and ostracod study; Aral Sea data are from Boroffka *et al*. (2006).**

## Acknowledgements

We are grateful to Prof. Ian Boomer of University of Newcastle, UK and Prof. Nikolaus Boroffka of Deutsches Archaologisches Institut in Berlin for their useful discussions. We are also thank Dr. Mitsuko Watanabe of Research Institute for Humanity and Nature in Kyoto, Mr. Sergey Perevosov of Institute of Geological Sciences in Almaty, Mrs. Almagul Hirono in Tokyo for their kind assistance with our field survey.

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# 3. Interactions between Human Activities and the Environment in the Context of Historical Transitions in Subsistence

# Land and Water Use in the Ili-Balkhash Basin from Paleolithic to Modern Times

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**CONTENTS**



## Abstract

Today a major methodological development of archaeological research is represented by inter-disciplinarity, namely the cooperation between archaeology and geographical and environmental sciences. This new approach, called geoarchaeology, is irreversibly changing the archaeological procedures of survey, excavation, documentation and interpretation. The present paper, adopting this point of view, analyzes the forms, factors and phases of landscape colonization in the Ili-Balkhash basin (Semirechie) from Paleolithic to modern times, on the basis of the documentation of the geographical location and chronology of monuments of material culture: settlements and towns, water devices and mines, roads, cemeteries and landscape marks like petroglyphs, henges and cairns. Some classificatory frames are suggested: ecological, topographical, and geomorphological.

The ecological frame results are the most proficient. It is based on the consideration of the relative weight and complex interaction of 6 "*location factors*" (partly natural partly cultural: raw materials, water resources, climate, relief, strategic economic opportunities, and socio-political control) which appear to be of the highest significance not only in the case of Semirechie in Kazakhstan but more generally in arid regions. The relative importance of these factors in determining the location of monuments has changed during history, in connection with non-linear demographic, technic-

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al-economical and climatic variations. The study ends with a model partitioning the historical development of land and water use in the Ili-Balkhash basin into four periods: Stone Age, Bronze and Early Iron, Middle Ages and Modern period. The other two location frames, topographical and geomorphological, mostly dependent on climatic changes, in some extreme cases will suggest the distinction of sub-periods. A depiction of demographic levels in the region for the whole time span under analysis is also provided.

## 1. Geoarchaeological approach and method to the landscape colonization of the Ili-Balkhash basin from Paleolithic to modern times.

At present, a high scientific level in the study of archeological objects cannot be attained without complex geological, geomorphological and paleontological analyses. This approach defines a new scientific field called *'**geoarchaeology**'*.

Fifty years after the first pioneering works of Soviet archaeologists such as S. Tolstov and geologists such as V. Andrianov and A. Medoev, a new wave of geoarcheological studies has been resumed during the last 10 years in ***Kazakhstan*** by an interdisciplinary team of scientists grouped as the "Laboratory of Geoarchaeology", mainly with the financial support of INTAS (EU Commission) and UNESCO.

Research has been carried out on monuments of the Paleolithic, Neolithic, Bronze, Early Iron, Medieval and Ethnographic periods, of which their location and patterns have been studied together with the paleogeography and paleoclimate of the region.

The method to collect and analyze the data can be referred to as analytic GIS. It includes the collection of data and sources from earth and human sciences, their mapping through a cartographic software (MapInfo, ArcGIS) enabling the overlayer of thematic maps and images and their storage in a database system made for creating and exporting graphics and tables.

### 1.1. Paleogeography and paleoclimate

Dealing with a monument or with a cluster of monuments, the geoarchaeologist will study the environmental and ecological conditions that supported the human community who built them and inspired their material and non-material culture. He will study the archaeological matrix that encloses and conserves the monument by documenting not only gross elements (architectural constructions, hardened surfaces, ceramics, metals, big bones) but also some subtle elements such as weak surfaces, micro-facies, distribution of chemical elements, phytolits, pollen and microfauna.

For this purpose, both the landscape surrounding the monument and the sedimentary body (archaeological matrix) that buries and preserves it are submitted to complex analyses: geomorphological, stratigraphic, physico-chemical, lithological, pedological, micro-morphological, paleontological (palinological, paleo-zoological); analyses for the definition of absolute age (radiocarbon and ESR); reconstruction of paleo-geographical and paleoclimatic changes.

Particular attention is dedicated to the reconstruction of the evolution during the Holocene period, atmospheric circulation and the environment because these factors determine the paleoecological features of the habitat and the processes that led to the sedimentation and conservation of the monumental structures. In Kazakhstan these paleodata are collected and elaborated by the specialists of the "Laboratory of Geoarchaeology" who have already provided some paleoclimatic and environmental reconstructions that constitute the basic reference for the calibration of archaeological

data (Fig.7):

– a general reconstruction of the development of regional climate and atmospheric circulation in the mountain and in the plain zones of Semirechie for the quaternary period
– a reconstruction with 150-200 year resolution of the climatic and environmental changes in Semirechie for the last 3500 years
– a model with yearly and seasonal resolution of the evolution of the climatic and hydrological regimes in Semirechie for the last 100–120 years

### 1.2. Location of cultural monuments

In the case of Semirechie, different and often opposite responses to climatic changes are documented in mountains and plains environments, a fact that throughout history compelled human adaptations by large vertical and horizontal displacements. So the territory constitutes an excellent study-object for the application of the geoarchaeological paradigm to the analysis of the correlation between the development during history of environmental features, human technologies and the location patterns of archaeological monuments.

The location of monuments in Semirechie can be classified from three points of view: ecological, topographical, and geomorphological. The ecological aspect refers to the presence of some economical and ecological determinant factors in the immediate environment, within a meso-scale range of 1-10 km; the topographical aspect refers to the geographical coordinates of the site; the geomorphological aspect consists of the meso-scale specific relief features surrounding the monument and the micro-scale ones supporting it.

- When classified on the basis of the ecological aspect (which in the latest periods manifests as socio-economical), the development of the location of monuments in Semirechie shows the complex role of 6 factors: raw materials, water resources, climate, relief, strategic economic opportunities, and socio-political control.
- The topographical location of monuments consists of the geographical coordinates of their distribution in the territory and is the only aspect considered by traditional archaeological reports. It can give information on clusters and concentrations of monuments, but becomes really significant only when correlated with environmental and ecological features.
- When analyzed from the point of view of the micro-scale geomorphological aspect, the development of monument location shows on one side very homogeneous traits, being that monuments of every epoch favor geomorphological rises characterized by high drainage and visibility; and on the other side shows synchronic geomorphological differences depending on the kind of monument and also remarkable diachronic changes provoked by climatic fluctuations alternating dry and wet phases and affecting the drainage rates of specific landforms.

By far the most important classifiers of settlement location in Semirechie are the 6 ecological factors. Their complex interaction and different weight during history suggests a succession of 4 periods: Stone Age, Bronze and Early Iron, Middle Ages and the Modern period. Topographic location and geomorphological features are sometimes quite significant because they reflect climatic and environmental changes and in such cases will distinguish phases within the 4 main periods.

Hereafter will be presented the forms and factors of landscape occupation in the four phases. Each phase presents: 1. the location and characteristics of the main sites, 2. the forms of land and water use, 3. the six main factors of the location of the monuments.

## 2. Four phases of land and water use in the Ili-Balkhash basin

### 2.1. Stone Age (Paleolithic, Neolithic)

Important **Early Paleolithic** (1 million y. – 30.000 BP) sites are found in 3 regions: the North Balkhash, the North Chu-Ili Mountains and the Charyn Canyon. (Fig.1)

The earliest stone tools are *chopping tools* in volcanic rock material (porphyrite) dated to the Lower Paleolithic period found by B. Aubekerov and O. Artioukhova in the Charyn canyon (Aktogai). Other more recent Mousterian stone tools were found in the same area (Aktogai 1-4, Sarytogai, Aktau) closer to the confluence of the Charyn and Ili Rivers[i]. (Fig.2)

Stone tools of Levallois-Acheulian tradition (Lower Paleolithic: 800-150.000 BP) and Mousterian with Acheulian tradition of Levallois flaking (Middle Paleolithic:150-40.000 BP) have been found on open air workshops and camps in the North Balkhash region at the sites of Bale, Semizbugu, Turanga and Kyzyl-Kainar[ii] and in the region of Jambul and Khantau in the North Chu-Ili Mountains (Fig.3). Most of the stone tools are made of black and grey-greenish flint, flinted aleurolit, sandstone and various igneous rock materials.

**Late Paleolithic** sites are found in North Balkhash, in the Zailiskii Alatau foothills (buried camp site of Maibulak, surficial findings in Degeres and individual findings near Almaty) and in the Ili Valley (Aktau). The richest open air camp-workshops are located near Sayak in the North Balkhash

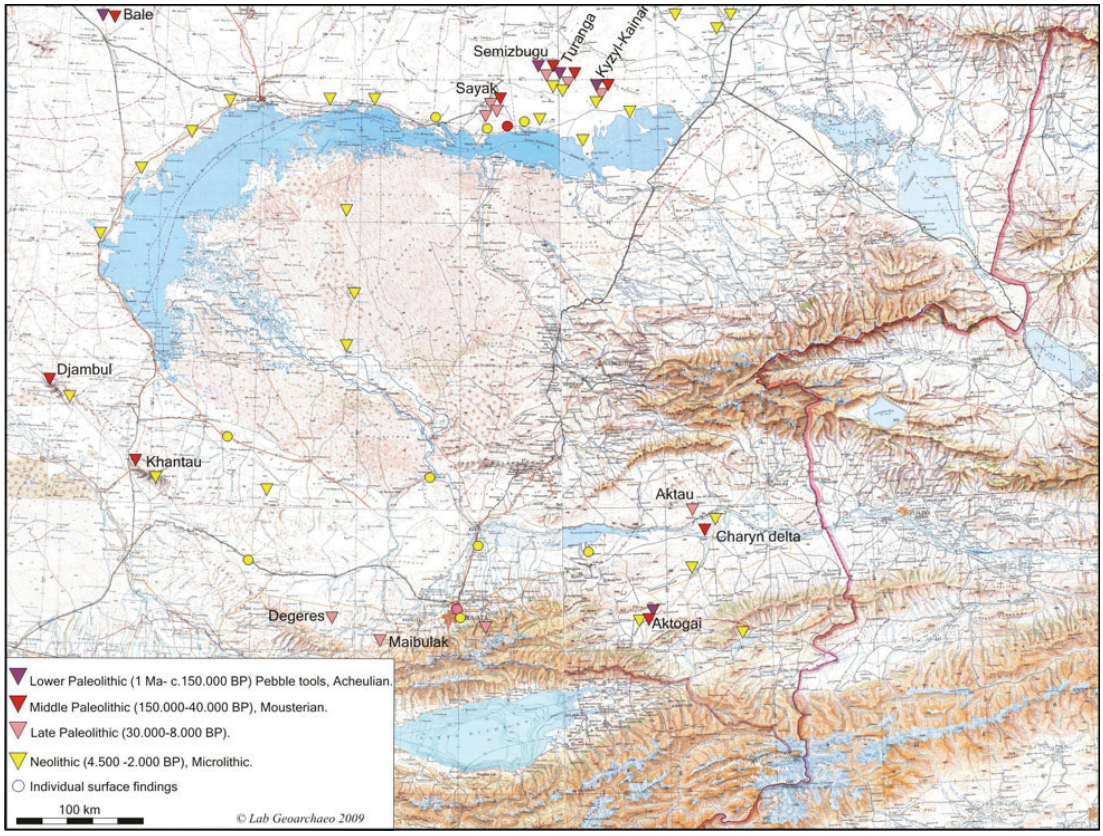


**Fig.1 Map of the Stone Age sites in Ili-Balkhash basin**

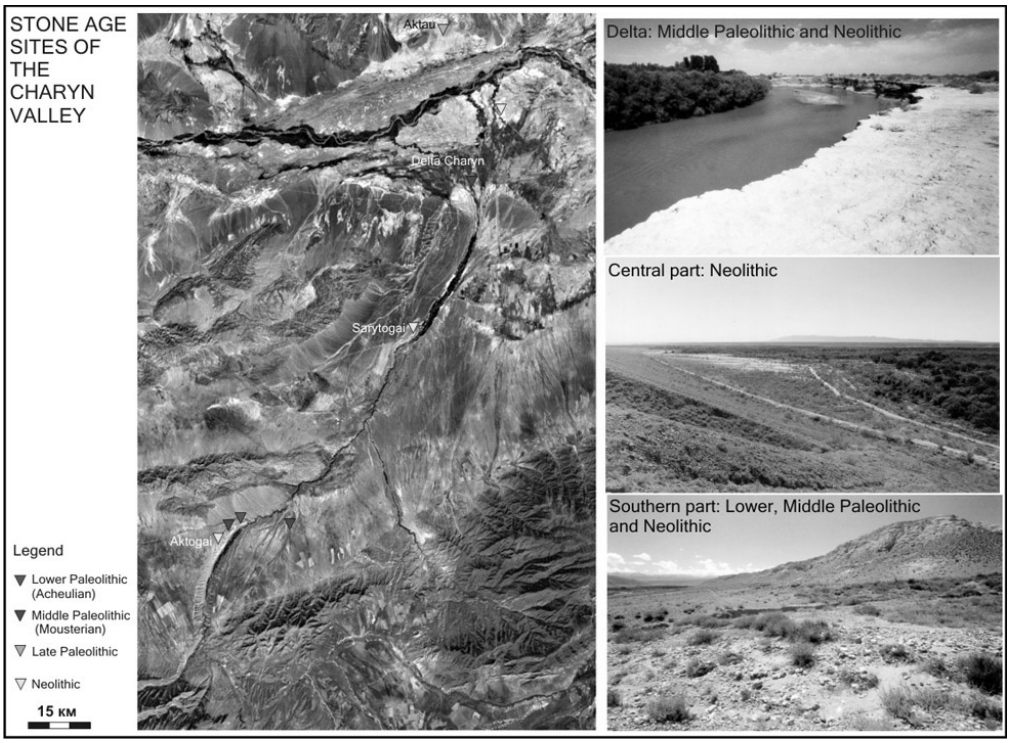


**Fig.2 Satellite image and views of the Stone Age sites in the Charyn Valley**

region. Most of the stone tools are made from black and grey-greenish flint and aleurolit.

If the **Mesolithic period** seems to have left no traces in Semirechie, with the **Neolithic** period (4,500-2,000 BC) sites characterized by microliths and grey pottery appear in many areas of the Ili-Balkhash basin. The richest concentrations of these two artifacts are found in the North Balkhash, in the piedmonts of the Chu-Ili Mountains and in the delta of the Ili River tributary valleys. The Neolithic sites are generally located in two kinds of landscapes: in the lowest part of the alluvial fans where the groundwater surges and forms lakes and pounds among sand dunes (often at the borders of takyrs) (Fig. 4) like in the lower alluvi-

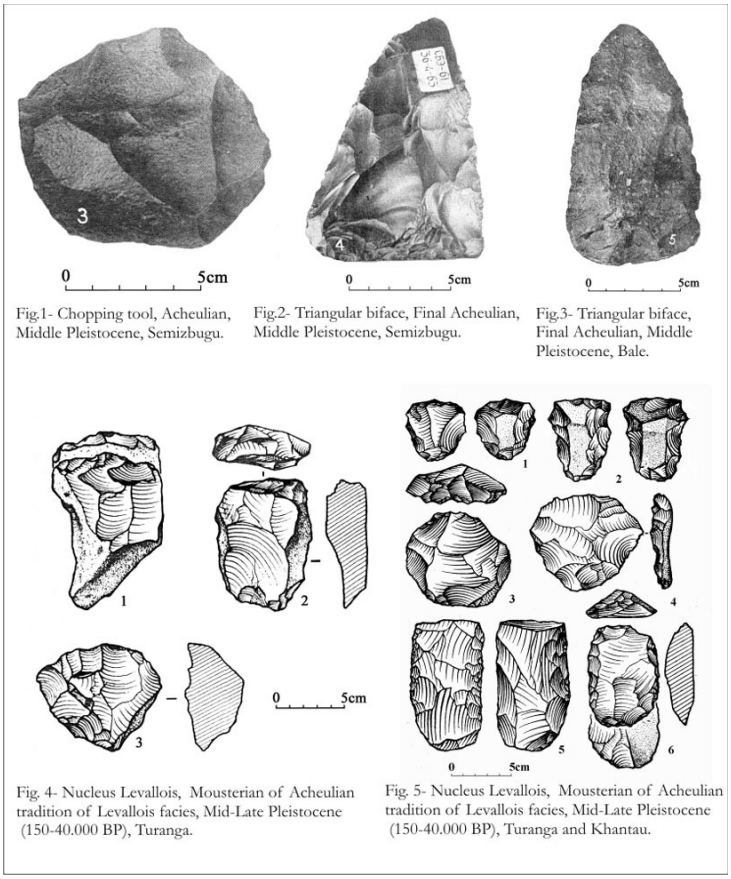


**Fig. 3-Paleolithic tools Pre-Balkhash**

**Fig.4 Neolithic takyrs in the West Chu-Ili Mountains**

al fans of the southwestern and northeastern foothills of the Chu-Ili Mountains and along the meanders of river deltas like in the lower part Kazkelen, Talgar, Chilik and Charyn Rivers at the confluence of the Ili River. Most of the materials are chalcedony agates and jasper. The first rock engravings of cup-marks, geometric shapes and animals predating the Bronze Age might be ascribed to the late Paleolithic-Neolithic period[iii].

In conclusion the Stone Age (Paleolithic and Neolithic) of Semirechie spans from 800,000 years BC until the Bronze Age period (second millennium BC). *Paleolithic* remains where flint, igneous and siliceous raw material is dominant are found from the early Pleistocene period; in the North Balkhash regions consisting of effusive-sedimentary materials, they are present starting from the middle Paleolithic across the upper Paleolithic periods. Paleolithic monuments consist of camps of open ground type. They are in general located on the terraces of alluvial fans (today dried valleys) and on their outcrops in the proximity of water where animals are easy targets. *Neolithic* monuments consist of camps and cemeteries. They are located near springs and wells, buried (often among sand dunes) under the colluvial or alluvial remains of small valleys.

We can summarize saying that the Stone Age monuments, as an expression of hunting and collecting communities, are *located in proximity to sources of water and raw materials*.

### 2.2 - Bronze and Early Iron Age

**Bronze Age** in Semirechie appears around 2,000 BC in the form of well-sheltered settlements, cemeteries with cist tombs and lithic monuments (petroglyphs, megaliths…)[iv]. The local culture belongs to the Andronovo culture mixing Alakul and Federovo cultures in artifacts (potteries, metallurgy) and funeral style (individual or collective cist tombs often with enclosures). The major sites are found in the mountains and piedmonts of the Jungarian Range (Upper Bien Valley in Kalakai, Muzbulak; Koksu Valley in Eshkeolmes and Begash), of the Ketmen Range (Kegen, Uzunbulak), of the Kungei Alatau (Kulsai), of the Zailiski Alatau (Assy, Kyzylbulak, Butakty, Uzun-Kargaly, Akterek), of the Kendiktas Range (Oi-Jailau) and in the Chu-Ili low mountains (Tamgaly, Kuljabasy, Seriktas, Kopaly, Khantau), in the alluvial bed (Koksu, Charyn) and alluvial fan (Talgar) of large valleys. Several sites are located around the Lake Balkhash (Fig.5).

**Iron Age** starts around 800 BC in the form of a demographic development, an extensive occupation of the territory, the rise of large cemeteries of kurgans in almost all piedmont valleys, the appearance of farms using irrigation channels and the rise of local mining work and iron metallurgy. The practice of vertical migration inaugurates the period of semi-nomadic pastoralism which continues till today. The various sizes and richness of the kurgans (some with hypertrophic dimension,

adorned weapons and wealthy treasures) reveal a warlike and hierarchised society known as the Saka tribes whose political center was in the Ili Valley according to historical sources. Their southward migration started around 140 BC under the pressure of the Wusun tribes coming from the Eastern Tienshan who continued the Saka traditions in impoverished numbers and forms till the demographic and cultural recession of the third century AD.

The Iron Age sites are found almost everywhere but the main concentrations are found in the alluvial fan of the main piedmont valleys (Lepsy, Aksu, Bien, Kyzylagach, Karatal, Koksu, Chilik, Turgen, Talgar), the alluvial bed and delta of the Ili tributaries (Charyn, Koksu, Chilik, Kaskelen), the gorges of the Chu-Ili Mountains and the mountain shelters which served as summer residences (Assy). The largest kurgan cemeteries are located in the valleys of the River Kegen, Chilik, Turgen, Talgar and along the Ili River (Besshatyr). (Fig.5)

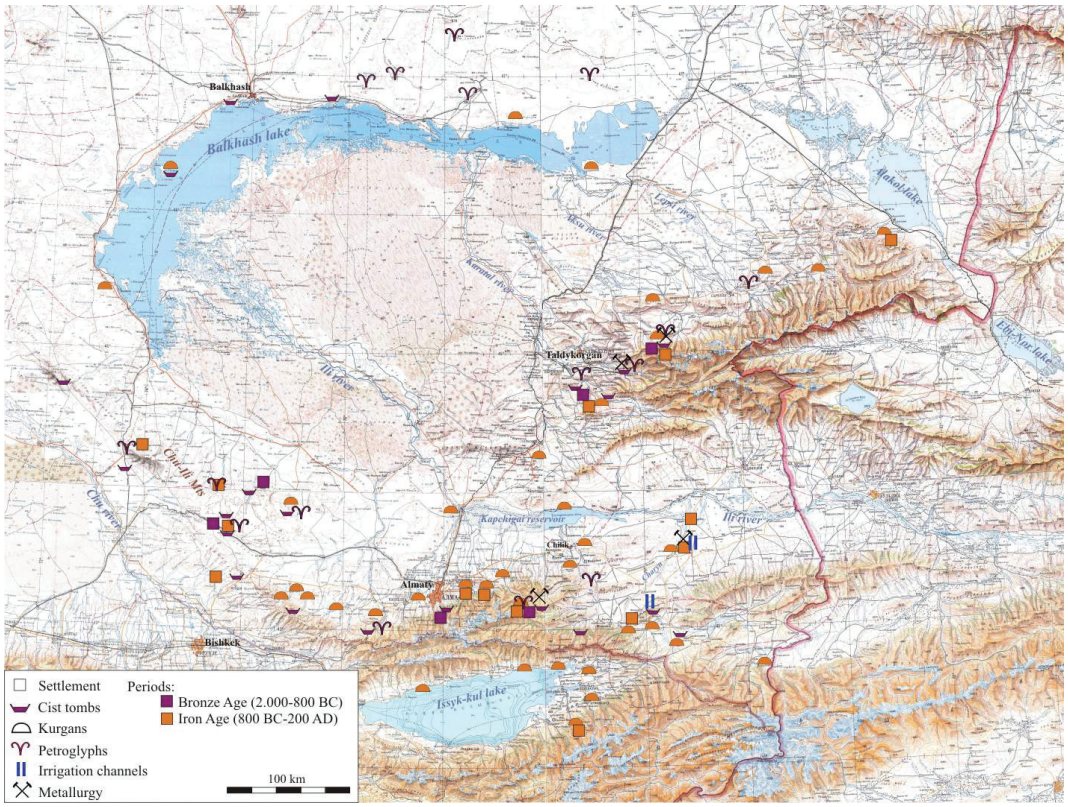


**Fig.5 Map of Bronze-Iron Age sites in the Ili-Balkhash basin**

The Bronze and Early Iron ages in the Ili-Balkhash basin cover the 2nd and 1st millenniums BC, characterized by mix-farming pastoralist communities. Their monuments consist of settlements, seasonal camps, cemeteries and landscape marks, early irrigation canals (in the Charyn canyon and Uzunbulak), mines and metallurgic workshops (Charyn, Muzbulak) located in various climatic and environmental zones and geomorphological positions.

The climatic-environmental zones are mountains, canyons, piedmonts, and desert oases.

According to their geomorphological position, settlements are distributed: in the mountain zone (Tienshan, Jungarian range) in valley terraces and remains of moraines; in the piedmonts on alluvial fans; in hilly semi-desert areas (Chu-Ili Mountains, Fig.6) on foothill deposits, alluvial fans and valley terraces; in plains around active streams, ponds and springs. Necropolises and barrows are

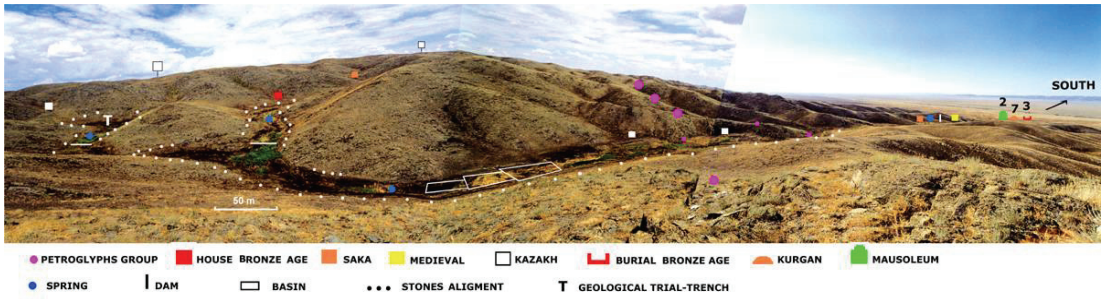


**Fig. 6 Cultural landscape of Chu-Ili Valley from Bronze Age to modern times**

always located in dry positive forms of the relief-like inter-river areas and relict elevations.

The location patterns of both the Bronze and Early Iron ages monuments show a basic similarity by being *not any more dependent on the proximity of raw materials.* Their location witnesses the existence of improved transport capacities and an efficient system of exchanges; and, as an expression of pastoralist communities, *is determined in a complex way by water, climatic conditions and relief.*

*Climatic changes* in the Ili-Balkhash basin deeply affect the distribution of humidity and seasonal stockbreeding opportunities and through that, strongly condition the distribution of vegetal zones and, with them, the altitude and geographical location of human and in particular pastoralist habitats. A deep change of climatic conditions at the turn of the 1st millennium BC determined significant switches of vegetal zones and with them the topographical location of monuments, so that the period of the 2nd-1st millennium BC, together with a basic homogeneity of settlement patterns from the point of view of the ecological location factors, shows by geographical considerations, a further subdivision into two phases: Bronze and Early Iron.

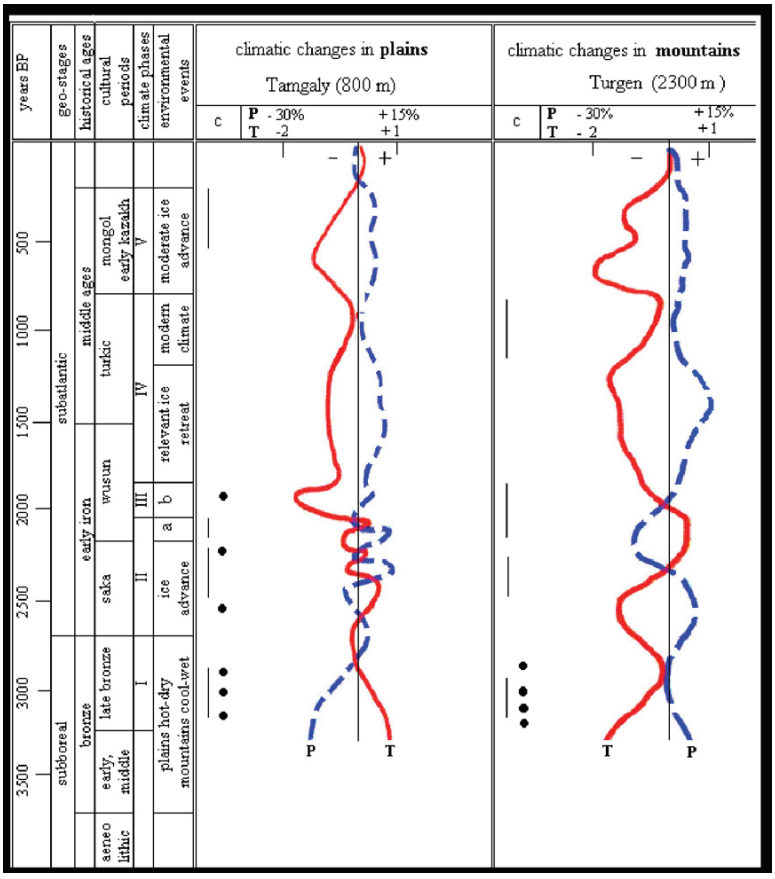


**Fig.7 Climatic reconstruction in Semirechie**

This major climatic change happened at the transition between the hot-dry late sub-Boreal (2nd millennium BC) and cold-wet early sub-Atlantic period (700-200 BC) (Fig.07). Natural resources were reduced in the mountains where meadows disappeared and increased in

the plains which were converted into steppes. This fact, among mix-farming shepherd communities, promoted new living strategies, mainly the switch of economic areas and the introduction of nomadic habits. Settlements changed localization, deserting the mountain meadows and populating piedmonts and plains; and, as a consequence of higher human mobility, saw the introduction of new types of dwellings: during the first phase (middle-late-final Bronze) entirely made of stones, clay and wood; during the second (Early Iron) made of light transportable elements and tents.

Therefore, these relevant climatic, environmental and cultural transformations of the turn of the 1st millennium BC allow us to distinguish, within the 2nd-1st millenniums, two phases of settlement location, respectively pertaining to the Bronze and Early Iron epochs.

### 2.3. Middle Ages

The Middle Ages in the Ili-Balkhash (early, middle, late) span from the second half of the 1st millennium AD (immigration of the Turkic confederations) to the 19th century (Kokand khanate occupation). The life was economically based on agricultural, commercial, and pastoralist practices and urbanization and politically on tribal chiefdom and primitive forms of statehood.

The Medieval monuments consist of large towns (walled towns and square forts-*tortkul*), villages, water devices and roads, cemeteries, ritual enclosures, mines and smelting workshops and landscape marks. The most significant among them are located at the mouth of mountain valleys or at the head of river deltas and irrigation schemes. The biggest Medieval sites of the region are: Kastek, Talgar, Chilik, Zharkent, Almalyk (in China), Dungene (Taldykorgan), Koilyk (Antonovka), Koktuma and 3 large forts at the South of the Lake Balkhash. (Fig.8)

Their location becomes independent from the natural location of raw materials and progressively

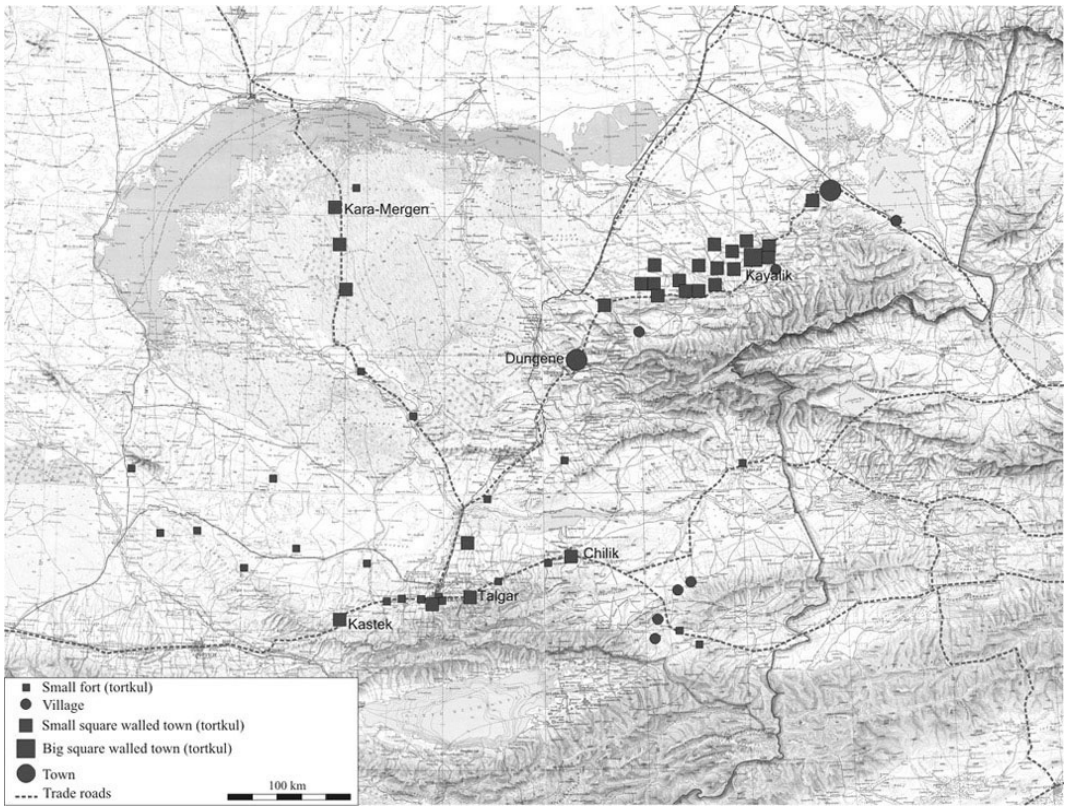


**Fig.8 Map of the Medieval towns of the Ili-Balkhash basin**

more independent from the natural location of water facilities, climate and relief features. In fact the medieval urban enterprise could ensure such conditions through other ways, like the use of large collective works and advanced technical expedients (transportation, canals, walls).

Instead, the main eco-economical feature of the geographical location of Medieval monuments, as an expression of large agricultural and commercial societies, is their *concentration in proximity to strategic economical opportunities: radially around irrigation schemes (Taldykurgan, Koilyk oases) and longitudinally along transport ways (Northern Silk Road)*.

The Kazakh (ethnographic) Late Medieval period shows the persistence of medieval location patterns.

### 2.4. Modern period

The advent of the Russian and Soviet periods has as its main characteristic the introduction of new advanced hydrological techniques (deep wells, artesian wells, long canals) which definitely freed the settlement location patterns from hydrological dependence, and favoured their larger concentration (Fig. 9). The new trend sees the displacement of all the pastoralist housings from inside valleys to large kolkhozes around piedmont wells, the concentration of a very large population in ancient towns and new ones located in piedmonts and plains, and the building of big mining centres in remote areas. From the geomorphological point of view, the new settlement patterns are definitely favouring large concentrations on wide flat areas of piedmonts and plains.

The *ecological factors of the geographical location of human monuments are not only the proximity of strategic economical opportunities like productive and commercial structures, but also clear political plans of administrative and territorial control.*


**Fig.9 Map of Almaty Province Today**

## 3. Conclusion

The historical development of the location of human settlements in the Ili-Balkhash region, when classified on the basis of ecological factors, happens across four successive periods that show the respective importance of different factors (in correspondence with four different economic bases): during the first period (Stone Age, non productive economy) the main factors are the provision of raw materials and water; during the second (Bronze and Early Iron, pastoralist economy) they are water, climate and relief; during the third (Middle ages, pastoralist-agricultural-commercial economy) agro-productive and commercial facilities; during the fourth (Modern period, agro-industrial-commercial economy) high hydrological technology, political control and mining activities.

Also topographical and geomorphological features dependent on climatic environmental changes constitute important aspects for further defining the secondary characteristics of monument location.

As a whole the historical changes of settlement location in the Ili-Balkhash basin show two general trends, persistent across climatic fluctuations:

- A *progressive independence* from natural factors thanks to growing human mobility, transport capability, technological capacities and market economy;
- A *progressive dependence* on socio-economical factors, i.e. the location of artificial constructions such as large productive plants and roads, and the administrative needs of societies integrated by politics, commerce and money.

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# The Medieval Urbanization of Semirechie

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**CONTENTS**



## Summary

This article analyzes the process of medieval urbanization of Semirechie within the context of the urbanization of the Northern Tienshan piedmonts, distinguishing 4 regions (Talas, Chu, Semirechie, NE-Tienshan) and 2 waves (1st-15th century AD, 17th-19th centuries AD). The 4 urban complexes are analyzed and compared in their structural and dynamic characters: by settlement number, total urban area, morphology and chronological development. For the Semirechie region, the urban development is analyzed in chronological detail, century by century; and finally correlated with demographical estimates and paleoclimatic reconstructions. During the first urban wave, the Semirechie complex is interpreted as being the last frontier of a western and an eastern wave of urban, agricultural and commercial activities, showing

chronological similarities with the west and morphological similarities with the east; and during the second wave it appears as the centre of a very peculiar military pastoralist urban park.

KEYWORDS: urbanization, middle ages, Northern Tienshan piedmonts, database

## 1. Subject, methods and significance of the research

This work is intended to elucidate the characteristics of a specific urban phenomenon: the development of the medieval walled settlement park of Semirechie. More generally, this article aims to highlight the significance of statistical analyses and digital elaboration of large databases concerning historical urban complexes, and for this reason, considerable space has been given to methodological considerations (par. 1.2).

### 1.1. Subject of research

The main subject of this research is the process of medieval urbanization of Semirechie, viewed within the context of the urbanization of the Northern Tienshan piedmonts, which involved four regions: Talas, Chu, Semirechie, and Northeast-Tienshan. (Fig 1)

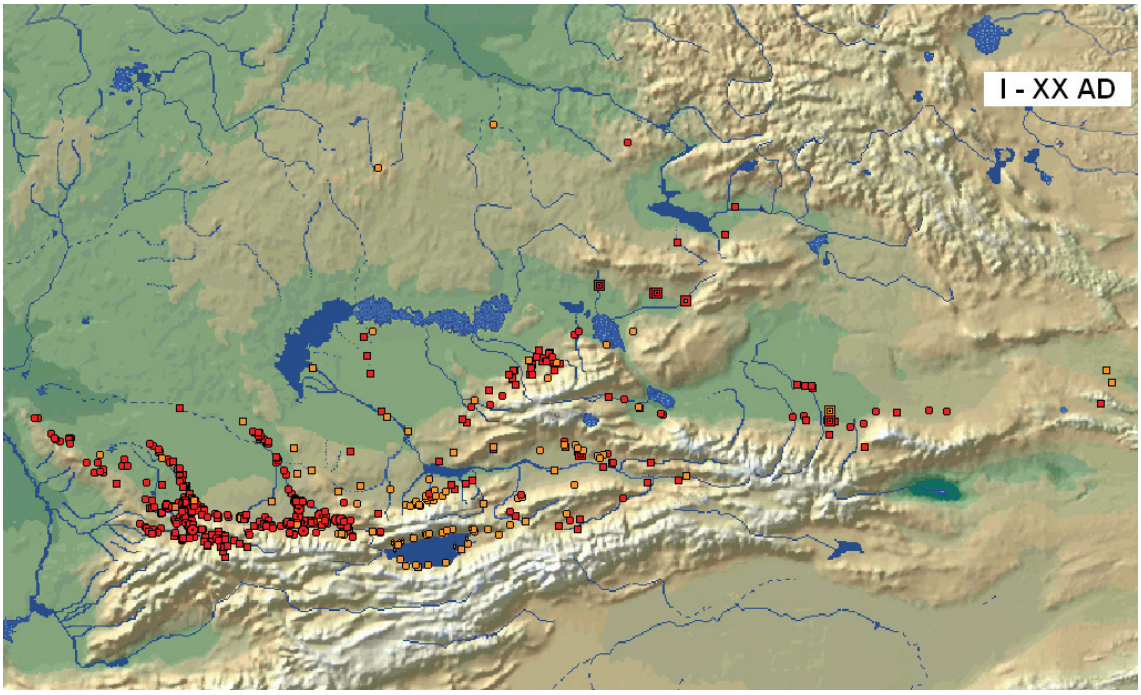



**Fig 1. Entire medieval urban complex of Northern Tienshan (1-20th AD): settlement location, size and type**

Two waves of urbanization were considered: the first wave between the 1st and the 16th centuries AD, which involved all the Northern Tienshan piedmonts; and the second wave between the 17th and 19th century, which involved only the Semirechie region under Jungar rule and the NE-Tienshan region under Manchu rule. Not considered is the third and last wave of modern urbanization consisting of non-walled

structures, which in Western Tienshan started at the end of the 19th century under Russian rule, and in NE-Tienshan at the beginning of the 20th century under Chinese rule.

Quotations from historical accounts of medieval travelers are included in the text, and considerations of demographic levels and climatic fluctuations are provided in the last paragraph of the article.

### 1.2. Methods

The documentation of the urban monuments of Semirechie and, more generally, of the Northwestern Tienshan piedmonts, is based on Soviet and post-Soviet reports (see bibliography), updated by new land and aerial surveys. The documentation of the monuments of NE-Tienshan is based on historical sources, modern archaeological reports, and satellite images, in a cooperative work with the sinologist Jean Marc Deom.

The entire Northern Tienshan urban park is divided into 4 *regions* characterized by a specific hydrology, landscape and cultural context, which determined the development of specific urban complexes. Hydrological differences are the most relevant and it is mainly on their basis that the four regions have been distinguished and indexed. Within each region, different sub-regions (*zones*) can be distinguished, generally again on the basis of important hydrological elements (main river course, tributary or distributary stream, trunk canals, primary and secondary deltas, etc), and occasionally on the basis of their special exposure to cultural influences from neighboring regions (as in the case of the upper Ili valley). For example, Semirechie is divided into 3 zones: the Middle and Low Ili valley, the Jungarian piedmonts and, during the second wave of urbanization, the zone of the southern and northern Tarbagatai piedmonts.

For each settlement unit the most important entries are the GPS coordinates, settlement code, size, type and form, function, chronology, geographical context (geomorphology, climate, soil, vegetation, landscape) and cultural-political context.

- The *units* of the settlement park are taken into account when the park is walled and dimensions and a starting-ending chronology are available, which results in the exclusion of the 5 to 20 % of the units that are badly recorded and require additional surveys. The non-walled rabats of the towns (the urban area located outside the walls) are not considered, nor are villages, because apart from some exceptional areas, detailed surveys and recordings of the rabats and villages are lacking. A few large villages are included when archaeologically important, which, in any case, are not representative of the entire village park; their consideration in the case of the Talas basin (the richest in villages) increases by 25% the number of settlements but increases by only 7% the total ha of the settlements. Units are clustered by hydrological basin and coded in progressive order from upstream to downstream following the dendritic pattern of the water system.

- The *size* of the urban structures is always based on the maximum historical development of their external walls, data which is completely reliable only for the flourishing period (which for Semirechie is the 9th–12th centuries AD) and must be decreased for earlier and sometimes also for later periods. The biggest towns in most cases are the most longstanding towns, suggesting the existence of a dynamic morphology that enlarged or doubled their walls.

- The settlement *type* is determined from the *shape* of the walls and the internal partitions. Types

include walled towns (Go, from gorod in Russian), tortkuls (To), fortresses (Fo), monasteries (Mon), and occasionally beacon towers (Be) and a few large non-walled villages (Vi). These types often evolve over the centuries into complex structures by a doubling of the range of the walls with walls of the same type or of a different type (Fig 2.1-2.6). Towns and tortkuls are the most frequent and important types. Towns are civil structures. The oldest, consisting of many cultural layers, are elevated as a tobe (anthropogenic mound, also called tepe); the youngest or the short living ones are flat. They can be in the shape of a horse-shoe (around springs), or circular, oval, square, rectangular, polygonal, irregular (adapted to the relief), or a planned Chinese-type town partitioned into walled quarters and suburbs. In the case of large towns, their actual shape is often the result of morphological development: either development from a more ancient smaller structure clearly included as a citadel, or the result of the building of a citadel inside former walls. Tortkuls are planned square fortified structures with thick walls, flanking towers and ditches, sometimes showing a second stage of development where they are surrounded by a second range of square or rectangular walls. In this research they are classified as a specific type of town-fortress because of their very high frequency and diffusion. Their number decreases from east to west and becomes insignificant in the middle Syrdarya. During the second wave of urbanization that involved Semirechie (17 -18$^{th}$ centuries AD), another type of settlement appears (conventionally called "monastery") consisting of a Buddhist monastery or temple at the centre of a walled compound for nomadic camps having a military, pastoralist, or metallurgic function. Non-walled villages, unlike the walled settlements mentioned above, are poorly documented and with varying precision in different regions. As such they are kept in consideration in the analysis of the single region but omitted in the comparative analysis of different regions. Exactly opposite to tortkuls, the number of documented villages decreases from west to east, constituting 25% of the total number of settlements in Talas, 17% in Chu, 8% in Semirechie, and are totally absent in NE-Tienshan. This fact must be attributed to a west-to-east increase of urban concentration and also to poorer surveys but, based on the present state of knowledge, tortkuls and villages respectively represent the specific characters of two different eastern and western patterns of urbanization.

- The morphological types Fo and Be coincide with univocal *functions*. By contrast, in the case of types Go, To, Mon and Vi, the function is less clear and can be sometimes individuated by the presence of special signs: the function would be political administrative (as a capital or as a secondary center) when the settlement has a large size and relevant citadel (Po1, Po2); military when heavily fortified (Mil); agricultural when surrounded by irrigation systems (Agr); metallurgic when covered by slag and/or surrounded by mines (Met); pastoralist when enclosing large empty spaces for tents and corrals (Pas); commercial when lacking other functions and clearly aligned along main routes and presenting a caravanserai form (Car). A high number of settlements (in particular large towns, tortkuls and monasteries) are characterized by multiple functions.

- The *chronology* adopted is totally dependant on previous studies, which possibly contain significant mistakes. This is surely true concerning the documentation of the NE-Tienshan monuments, which have been dated not on the basis of archaeological studies but of Chinese historical sources, which are quite precise for the first T'ang and latest Manchu periods, very approximate for the Karluk period, and totally silent about the Jungar period.

**Fig2-1. Aerophoto of Tastobe, Talas region (6-12th AD) / oval tobe / orthogonal, view-S**

**Fig2-2. Aerophoto of Kostobe, Talas region (6-12th AD) / rectangular town with tobe as citadel / orthogonal, v-E**

**Fig2-3. Aerophoto of Intimak, Talas region (7-12th AD) / tortkul / orthogonal, v-S**

**Fig2-4. Aerophoto of Konyrtobe, Talas region (6-13th AD) / tobe with tortkul as citadel / orthogonal, v-E**
**→**

**Fig2.5. Aerophoto of Krasnayarechka, Chu region (5-12th AD) / Chinese-type town with tortkul as citadel / oblique, v-N**

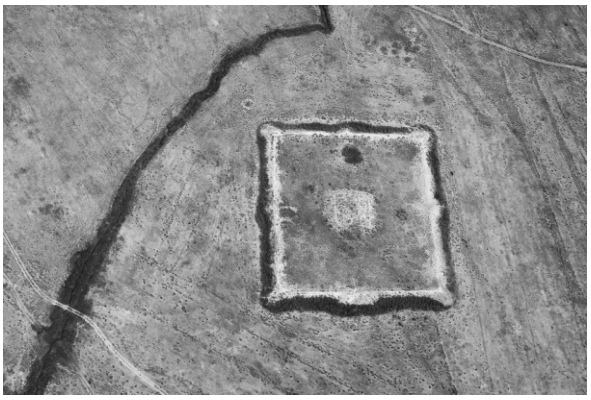


**Fig 2.6. Aerophoto of Shorga, N-Tarbagatai zone (18-18th AD) / walled square structure with monastery at centre / orthogonal, v-N**

- The geographical context is represented in the database by the consideration of climate, relief (valley, low-hill, plain, colluvium, terrace, alluvial plain, floodplain), hydrology (stream, delta, tributary and distributary, spring, lake), soil and vegetation, landscape, ore deposits; as well as remains of artificial constructions like canals, dams, karez, external walls several km long, and roads. Geographical analysis helps suggest the kind of function of a given settlement and allows cross-sections for the study of the environmental context and impact of an urban system.

### 1.3. Significance

The study of ancient processes of urbanization, i.e., the analysis of the rise and fall of towns during historical times, provides information about longstanding patterns of land and water use and adaptations to climatic and environmental conditions, about demographic changes, and about interactions, cooperation and conflict between humans and environment and between human groups themselves.

The information provided by the present article is based on a reading and systemic elaboration of existing materials, which implies three important considerations. On the one hand, the systemic character of this information constitutes a useful preliminary tool for any archaeological study of medieval urban structures of Northern Tienshan, supporting the choice of priority objects and tasks. On the other hand, the reliability of such information is affected by limits and errors in the documentary sources, so the systematization must suggest lines of research in order to correct mistakes and fill in blanks in the present state of knowledge (most important is the implementation of radio-carbon dating analyses). Third, the general data base of the urbanization process of Northern Tienshan must be organized in a format that can easily accept the corrections and additions suggested by new discoveries and be able to automatically express new tables, graphics and maps.

## 2. Urbanization of the Northern Tienshan piedmonts

The first urbanization of the Northern Tienshan piedmonts happened during the Middle Ages, when the territory represented the ultimate northernmost expansion on the steppes of Eurasia of two civilizations: the civilization of Transoxiana (more precisely the urban cultures of the Middle Syrdarya and the Chach

region) on one side, and the civilization of the Tarim oases on the other side. It was an accelerated and relatively short-lived process of huge proportions. It involved ten zones that, on the basis of hydrological and cultural considerations, can be grouped into four regions representing four large urban complexes.

### 2.1. The four urban regions of Northern Tienshan

The medieval urban zones of Northern Tienshan occupy ten areas that were most profitable from the point of view of water and land use.

1. The Talas delta
2. The Talas valley
3. The Chu mid valley (containing lake Issykul)
4. The Chu low valley
5. The Ili middle valley
6. The northern piedmonts of the Jungarian Range (which together with the middle Ili valley constitute Semirechie)
7. The southern and northern slopes of the Tarbagatai Range (which were urbanized only during the second wave of Semirechie urbanization of the 17-18th centuries AD)
8. The Ili upper valley
9. The Borotala valley
10. The northern piedmonts of Northeast Tienshan

Strict similarities of landscape features and phases of urbanization suggest the clustering of these 10 zones into 4 regions: Talas (zones 1 and 2), Chu (zones 3 and 4), Semirechie (zones 5, 6, and 7), NE-Tienshan (zones 8, 9, and 10).

Each of the four regions was involved differently in the urbanizing process. They present different agro-pastoral potentials, dimensions, urban forms, and chronology, as shown in Table 1.

The information provided by this table allows the four regions to be compared on the basis of the following entries: agronomical potential, dimensions (number, ha and average ha), morphology (type) and chronology of the settlement park. The most significant similarities and differences, entry by entry, are as follows:

The highest *agronomical potential* (20-10000 km2) is found in the zones of the NE-Tienshan piedmonts, Chu mid-course, upper-Ili, and Jungarian piedmonts.

Higher values for the number of settlements are found in the regions of Talas and Chu, because here small settlements and villages are more abundant and/or better surveyed. The lowest values are found in the NE-Tienshan region where practically no villages are documented.

The highest *total ha* is found in the Chu mid-course zone, followed by the upper-Ili and NE-Tienshan piedmonts. From the point of view of total ha, the complexes of the Chu and NE-Tienshan regions considered as a whole are strictly equivalent.

**Table 1. Talas, Chu, Semirechie, NE-Tienshan: structural features of the 4 urban complexes ***

| Urban complex (region) | Zone | Potential agro area in km² | Medieval settlement park | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Dimension | | | | Type | | Chronology (century AD) | | |
| | | | Total n | Total ha | Ave. ha** of total | Ave. ha** of 5 top settlements | Tortkul % n | Tortkul % ha | Start-end | Flourished | Decay |
| Talas | Talas delta | 5500 | 148 | 280 | 1.8 | 17 | 51 | 89 | 1-19 | 10-11 | 13-14 |
| | Talas valley | 1500 | 61 | 136 | 2.2 | 16 | 47 | 12 | 6-15 | 10-12 | 13-14 |
| | *Talas complex* | *7000* | *209* | *416* | *1.9* | *21* | *39* | *32* | *1-19* | *10-12* | *13-14* |
| Chu | Issykul | 2500 | 47 | 82 | 1.8 | 13 | 95 | 55 | 7-19 | 10-12 | 13-15 |
| | Chu mid-course | 8500 | 103 | 815 | 7.9 | 51 | 30 | 36 | 5-19 | 10-12 | 13-14 |
| | Chu low-course | 3000 | 25 | 34 | 1.3 | 5 | 24 | 9 | 7-18 | 10-12 | 13-14 |
| | *Chu complex* | *14000* | *176* | *931* | *6.5* | *51* | *46* | *24* | *5-18* | *10-12* | *13-14* |
| Semire-chie,Pre-Balkhash | Middle Ili (KZ) | 5000 | 44 | 123 | 2.7 | 15 | 77 | 77 | 8-14, 17-19 | 11-12, 17-18 | 13-14, 18 |
| | Jungarian piedmonts | 10000 | 37 | 134 | 3.6 | 17 | 78 | 78 | 8-14, 17-19 | 11-12, 17-18 | 13-14, 18 |
| | Tarbagatai S | 5000 | 13 | 71 | 5.7 | 13 | 7 | 7 | 12-15, 18-19 | 18 | 15, 19 |
| | *Semirechie complex* | *20000* | *94* | *327* | *3.4* | *27* | *64* | *63* | *8-15, 17-19* | *11-12, 17-18* | *13-14, 18-19* |
| NE-Tienshan | Borotala valley | 4000 | 6 | 56 | 9.3 | 13 | 66 | 81 | 7-19 | 10-14, 18 | 15, 19 |
| | Upper Ili | 17000 | 21 | 423 | 20.1 | 14 | 60 | 19 | 7-19 | 12-14, 18-19 | 15, 19 |
| | NE-Tienshan piedmonts | 19000 | 20 | 373 | 18.6 | 53 | 69 | 19 | 7-19 | 7-14, 19 | 15-17, 19 |
| | *NE-Tienshan complex* | *40000* | *47* | *854* | *18.1* | *109* | *52* | *23* | 7-19 | 7-14, 18-19 | 15-17, 19 |
| **total N-Tienshan** | | 81000 | 479 | 2434 | 5.0 | 129 | 40 | 25 | - | - | - |

* Clusters (by column) of similar values are marked by the same shade of gray.

** Average ha values are depending from the existing documentation of small settlements, which are evidently quite good for the Talas basin and very poor for the NE-Tienshan zone. More accurate surveys and documentation of small towns and villages will increase the value of the number of settlements and decrease the value of average ha.

The highest *average ha* is that of the NE-Tienshan complex, twice as large as that of Chu and 7 to 10 times larger than those of Semirechie and Talas. The average ha of the top 5 capital towns is the same in the zones of the NE-Tienshan piedmonts and Chu mid-course (more than 50 ha), and is 3 times higher than in Semirechie and Talas. The 5 main towns of NE-Tienshan as a region have the peak average of 109 ha.

Regarding the *morphology* of settlements, in all four regions tortkuls constitute a significant percent of the settlement park. By number they represent the 39% in Talas, the 46% in Chu (but the 95% in the sub-region Issykul), the 64% in Semirechie and the 52% in NE-Tienshan. By ha, in Talas and Semirechie they represent the 39 and 63% (i.e. they have an average size); but in the big complexes of Chu and NE-Tienshan they are much smaller than towns and their total ha represents respectively the 24 and 23%. So, Issykul and Semirechie, the two territories linking the Chu and NE-Tienshan urban complexes, are by far the regions where the percentage of tortkuls is higher by number and ha.

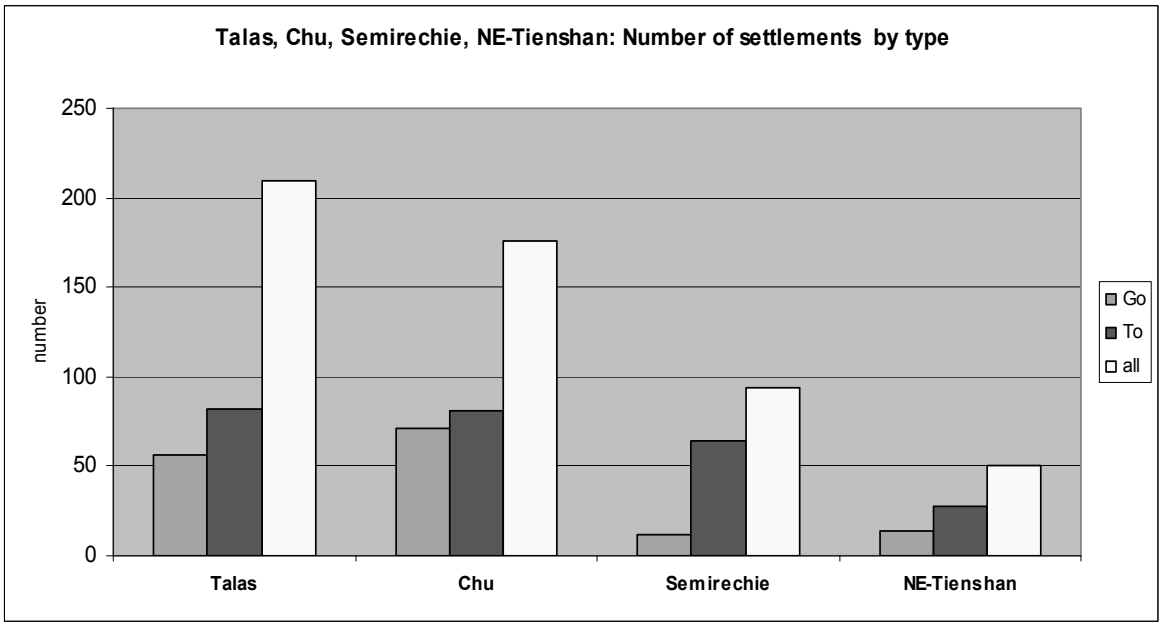
Tortkuls are quite peculiar constructions due to their military character and interregional morphological homogeneity. They are rare along the Middle Syrdarya and abundant in the N-Tienshan piedmonts. In the latter territory they appear everywhere during the 6-8$^{th}$ centuries AD; and they represent a significant part (between the 30 and 65%) of the building peak of the 10$^{th}$ century AD. They grow complementarily to towns, often at the periphery of the urban system or along interregional roads: in Talas (and Chu) they appear in the V century AD accompanying the building of the second (the first in Chu) generation of towns, and then again with the following generation in the 10th century AD; in NE Tienshan they are built together with the first large towns of the 7$^{th}$ century AD, in bigger numbers and smaller dimensions. Their presence is totally dominant in Issykul and Semirechie where they basically constitute the core of their 8-12$^{th}$ century urban systems. Chronologically tortkuls are connected with the westward expansion of the Turks and show similarities with Chinese military constructions. As such, this urban morphology apparently comes from the east.

From the point of view of the *chronology* of the growth and decay of urban complexes, two waves of urbanization are clearly observed. The first wave, between the 1$^{st}$ and 15$^{th}$ centuries AD, involves all four regions and is characterized by two quite different processes, a western and an eastern one. The western process starts in Talas in the 1$^{st}$ century AD, in Chu in the 5$^{th}$, in Semirechie in the 8$^{th}$, culminates everywhere in the 11-12$^{th}$, and ends everywhere during the 13$^{th}$ to the 15$^{th}$ centuries. The eastern process starts in NE-Tienshan in the 7$^{th}$ century AD, culminates in the 13$^{th}$, and fades progressively during the 14$^{th}$ to the 16$^{th}$ centuries. The second urban wave, between the 17$^{th}$ and 19$^{th}$ centuries AD, involves only Semirechie (now together with the Tarbagatai range) and NE-Tienshan.

The Semirechie region, located between NW and NE Tienshan, presents in its urbanization patterns both a western and an eastern character. In fact its first urban wave is chronologically timed to the development and fading of Chu; and, by its morphology consisting of only tortkuls, shares similarities with NE-Tienshan, i.e., it seems to have been planned and built by tribes of eastern origin (Karluk) under the influence of the upper-Ili and NE-Tienshan urban culture (see below par 5). During the second urban wave, Semirechie sees enhanced its eastern links: it represents at first the centre of the Jungar (Kalmyk) urbanization and then the periphery of the Manchu urbanization (see below).

### 2.2. Comparative graphics concerning the urbanization of Northern Tienshan

This comparative analysis of the 4 regions is supported by graphic tables showing the proportion of morphological types (Fig 3.1), the evolution of the number, total ha and average ha of the four urban complexes of Talas, Chu, Semirechie and NE-Tienshan (Fig 3.2), and the evolution of building and abandonment by number and ha (Fig 3.3).



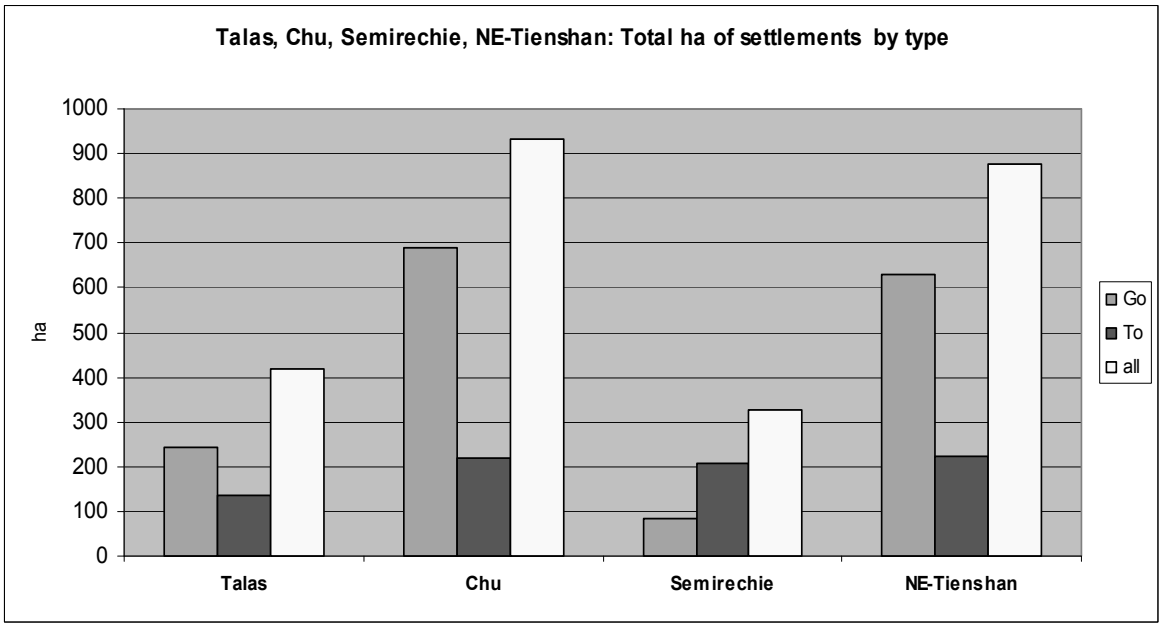
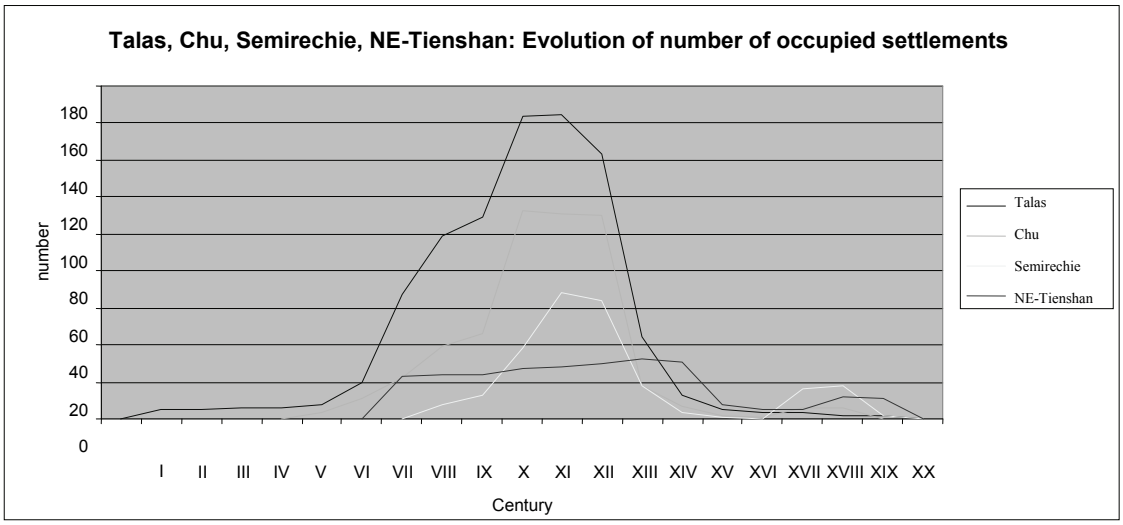
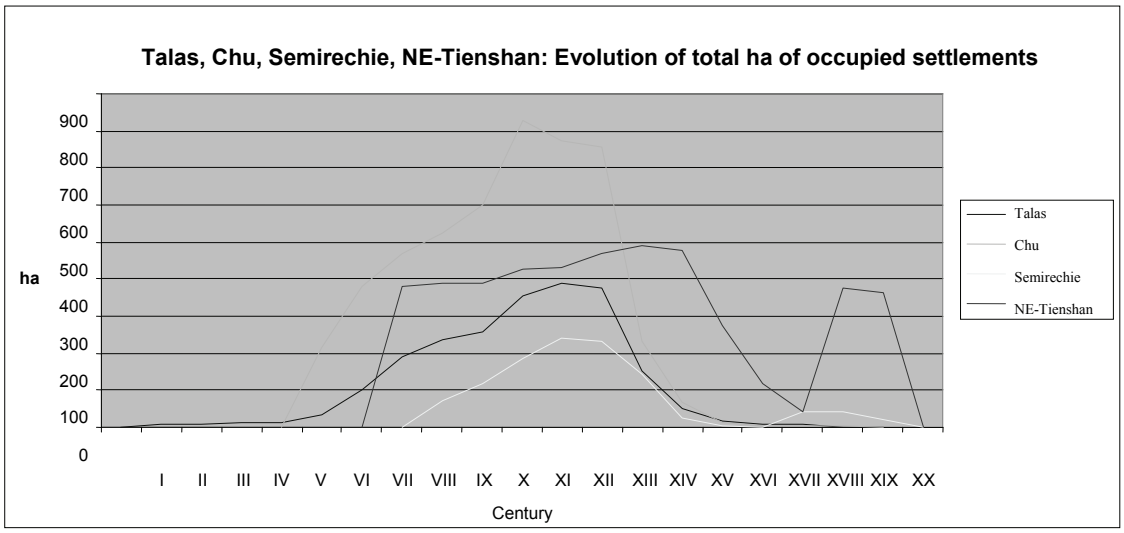




**Fig 3.1. Graphics of the number and total ha of the settlement types (Go, To, all) in the 4 urban regions of the Northern Tienshan piedmonts**



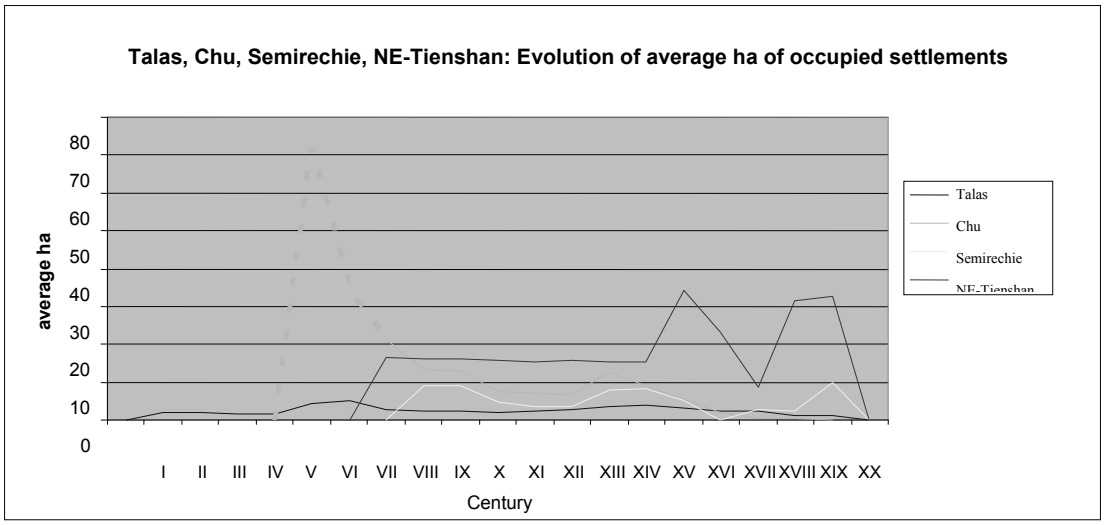




**Fig 3.2. Graphics of the development of the number, total ha and average ha of settlements in the 4 urban regions of the Northern Tienshan piedmonts (1-20$^{th}$ centuries AD)**

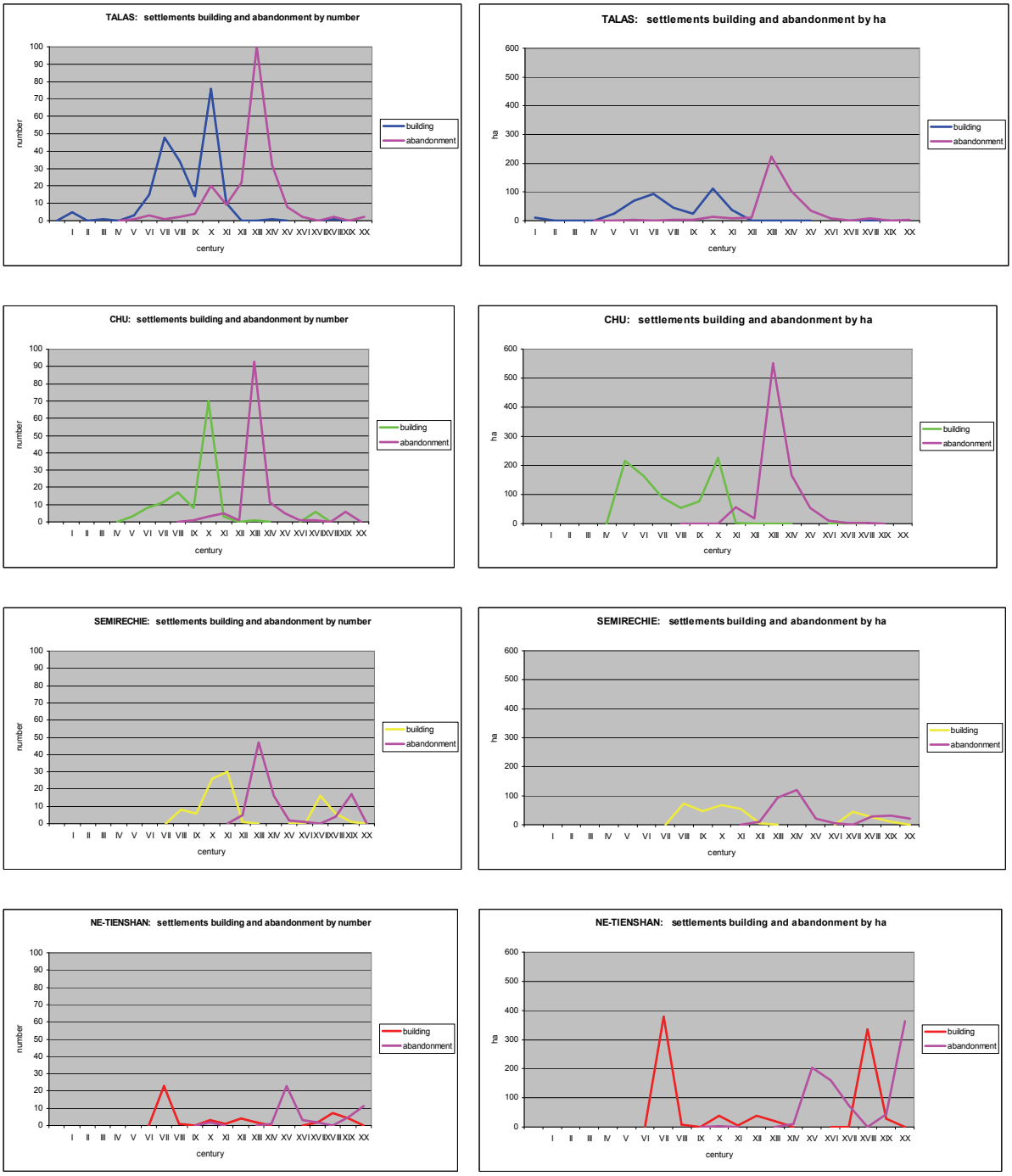



**Fig 3.3. Graphics of the development, by number (left) and total ha (right), of the building and abandonment of settlements in the 4 urban regions of the Northern Tienshan piedmonts (1-20th centuries AD)**

## 3. Structure and development of the medieval urban complex of Semirechie

The Semirechie region refers to the northern piedmonts of the Za-Ilisky Tienshan (i.e., the middle course

and delta of the Ili River) and the Jungarian range (i.e., the Karatal, Aksu, Lepsy and Tentek river valleys). Moreover, some neighboring territories of East Kazakhstan that, like Semirechie, are involved in the second late medieval wave of urbanization are also considered: the southern and northern Tarbagatai piedmonts and further downstream, a couple of structures located in the Irtysh basin (see the chronological maps of the 17th and 18th century AD).

### 3.1. Settlement park dimensions and morphology

Dimensions

Total number: 111 / Unworkable: 17 / Workable: 94

Total workable ha: 327.50 / Average size: 3.48

Morphology

Type: towns 12, tortkul 64, fortresses-monasteries 10, beacon towers 0, villages 8

Size: 1) 3; 2) 7; 3) 9; 4) 12; 5) 22; 6) 26; 7) 11; 8) 4 / Maximum town ha: Chilik, 38.50 ha

Settlements with 2 or 3 zones (citadels, shahristan, or other anomalous partitions): 3; with 2 walls: 8; without walls: 3

**Table2. Semirechie: Settlements by number, type and size**

| Size * | | Numbers by shape | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Town** | **Tortkul** | **Fortress, monastery** | **Beacon-tower** | **Village** | **Total** |
| 1 | ≥20 ha | 1 | 2 | 0 | 0 | 0 | **3** |
| 2 | 19> x ≥10 ha | 4 | 2 | 0 | 0 | 1 | **7** |
| 3 | 10> x ≥5 ha | 1 | 6 | 1 | 0 | 1 | **9** |
| 4 | 5> x ≥2 ha | 2 | 9 | 1 | 0 | 0 | **12** |
| 5 | 2> x ≥1 ha | 3 | 17 | 1 | 0 | 1 | **22** |
| 6 | 1> x ≥0.5 ha | 0 | 15 | 6 | 0 | 5 | **26** |
| 7 | 0.5> x ≥0.2 ha | 1 | 9 | 1 | 0 | 0 | **11** |
| 8 | 0.2> x ≥0.05 ha | 0 | 4 | 0 | 0 | 0 | **4** |
| **Total number** | | **12** | **64** | **10** | **0** | **8** | **94** |
| **% of total** | | **21.7%** | **68.0%** | **10.6%** | **-** | **8.5%** | **100 %** |

***** Settlements of size 1 are called very large, of size 2-3 large, of size 4-5 mid-size, and of size 6-7-8 small

**Table 3. Semirechie: Settlements by area, type and size**

| Size (ha) * | | Σ area (ha) * | | | | | |
|---|---|---|---|---|---|---|---|
| | | Town | Tortkul | Fortress, monastery | Beacon-tower | Village | Total |
| 1 | ≥20 | 28.38 | 76.43 | 0 | 0 | 0 | **104.81** |
| 2 | 19> x ≥10 | 41.56 | 34.00 | 0 | 0 | 10.00 | **85.56** |
| 3 | 10> x ≥5 | 5.25 | 40.72 | 8.50 | 0 | 6.00 | **60.51** |
| 4 | 5> x ≥2 | 5.34 | 25.57 | 3.44 | 0 | 0 | **34.35** |
| 5 | 2> x ≥1 | 4.00 | 18.36 | 1.74 | 0 | 1.00 | **25.10** |
| 6 | 1> x ≥0.5 | 0 | 7.85 | 3.00 | 0 | 2.50 | **13.35** |
| 7 | 0.5> x ≥0.2 | 0.25 | 2.97 | 0.23 | 0 | 0 | **3.45** |
| 8 | 0.2> x ≥0.05 | 0 | 0.37 | 0 | 0 | 0 | **0.37** |
| **Total area **** | | **84.78** | **206.27** | **16.91** | **0** | **19.50** | **327.50** |
| **% of total** | | **25.9%** | **63.0%** | **5.1%** | **-** | **5.9%** | **100%** |
| **Average area (ha)** | | **7.06** | **3.22** | **1.69** | **-** | **2.43** | **3.48** |

***** The area of the individual settlement is calculated within its outermost borders and thus is the size in its flourishing phase, not its size in earlier or subsequent times. As such, the area evaluation is quite valid for the 9-12th centuries but must be proportionally diminished for earlier and later periods.

The settlement park of Semirechie (and East Kazakhstan) consists of 94 monuments covering a total area of 327 ha.

Two waves of urbanization are observed: the first wave involved only Semirechie ($8^{th}$ -$15^{th}$ century AD) and consisted of 71 urban structures covering a total of 250.57 ha; the second wave, 4 times less relevant, involved Semirechie and East Kazakhstan ($17^{th}$ -$19^{th}$ century AD) and consisted of 23 units covering 76.93 ha. Referring to the territory of the first wave, two habitats and urban zones are clearly distinguished: the northern Tienshan piedmonts facing the Ili middle valley and the Ili delta, with 44 units covering 123 ha; and the northern Jungarian piedmonts facing the Balkhash depression, with 37 units covering 134 ha. The last zone has an agricultural potential that is two times higher, but as a whole the dimensions, morphology and chronology of the two urban complexes are very similar.

The average size of the units of the settlement park is 3.4 ha (almost two times larger than the average settlement ha of the Talas basin and two times smaller than that of the Chu valley); and the average size of the 5 largest units is 27 ha, as opposed to the 21 ha of Talas, the 51 ha of Chu and the 54 ha of Northeastern Tienshan.

By type, the urban monuments mainly consist of tortkuls (64 monuments representing 68 % of the total number and 63 % of the total area), of which the 10 having the largest sizes (1, 2 and 3) cover all together almost 50% of the total area (151 ha). Tortkuls in Semirechie are classic multi-functional (military, agro-pastoralist and commercial) planned structures, walled and fortified, with a square form, encircled by one or two walls (in this last case the external walls sometimes have a rectangular plan), and are larger in size than the other types of monuments.

Even the monuments that are less fortified and approximately classified as a town or monastery have a square or rectangular shape. In fact, the 12 towns of the Semirechie park do not present an organically de-

veloped morphology adapted to the relief (as is the case with most of the Syrdarya towns and several towns of the Talas and Chu basins), but have instead a planned rectangular or trapezoid form, occasionally evolved out of an original tortkul. The 9 Buddhist temples and monasteries of the Jungar period always constitute the central point of a walled square space functioning as camp for nomadic pastoralist, military, and metallurgic groups, so that they must be considered as a special type of settlement planned for nomadic people (Fig 2.6).

### 3.2. Chronology

**Table 4. Semirechie: Chronology of settlements by number, area and morphology (Go, To)**

| AD *** | SETTLEMENTS | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number * | | | | | | | | | Total ha ** | | | | | | | | |
| | Built | | | Abandoned | | | Occupied | | | Built | | | Abandoned | | | Occupied | | |
| | Go | To | all | Go | To | all | Go | To | all | Go | To | all | Go | To | all | Go | To | all |
| I | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| II | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| III | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| IV | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| V | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VII | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VIII | 2 | 6 | 8 | 0 | 0 | 0 | 2 | 6 | 8 | 14.54 | 58.44 | 72.98 | 0 | 0 | 0 | 14.54 | 58.44 | 72.98 |
| IX | 1 | 5 | 6 | 0 | 0 | 0 | 2 | 11 | 13 | 1.00 | 44.95 | 45.95 | 0 | 0 | 0 | 14.54 | 103.39 | 117.93 |
| X | 2 | 16 | 26 | 0 | 0 | 0 | 4 | 26 | 38 | 7.37 | 41.61 | 68.48 | 0 | 0 | 0 | 21.91 | 142.75 | 184.16 |
| XI | 3 | 27 | 30 | 0 | 0 | 0 | 7 | 53 | 68 | 3.25 | 52.07 | 55.32 | 0 | 0 | 0 | 25.16 | 194.82 | 239.48 |
| XII | 0 | 1 | 1 | 1 | 4 | 5 | 6 | 50 | 64 | 0 | 5.00 | 5.00 | 2.12 | 7.87 | 9.99 | 23.04 | 191.95 | 234.49 |
| XIII | 0 | 0 | 0 | 4 | 37 | 47 | 2 | 14 | 18 | 0 | 0 | 0 | 6.47 | 77.57 | 93.04 | 16.57 | 116.63 | 143.70 |
| XIV | 0 | 0 | 0 | 2 | 12 | 16 | 1 | 2 | 3 | 0 | 0 | 0 | 6.25 | 102.63 | 119.38 | 11.32 | 14.00 | 25.32 |
| XV | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 11.32 | 9.00 | 20.32 | 0 | 5.00 | 5.00 |
| XVI | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5.00 | 5.00 | 0 | 0 | 0 |
| XVII | 1 | 9 | 16 | 0 | 0 | 0 | 1 | 9 | 16 | 28.38 | 4.20 | 43.35 | 0 | 0 | 0 | 28.38 | 4.20 | 43.35 |
| XVIII | 2 | 0 | 6 | 1 | 0 | 4 | 2 | 9 | 18 | 20.24 | 0 | 26.42 | 28.38 | 0 | 29.61 | 20.24 | 4.20 | 40.16 |
| XIX | 1 | 0 | 1 | 1 | 9 | 17 | 2 | 0 | 2 | 10.00 | 0 | 10.00 | 10.24 | 4.20 | 30.16 | 20.00 | 0 | 20.00 |
| XX | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20.00 | 0 | 20.00 | 0 | 0 | 0 |
| TOT | | | | | | | - | - | - | | | | | | | - | - | - |

* Built during the century / abandoned before the start (or at the very start) of the century / occupied within the end of the century / 'all' refers to the sum of Go, To, Fo, Be, and Vi.

** The area of the individual settlement is calculated within its outermost borders and thus is the size in its flourishing phase, not its size in earlier or subsequent times. As such, the area evaluation is quite valid for the IX-XII centuries but must be proportionally diminished for earlier or later periods.

*** White-grey bands distinguish the 5 phases of urban history of Semirechie (see below) / blue highlights mark peaks of development; crimson highlights mark peaks of decay

**Table 5. Semirechie: Chronology and rate of development of occupied settlements**

| OCCUPIED SETTLEMENTS * | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PHASES | AD | Number | | | ha | | | | |
| | | Total n | Increase | | Total ha | Increase | | Average ha | |
| | | | Δ n | % | | Δ ha | % | Aver ha of occupied settlements | Δ ha / Δ n |
| | V | 0 | - | - | 0 | - | - | - | - |
| | VI | 0 | - | - | 0 | - | - | - | - |
| | VII | 0 | - | - | 0 | - | - | - | - |
| 1 | VIII | 8 | +8 | start | 72.98 | +72.98 | start | 9.1 | +9.1 |
| | IX | 13 | +5 | +62% | 117.93 | +44.95 | +61% | 9.0 | +9.0 |
| | X | 38 | +25 | +192% | 184.16 | +66.23 | +56% | 4.8 | +2.6 |
| | XI | 68 | +30 | +79% | 239.48 | +55.32 | +30% | 3.5 | +1.8 |
| | XII | 64 | -4 | -6% | 234.49 | -4.99 | -2% | 3.6 | -1.2 |
| 2 | XIII | 18 | -46 | -72% | 143.70 | -90.79 | -39% | 8.0 | -1.9 |
| 3 | XIV | 3 | -15 | -83% | 25.32 | -118.38 | -82% | 8.3 | -7.8 |
| | XV | 1 | -2 | -67% | 5.00 | -20.32 | -81% | 5.0 | -10.1 |
| | XVI | 0 | -1 | -100% | 0 | -5.00 | -100% | - | - |
| 4 | XVII | 16 | +16 | start | 43.35 | +43.35 | start | 2.7 | +2.6 |
| | XVIII | 18 | +2 | +12% | 40.16 | -3.19 | -7% | 2.2 | +2.2 |
| 5 | XIX | 2 | -16 | -88% | 20.00 | -20.16 | -50% | 10 | -1.2 |
| | XX | 0 | -2 | -100% | 0 | -20.00 | -100% | - | -10 |

* White-grey bands distinguish the 5 phases of urban history of Semirechie (see below) / blue highlights mark peaks of development; crimson highlights mark peaks of decay; yellow highlights mark optimal evaluation, green indicates re-structuring (the presence of both building and abandonment)

The urban development of Semirechie consists of 2 waves, separated by two centuries of total de-urbanization.

First urban wave (7th -14th century AD). The first and by far most important urban wave starts in the 8th century AD and blossoms in the 11th and 12th century AD. The dismantlement of the settlement park starts in the 13th century AD and is complete by the end of the 14th century AD (Emil, the only town left in the 15th century AD, is located in SE Tarbagatai and was evidently included in the NE-Tienshan complex). In comparison with the other regions of Northern Tienshan, the building process starts relatively late and is accomplished within just 5 centuries, which partly explains why the Semirechie settlements, at the difference from the ones of the Talas and Chu basins, don't present shapes organically evolved from earlier smaller constructions but shapes which are the result of just one or two stages of planning. Their abandonment instead proceeds like in the Chu and Talas valleys, involving at first mid-size structures averaging 0.9 ha (13th century AD) and ending with the largest structures averaging 7.8 ha (14th century AD)

The average size of the settlements occupied in the 11th century AD (the most reliable period for average ha

calculation), is 3.5 ha, two times larger than the average of 1.9 ha of the Talas basin and much smaller than the 6.9 ha of the Chu valley. The 5 largest settlements average 24 ha, as opposed to the average of 21 ha of the Talas basin, the 51 ha of the Chu valley, and the 53 ha of Northeastern Tienshan.

Considering the generations of towns, in correspondence with the first urban wave two analogous peaks of building (8th and 10th -11th century AD) and one of abandonment (13th -14th century AD) are observed. A lesser event of abandonment happens in the 12th century AD, involving 5 mid and small sized towns at the NE borders of the region, on the Lepsy and Tentek Rivers, possibly in connection with the Karakitai invasion. Also the building in the 12th century AD of the S Tarbagatai town of Emil is probably connected with the Karakitai. The average endurance of the units of the whole Semirechie complex is 280 years, with Talgar and Antonovka enduring 7 centuries and the largest 15 towns of sizes 1, 2 and 3 averaging an endurance of 3.7 centuries.

Second urban wave (17th -19th century AD). The second wave of Semirechie urbanization starts in the 17th century, more than 200 years after the disappearance of Talgar and Antonovka. This wave was implemented by the military expansion of the Jungar empire. It consists of 16 units covering 25% of the urban area occupied by the first wave, with structures averaging 2.6 ha and still having a square morphology but, as we said above, they were of a different type and function. The Jungar phase ends in 1753 with the defeat of the Jungars by the Chinese empire, and is followed by a short phase of Chinese Manchu urbanization that in its periphery involves also the S Tarbagatai piedmonts.

In correspondence with the second urban wave, one peak of building and one peak of abandonment are observed in both the Jungar (17th -18th century AD) and Manchu phases (18th -19th century AD). These are warring times and several units are abandoned within a century of their construction, making an average endurance of the units of the whole complex of only 140 years.

As a whole, without considering the two centuries of hiatus, five phases can be distinguished in the development of the urbanization of Semirechie, three in the first wave and two in the second.

1. Phase 1 - Early Karluk and Karluk-Karakhanid (8th -12th century AD). From the point of view of the forms and dynamics of the urban development, in Semirechie, at the difference from the Talas and Chu basins, the 10th century does not seem to constitute a dividing line between two different urban phases. As such, the 8th -12th century AD must be considered as one period of accelerated initial and subsequent development, bringing the complex to full flourishing and stabilization. The process happened in a continuous way, most probably always under the rule of the Karluk tribes acting within different alliances. The urbanization starts in the 8th century AD with 5 units built on the alluvial fans of the Chilik, Talgar and Lepsy rivers (areas clearly endowed with the best agricultural potential and proximate to the NE-Tienshan complex) and 3 units along the caravan road crossing the Ili delta. Together with the agricultural facilities, the commercial routes connecting the eastern Tienshan piedmonts with the western piedmonts and both of these with the northern territories were evidently important. The settlements of Chilik and Talgar in the middle valley of the Ili and the settlement of Antonovka in the eastern Jungarian piedmonts would become the biggest urban structures and evidently acted as the capital towns of their respective zones. From these areas located in the eastern parts of Semirechie the urban process developed, crowding the surroundings with new tortkuls and spreading westward along the Tienshan and Jungarian piedmonts. During the 9th century AD a new major town, Dungene, was established on the

Koksu River in the western spurs of the Jungarian mountains; the 10th century AD sees the further urbanization of the deltas of the Lepsy, Bien, Chilik and Talgar rivers; and during the 11th century AD, with a further development of the Lepsy zone, the urban complex of Semirechie reached a peak of 239 ha. Remarkable is the fact that, in this last territory of urban colonization, unlike the other three regions, the building of settlements continued also during the 11th century and stabilization happened only during the 12th century AD. The unrivalled development of the 11th century gave wealth and power to the Karluk tribes, so that Karluk raids for booty at that time are documented as far as south of Samarkand, on the Kaskhadarya delta.

2. Phase 2 - Early Mongol (13th century AD). Under Mongol rule the area covered by the settlement park contracted by only 39%, 2 times less than in the Chu and Talas basins. Abandoned were 47 middle and small size towns (averaging 1.9 ha) mainly located in the Talgar, Bien and Lepsy zones; and 18 units were left, six of which had a size larger than 10 ha. The main towns of Chilik, Talgar, Dungene and Antonovka resisted and kept acting as capital towns.
   In October 1221 the Chinese monk Qiu Changchun, traveling westwards across Semirechie, describes his journey to Talgar (a town of 9 ha) saying that, after "crossing the Ili river on a boat and going southwards, I came to a high mountain (peak Talgar) with a small town on its northern slopes".
   In November 1253 the Franciscan traveler Rubrouck, in his way to the court of Mangu-khan in Karakorum, after finding "a large river (Ili) which we had to pass on boat", crossed the ruins of a castle and then came to "a large village called Equius (probably Dungene) inhabited by Mohametans who spoke Persian, although so far removed from Persia". Then, entering the northern Jungarian piedmonts and "having high mountains on our right hand and a sea or lake (Balkhash) on the left", he calls the region "Organum" (which he explains as a relict toponym referring to the now disappeared local language and culture famous for its musicians) and describes it as "a plain watered or irrigated at will, by mean of streams descending from these mountains and ending in the before mentioned lake; …formerly crowded with large towns, the most part of which are now destroyed in order to keep space for Tatar pastures, because here pastures are excellent". The large town of Cailac (Antonovka) is said to host a big crowded bazaar and several religious sects.
   In March 1259 the Chinese Chang Te, envoi of Mongke-khan, traveling westwards along the Northern Tienshan piedmonts, crosses the town of Chimuer (most probably Mohe on the upper Ili valley but by some authors individuated as Talgar in the middle Ili valley) where he finds the presence of Chinese immigrants and, like today, the production of wine: "South (of Almalik) there was a city called *Chi-mu-er* (red-tree). Amongst the inhabitants there were a great many Chinese from *Ping* and *Fen* (Shansi, SE of the Gobi desert). There is in this country an animal (snow leopard) which resembles a tiger, but its fur is denser, and is gold-coloured, while the skin is without stripes. It is very ferocious and attacks men. There is also an insect resembling a spider (karakurt). When the poison of it enters a man's body, violent thirst is felt. Should he then drink water he will die instantly; but when he can intoxicate himself by grape wine to induce vomiting, then the poison is neutralized. They have also a kind of wine with a strong smell". He continues saying that "Going westward from the City of Bu-lo (Dalet, in the Borotala valley) the coins in use are made of gold, silver, and copper, and bear inscriptions, but they have no square holes." Chang Te then entered the country called *Ma-a*, where the people (in winter) harness horses to sledges, and carry heavy "burdens in this manner from station to station, going very quickly. It is reported that the *Ki-li-ki-sz* (Kirghizes) instead of horses use dogs (for drawing sledges)."

3. Phase 3 - Late Mongol (14th century). The total abandonment of the settlement park happens within just a century of Chagatai and Moghul rule and their intensive wars against the Timurids. Are now abandoned the big settlements, averaging all together 7.8 ha. Chilik, Dungene and all the other settlements that survived the Mongol invasion are abandoned by the end of the 14th century, and only Talgar and Antonovka would resist until the beginning of the 15th century AD. This phase is followed by two centuries with no urban structures (15th -16th century AD), apart from the town of Emil in SE Tarbagatai that, included in the NE-Tienshan complex, survived during the 15th century AD.

4. Phase 4 - Jungar (17th -18th century). A second wave of urbanization starts under Jungar rule. It covers 25% of the urban area occupied by the first wave and consists of square planned walled settlements having not productive or commercial functions but rather military, political, administrative and religious functions, built in conjunction with geopolitical points or ore deposits. In terms of shape they consisted of walled square flat Chinese-type towns (the 28 ha Chinese-type town of Kaljir), and of Buddhist monasteries and temples at the center of a walled area functional to nomadic camps. The entire urban complex was abandoned in 1753 with the defeat of the Jungars by part of the Chinese army; but a few monasteries continued to exist one century longer (Sumbe).

5. Phase 5 - Manchu Chinese (1753-1850). A short fifth phase follows, represented by the building of three typical Chinese towns in the southern piedmonts of the Tarbagatai range, evidently a western protrusion of the Manchu urbanization of NE Tienshan. They are short-lived and abandoned, like the whole Manchu complex, by the first half of the 19th century AD.

### 3.3. Chronological maps of the development of the urban complex of Semirechie (7th -20th century AD)

A series of 14 alleged maps (Figs 4.1-4.14) represent, century by century from the 7th to the 20th century AD, the location, size and form of the urban development of Semirechie and part of its western and eastern neighbouring regions. During the 7th, 15th, 16th, 19th and 20th centuries AD the Semirechie region was deprived of urban structures.

The legend of the symbols of the maps is as follows:

- Roman numbers: the century to which the map is related.
- Dot size: 5 different sizes indicate settlements that are very large (≥20 ha), large (20>x≥5 ha), medium (5>x≥2 ha), small (2>x≥0.5) and very small (0.5>x≥0.01 ha).
- Dot form: round dots indicate oval, rectangular or irregular towns; round concentric dots indicate towns surrounded by out-walls several km long; square dots indicate square fortified tortkuls; and square concentric dots indicate Chinese-type towns.
- Dot color: yellow indicates settlements built during the quoted century; red indicates settlements built previously and still occupied; white indicates settlements abandoned just before the start of the quoted century; orange indicates settlements lacking chronological fixation.

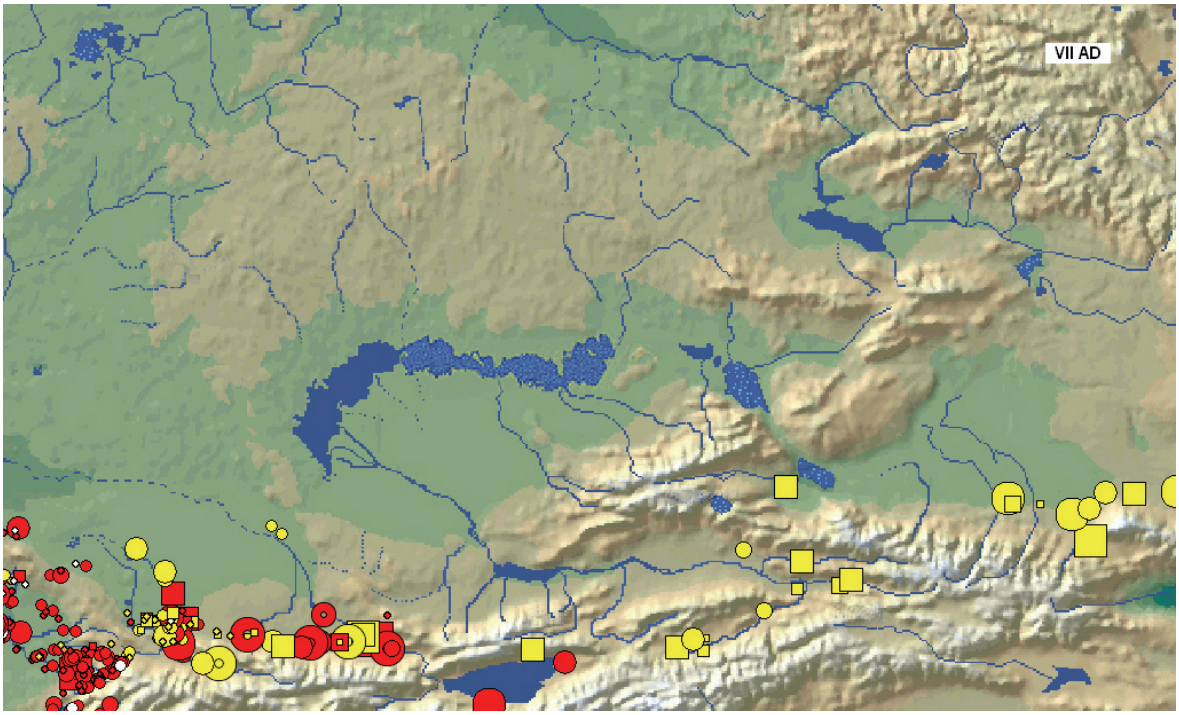



**Fig 4-1. 7 AD**

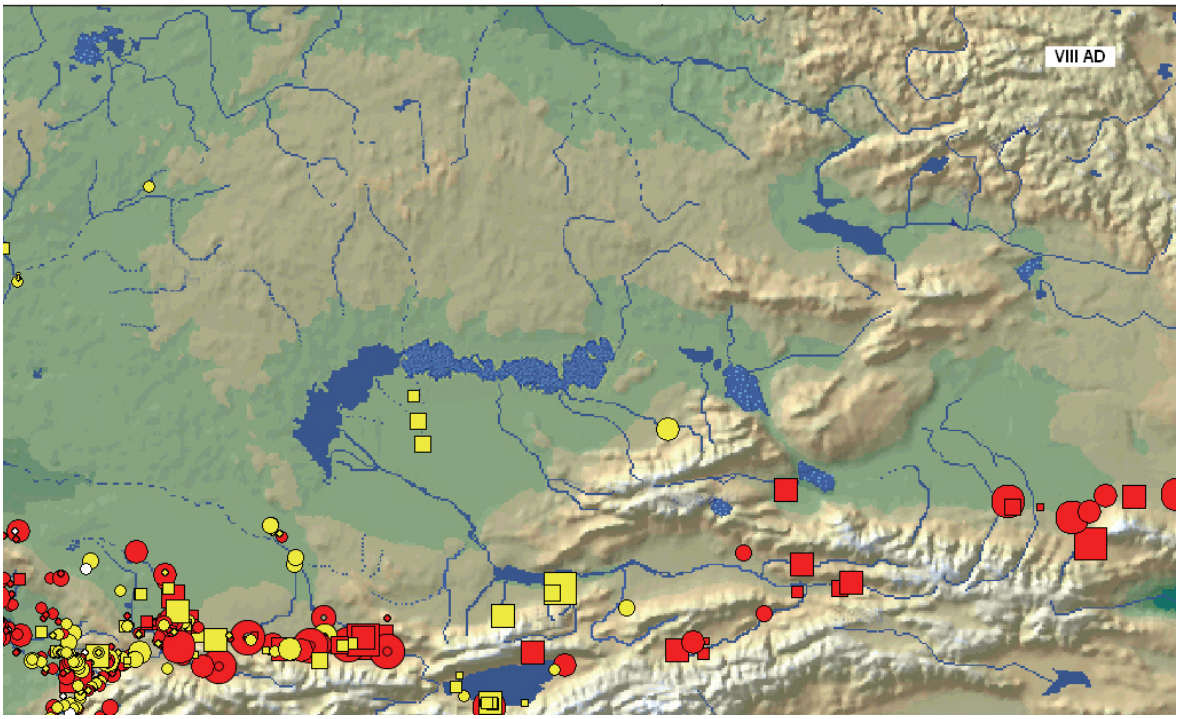



**Fig 4-2. 8AD**

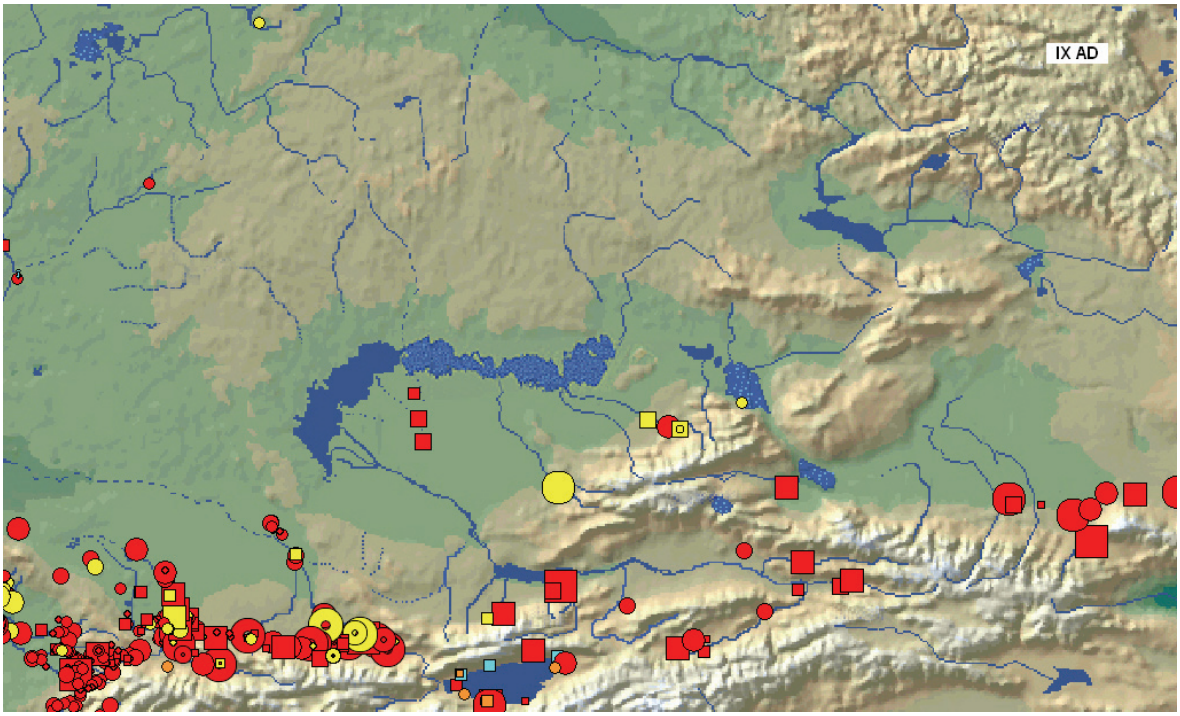



**Fig 4-3. 9AD**

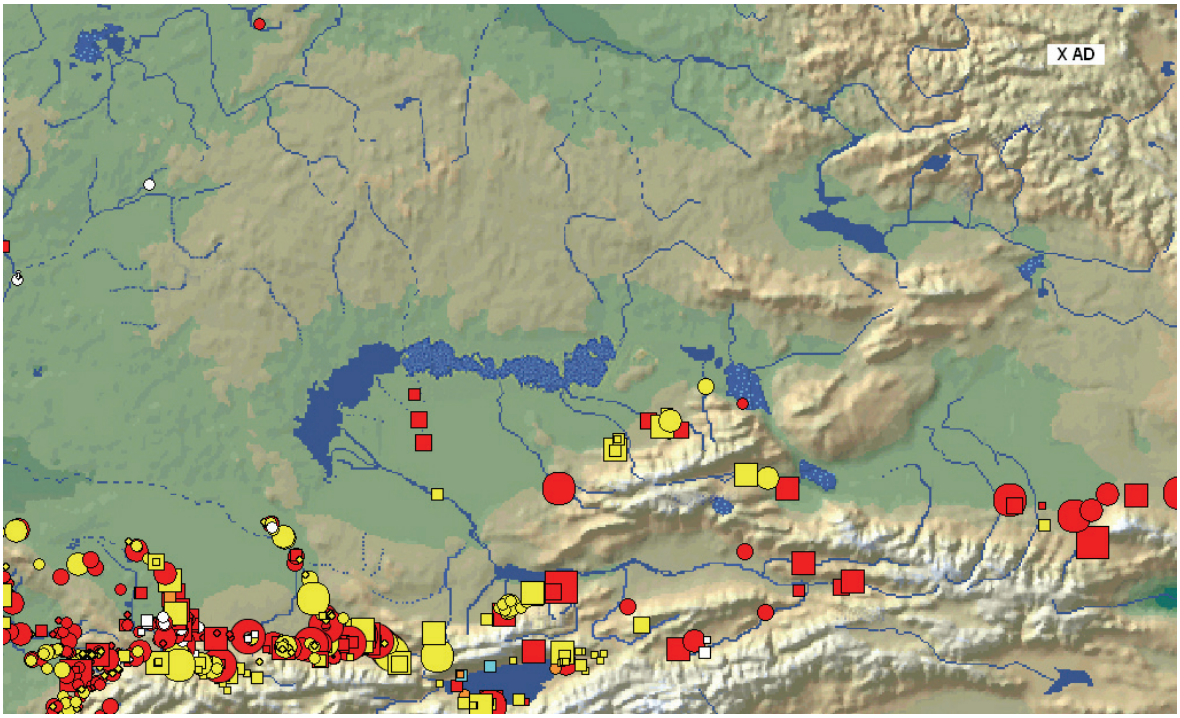



**Fig 4-4. 10AD**

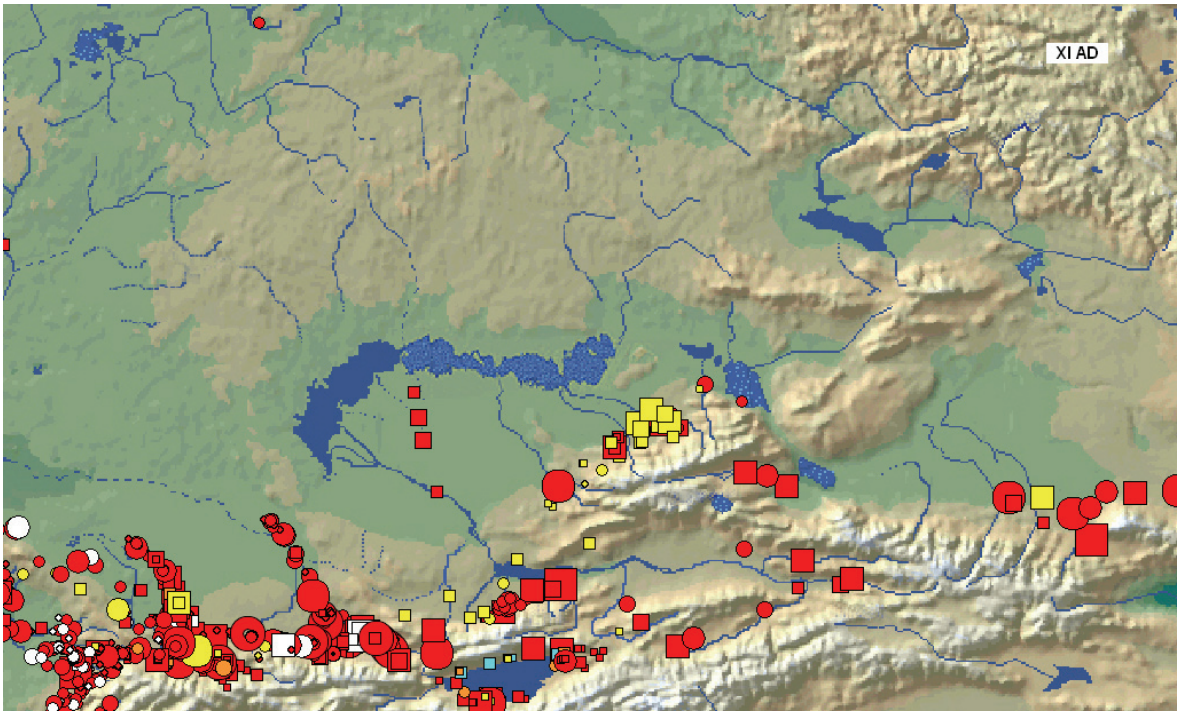



**Fig 4-5. 11AD**

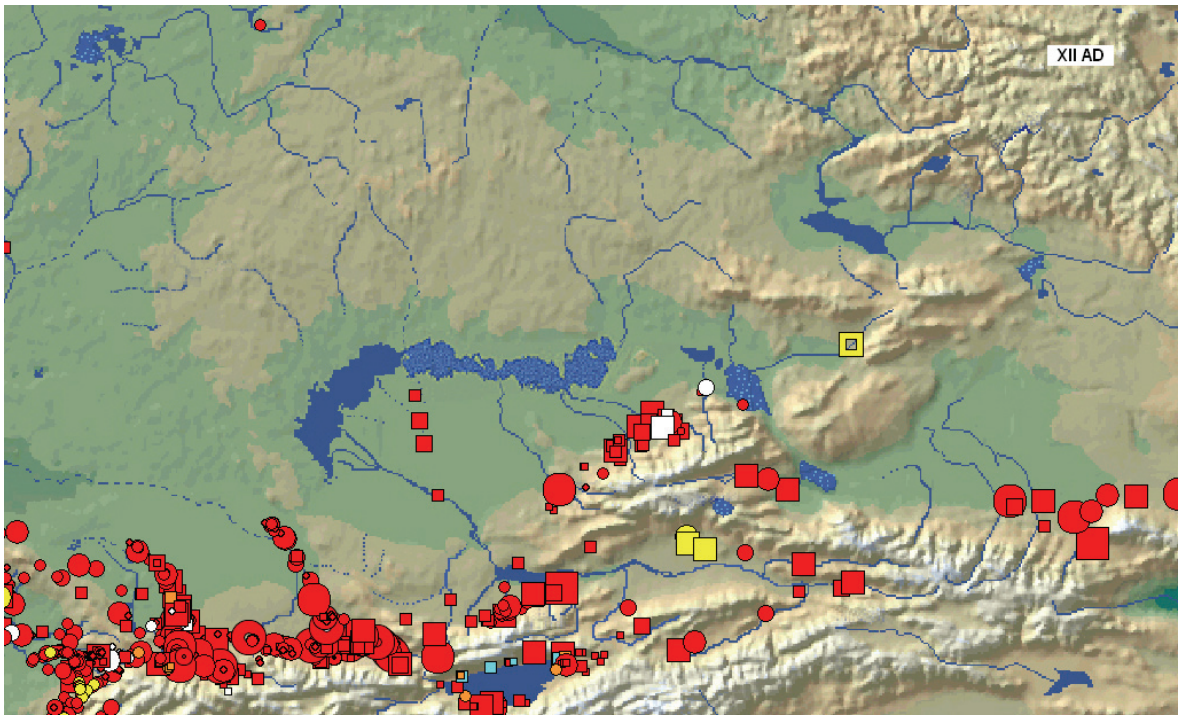



**Fig 4-6. 12AD**

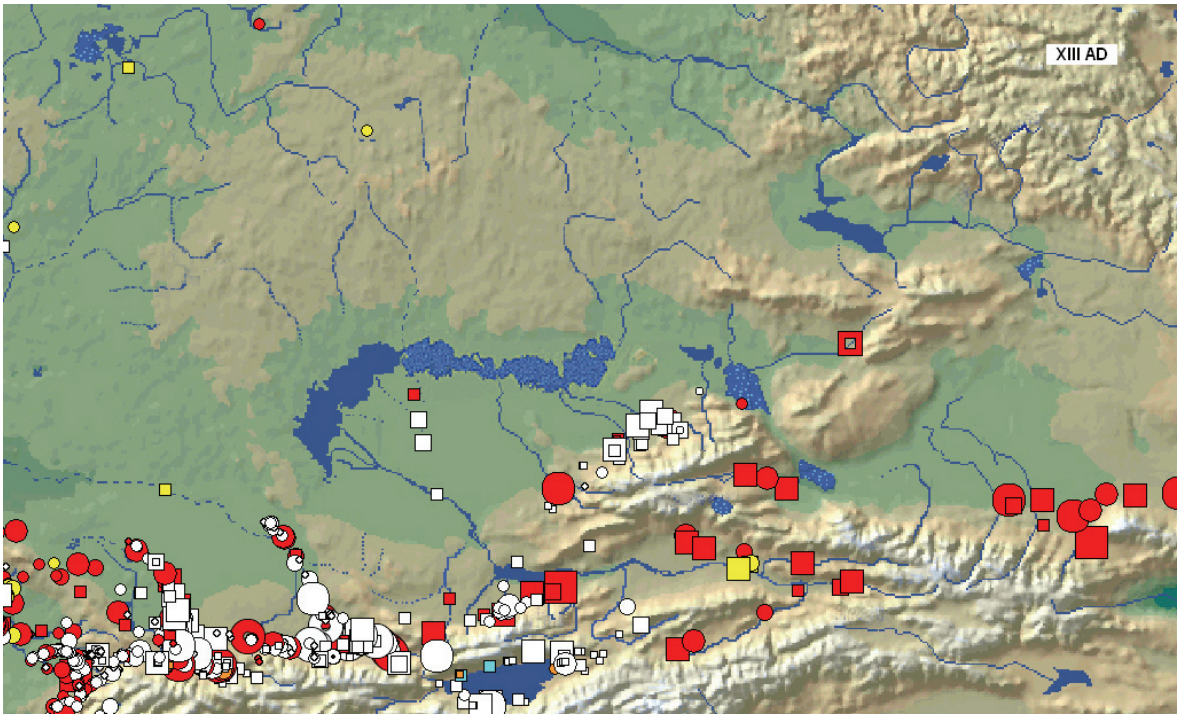



**Fig 4-7. 13AD**

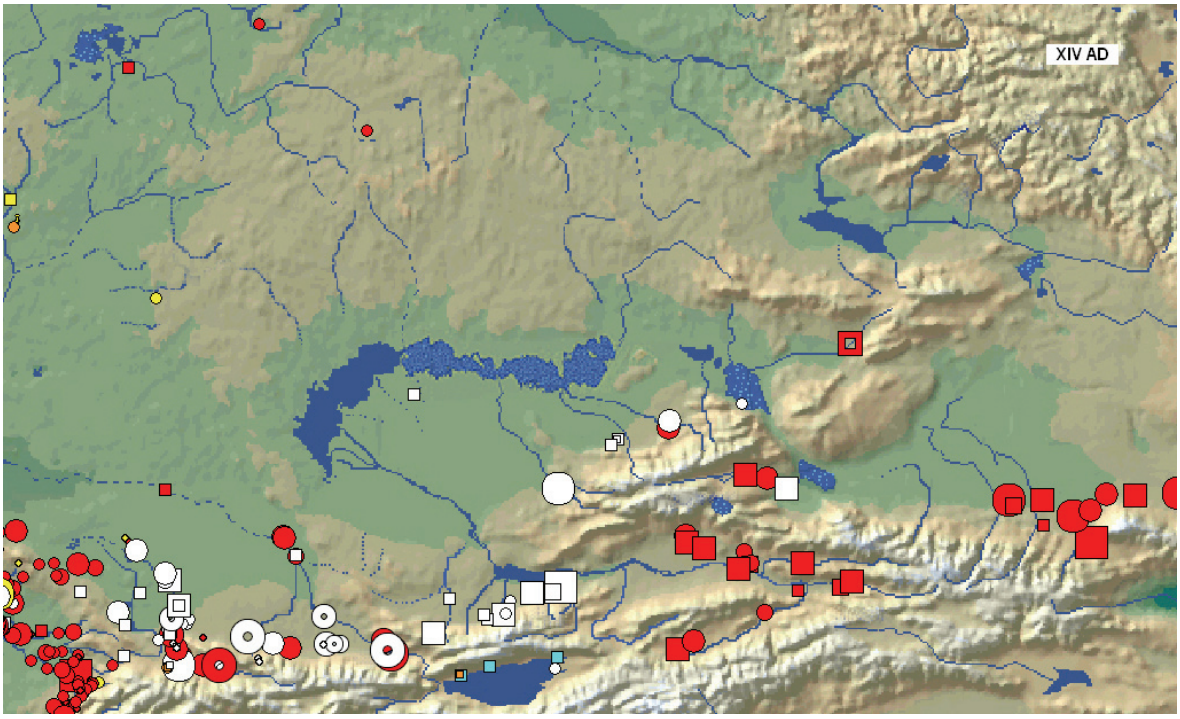



**Fig 4-8. 14AD**

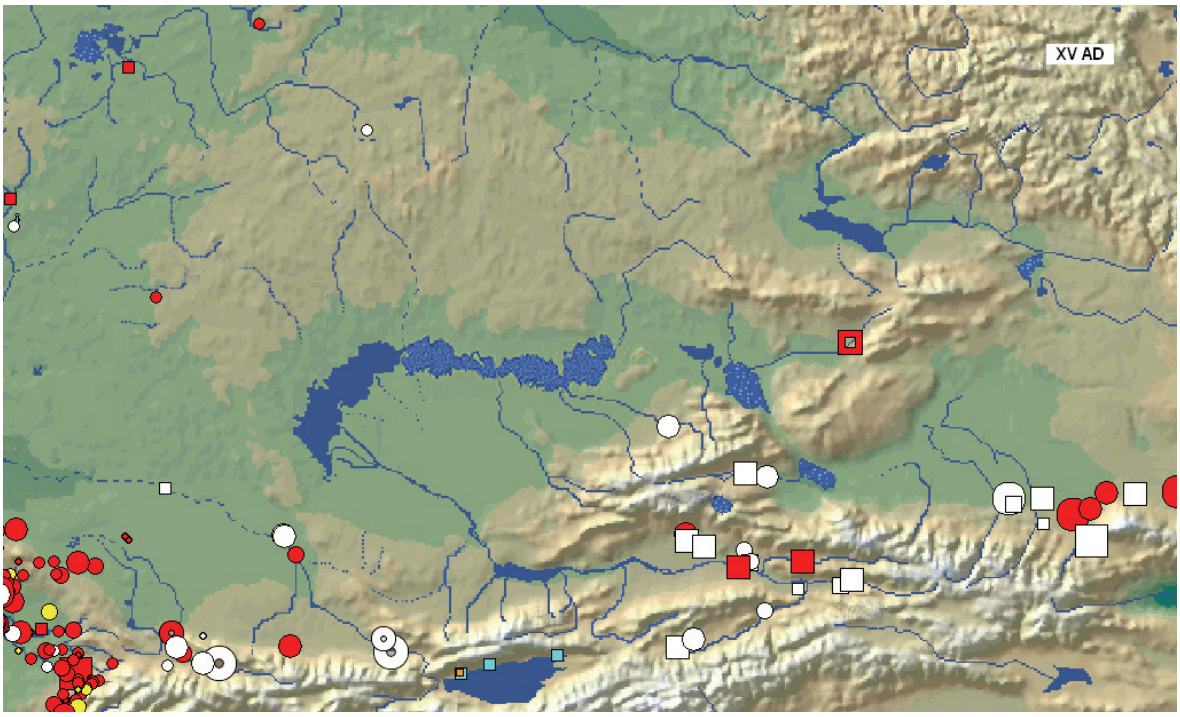



**Fig 4-9. 15AD**

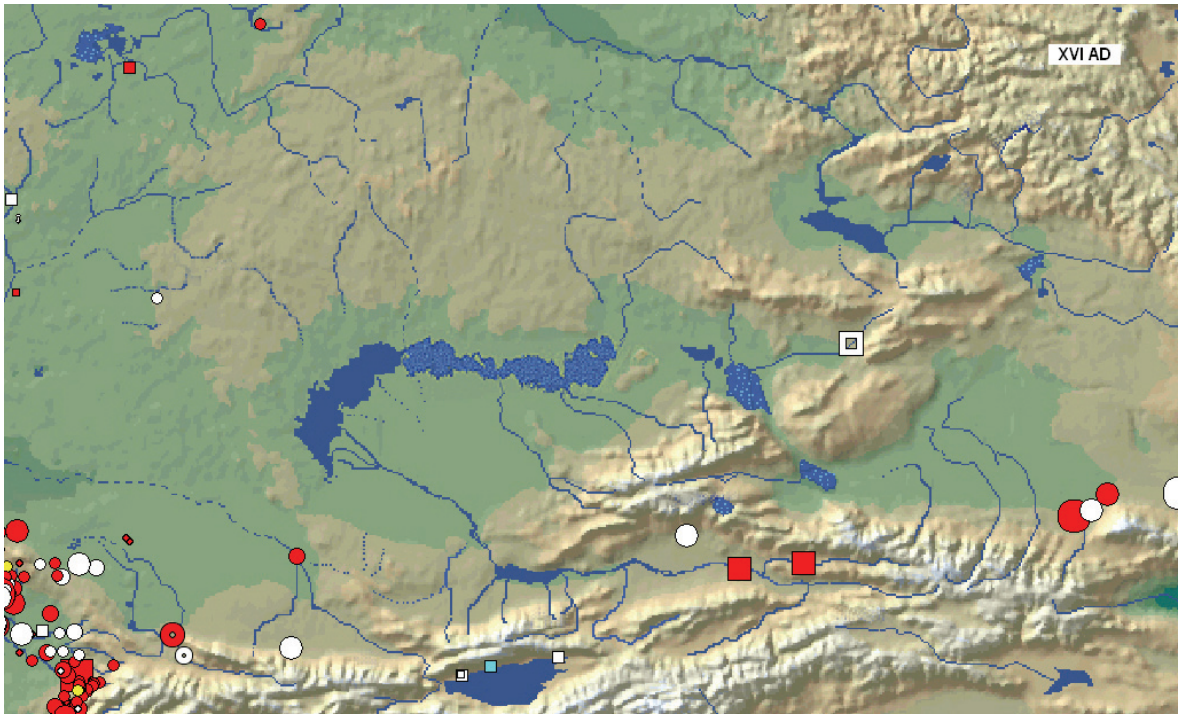



**Fig 4-10. 16AD**

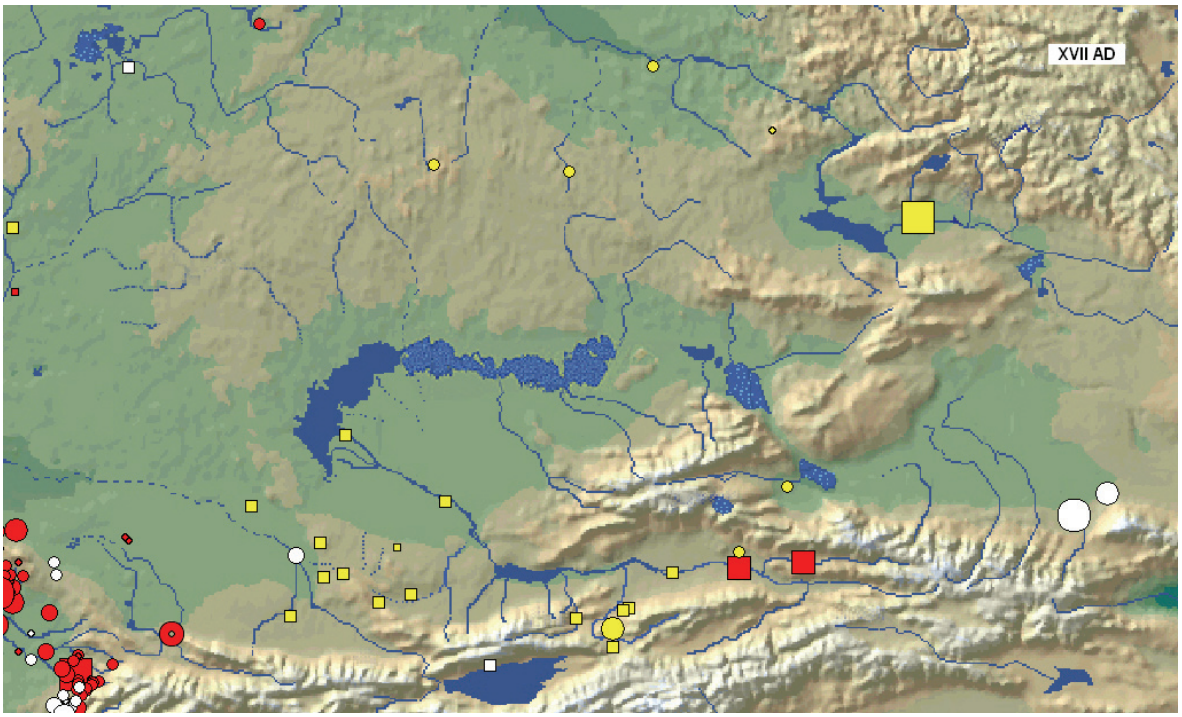



**Fig 4-11. 17AD**

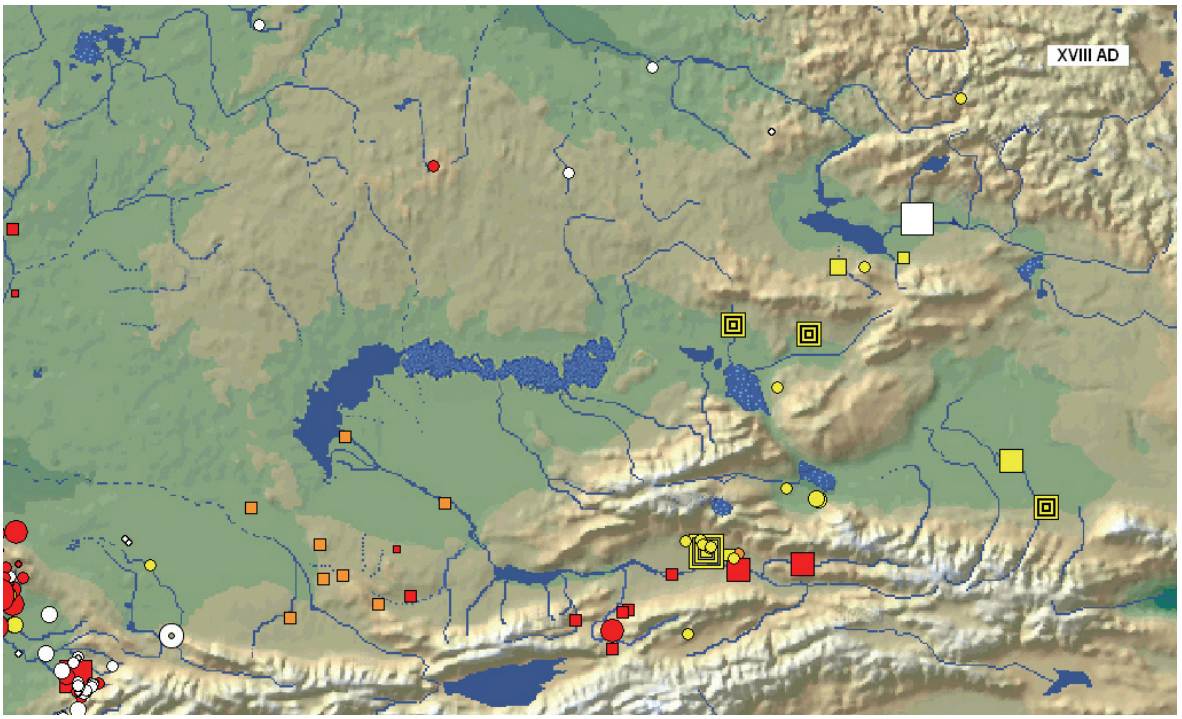



**Fig 4-12. 18AD**

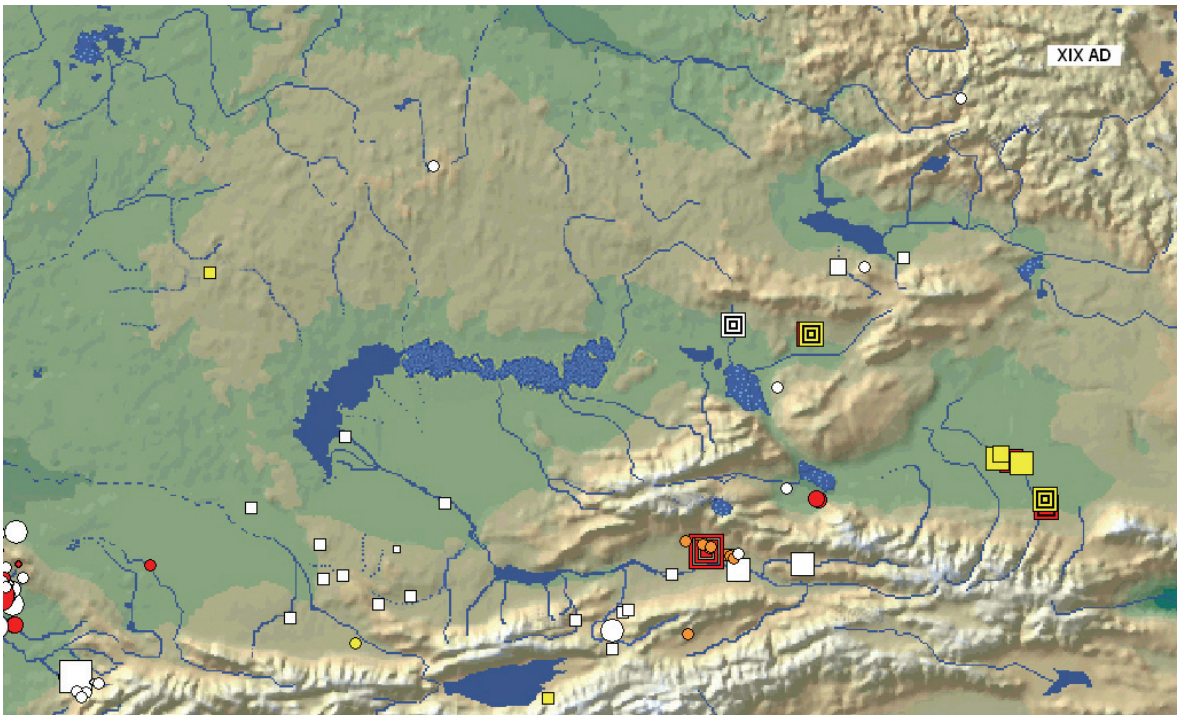



**Fig 4-13. 19AD**

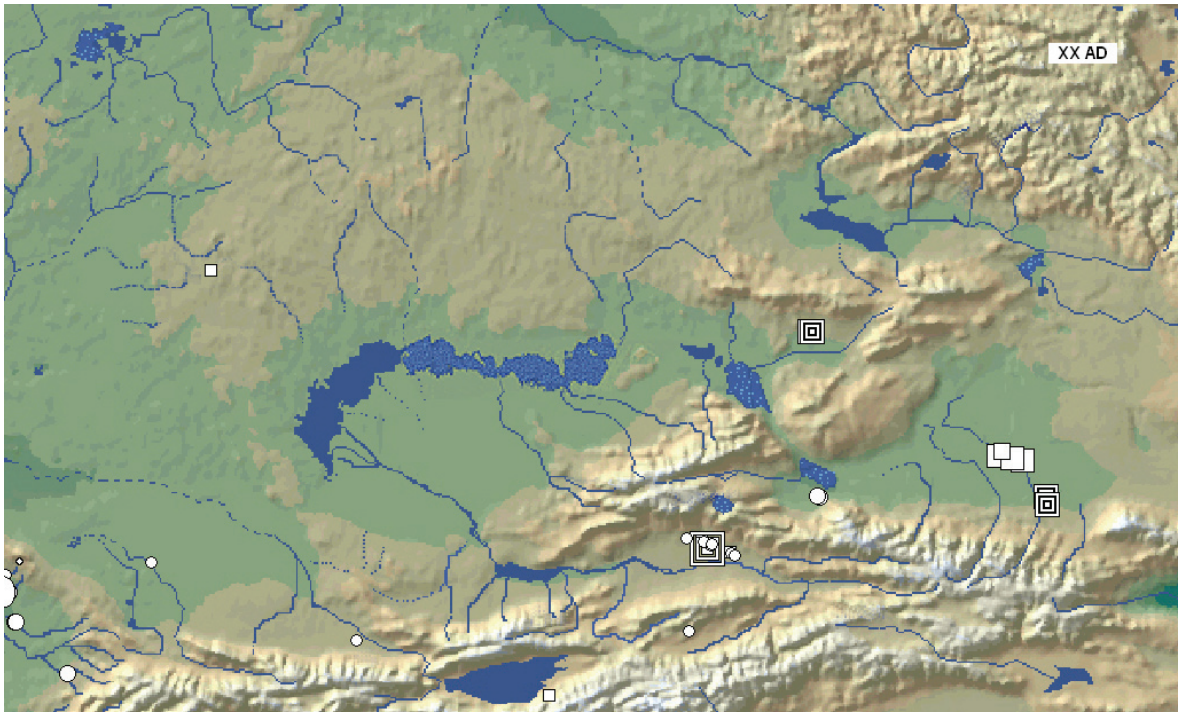



**Fig 4-14. 20AD**

**Fig 4. Historical evolution, century by century, of urbanization in Semirechie (7-20th AD):** 14 chronological maps of occupied settlements, marking location, size and shape. LEGEND: Roman numbers represent the century to which the map is related / Dot size: 5 different sizes indicate settlements that are very large (≥20 ha), large (20>x≥5 ha), medium (5>x≥2 ha), small (2>x≥0.5) and very small (0.5>x≥0.01 ha) / Dot form: round dots indicate oval, rectangular or irregular towns; round concentric dots indicate towns surrounded by out-walls several km long; square dots indicated square fortified tortkuls; square concentric dots indicate Chinese-type towns / Dot color: yellow indicates settlements built during the quoted century; red indicates settlements built previously and still occupied; white indicates settlements abandoned just before the start of the quoted century; orange indicates settlements lacking chronological fixation (like the Issykul settlements in the Chu region conventionally inserted in the 10-12th century figures)

## 4. Semirechie: Medieval urbanization, demography and climate

Preliminary estimates are provided below concerning demographic levels and climatic trends during the urbanization process in order to sort out possible correlations between the three processes.

### 4.1. Urbanization and demographic levels

An approximate evaluation of the development of demographic levels in Semirechie (middle Ili valley and Jungarian piedmonts) from the 7th to the 19th century AD has been attempted on the basis of historical estimates of world population provided by various authors (Biraben, Mc Evedy, UNESCO 1999, etc), of values of occupied urban surface, and of Chinese historical sources. Preliminary estimates (which could be adjusted by ≥30 %) suggest that with the 8th century AD, an accelerated demographic growth starts in Semirechie that brings the population from 140000 people in the 7th century AD to a peak of 300000 in the 12th century AD, i.e., an average growth of 0.22 % per year. During the 11th century AD, of a total population of 230000 people, 87000 (37 % of the total) were living in towns (400 people per ha in a settlement park of 217 ha). The following two centuries, with economical crises, wars and black death ravaging the territory, are characterized by demographic contraction (to 240,000 in the 14th century); and the population levels of the 12th century AD are recovered only at the end of the 15th century AD. The following centuries represent a new phase of demographic expansion that, with an average yearly growth of 0.28 % per year, doubles the population to 600,000 people by 1850 AD. (Fig 5)

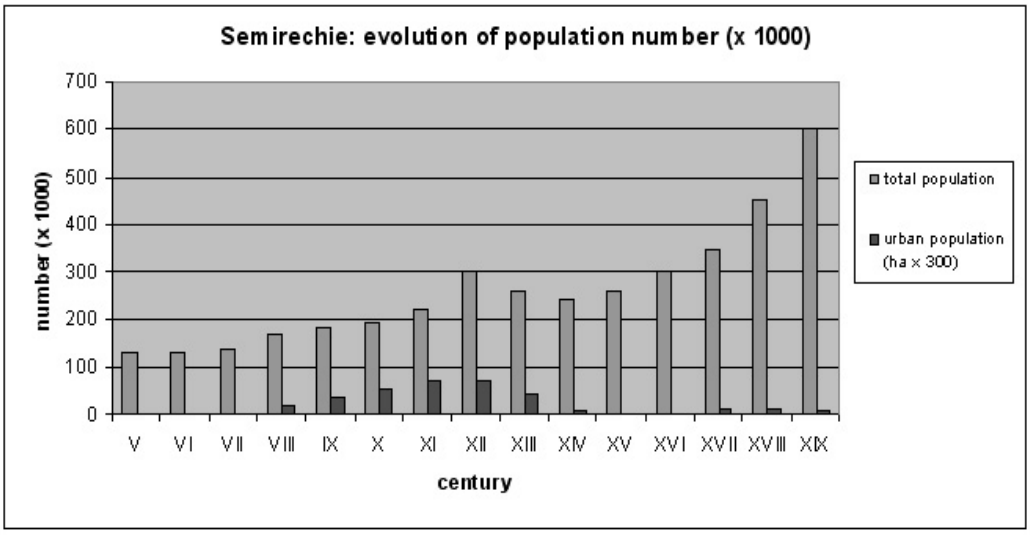



**Fig 5 Semirechie: Evolution of population (7th-19th century AD) (elaboration by the author)**

On the basis of these data, in Semirechie, the demographic expansion related to the urbanization of the 8th -12th century AD is slightly inferior to the expansion connected with the pastoralist use of the territory during the Jungar and Kazakh phases.

### 4.2. Urbanization and climate

Paleo-climatic fluctuations in the Semirechie region have been reconstructed on the basis of palynological analyses of samples from several sites of the mountain and plain zones. The results concerning the plain zone (Tamgaly site) are given in Graphic-15.

The development of climatic conditions in Semirechie in relation to the process of urbanization can be summarized as follows.

The flourishing period of Semirechie urbanization, between the 10th and the 12th century AD, happened under a climate that was becoming progressively warmer, drier, and less continental, until conditions similar to the modern climate were reached in the 12th century AD. The strongest regression of water level of Lake Balkhash, as well as the regression of the Aral Sea, happened from the 11th to the 13th century AD, and in both basins is most probably attributed to natural as well as anthropogenic factors, i.e., to a dry-hot climatic phase and to a peak of urbanization, agricultural activity and water use. Evidently anthropogenic water use increases during arid phases and, in Medieval times (like today), could have acted as positive feedback on a naturally induced regression of the Balkhash and Aral Lakes (Aubekerov et alia 2009).

The urban decay of the 13th and 14th century AD, following the Mongol invasion, coincides with a sudden fall of temperature and a slight rise of precipitation, representing the first of a series of cooling and pluvial phases that would continue until the 18th century AD.

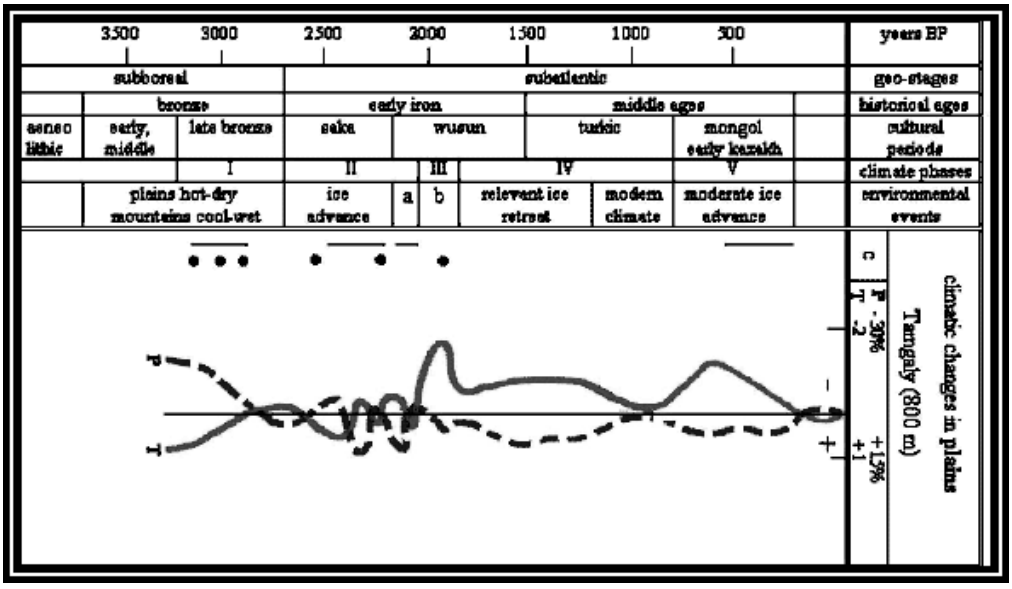



**Fig 6. Semirechie: Reconstruction of average fluctuations of temperature and precipitation in the plains during the last 3200 yrs (150-yr temporal resolution), based on palynological analyses. LEGEND:** Temperature (T) in continuous lines; Precipitation (P) in broken lines; (a) fires; (b) cryolitic formations; (c) chronological attribution provided by EPR and C14 analyses (dots) and archaeological correlation (segments) (Aubekerov, Sala, Nigmatova 2003)

This means that in Semirechie the development of towns and irrigation practices coincides with a progressive scarcity of water; and the pastoralist conversion that followed the Mongol invasion coincides with the start of a series of pluvial phases and the expansion of the steppe zone. (Fig 6)

## 5. Conclusion

The preliminary results of this research can be summarized, for the case of Northern Tienshan as a whole and in particular for Semirechie, as follows.

### 5.1. The urbanization of Northern Tienshan

The first wave of urbanization of the Northern Tienshan piedmonts proceeded from the west and from the east. In the west it started during the 1st century AD (Talas) and in the east during the 7th century AD (NE-Tienshan), reaching Semirechie as the last region during the 8th century AD. The western and eastern trends show different chronologies, settlement morphologies and functions, speeds of development, and political agents; and they affected in a complex way the urban development of Semirechie.

- The urbanization of the Northwestern Tienshan piedmonts (Talas and Chu basins) happened under the influence of the Zeravshan valley, which already reached the Chach region (right bank of Middle Syrdarya) and the NW Karatau piedmonts at the end of the I millennium BC, then the Talas delta at the beginning of the first millennium AD, and from there, in five centuries, the Chu basin. By the 8$^{th}$ century AD the Chu and Talas complexes constitute an integrated political, economical and urban system that flourished, like everywhere in the Northern Tienshan piedmonts, from the 9$^{th}$ to the 12$^{th}$ century, and faded during the following two centuries. Morphologically, the majority of the settlement park consists of rectangular and irregular towns, organically developed from smaller oval or circular tobe-type structures, ending up encircled by one or two ranges of planned rectangular walls and sometimes by out-walls several km long; and a 30-40% of it consists of tortkuls (Fig 2.1-2.5).

- The urbanization of Northeastern Tienshan consists of two waves, both starting under the impulse of Chinese dynasties. The first wave started and immediately flourished during the Tang dynasty in the 7$^{th}$ century AD under the influence of the urbanized oases of Tarim, and remained stable until the end of the 8$^{th}$ century AD. Then, after a long crisis following the Moghul rule, a second short-lived urban wave restarted in the 18$^{th}$ century under Manchu rule. Morphologically the entire urban complex consists of planned structures: very large rectangular towns (29% of total number, covering 73% of the total area) and tortkuls (59% of the total number but, smaller in size, covering 25% of the total area).

- The urbanization of Semirechie started as the last region during the 8$^{th}$ century AD, immediately following the expansion of the Chu urban complex and the rise of the NE-Tienshan complex, on the wave of their economical, political and military interaction; and quickly developed during the general flourishing of the 9$^{th}$ to the 12$^{th}$ century AD. After two centuries of progressive abandonment and two more centuries of total de-urbanization, a second urban wave of a very different character began in the 17$^{th}$ century AD and faded due to military conflict around the middle of the 18$^{th}$ century AD. Morphologically both waves practically consist of planned square walled urban structures (tortkuls and Chinese-type towns).

Semirechie has been the last territory to be urbanized, a kind of last frontier that, during the 11th century AD, was the only region of Northern Tienshan that saw the building of new urban structures around former urban centers or along roads.

Comparing the urban trends of Semirechie with those of its western and eastern neighbors, a distinction must be made between the first and the second wave.

The first wave of urbanization of the Northern Tienshan piedmonts happened first in Talas and Chu, then in NE-Tienshan, and finally in Semirechie (located between the other regions), with different trends and forms (classic organically developed West Central Asian towns and tortkuls in Talas and Chu, planned Chinese-type towns and tortkul in NE-Tienshan, tortkuls in Semirechie), with different economical functions (agricultural-metallurgic in Talas and Chu, agricultural-military in NE-Tienshan, commercial in Semirechie), and by the action of different agents (Turko-Sogdians and Karakhanids in Talas and Chu; Tang, Karluk and Uighurs in NE-Tienshan; Karluk in Semirechie).

The building of the urban complexes starts early and takes place gradually in Talas and Chu, starts early and takes place suddenly in NE-Tienshan, and starts late and is sudden in Semirechie.

Concerning the abandonment of the urban system, this starts simultaneously with the Mongol invasion (13th century AD) in Talas, Chu and Semirechie, where is accomplished by the end of the 14th century. In NE-Tienshan it starts 2 centuries later (15th century) under the Moghuls, and few towns are left until the establishment of the second urban wave. The urban complexes of Talas, Chu and Semirechie see a sudden dismantlement; by contrast the settlement park of NE-Tienshan decays in a gradual way over four centuries.

From a chronological point of view, the urban complex of Semirechie shows more affinities with those of Chu and Talas; and, from a morphological point of view (tortkul forms) and by the patterns of geographical diffusion, shows connections with NE-Tienshan. These similarities lead to the inference that the general urban and commercial activity following the rise of the Chu and NE-Tienshan urban complexes enhanced the importance of trade roads across Semirechie, favoring the rise of commercial and agricultural towns. At the same time, one suspects that those roads and settlements were controlled by tribes that eventually allied with the western powers but by themselves were of eastern origin or at least inspired by eastern urban constructions (the Karluk).

The second urban wave involves only the Semirechie and NE-Tienshan regions and has a totally different character. It started in East Kazakhstan and Semirechie during the 17th century AD under Jungar rule and developed further during the first half of the 18th century, slightly transgressing into the neighbouring regions of Issykul, Chu and NE-Tienshan. The type and function of the settlements is quite peculiar and, as a whole, represents a clear sample of 'nomadic' urbanization (see above). This second urban wave suddenly came to a halt within less than 2 centuries with the military defeat of its agents by the Chinese army. The defeat of the Jungars represents the start of a similarly short lived urbanization spurred by the Chinese Manchu dynasty, centred in NE-Tienshan and slightly involving the S-Tarbagatai piedmonts.

### 5.2. The urbanization of Semirechie

The further away one moves from the original centers of urbanization based on irrigated agriculture (the Zeravshan valley in the west and the Tarim in the east), the less one finds longstanding settlements endowed

with circular or irregular forms resulting from organic evolution from villages, and planned geometric fortified structures instead become dominant.

Before the 8th century AD, in the most remote areas of the Tienshan piedmonts like Semirechie, the first commercial dwellings were most probably simple bases for organizing the collection and trade of natural resources (metals, furs, stones, slaves) located beyond the reach of the main agro-irrigational urban centers and controlled by independent mobile and armed solidarity groups. The archaeological remains of these monuments are difficult to interpret.

Then, with the interaction of the Chu and NE-Tienshan urban cultures, trading activities increased and, in the 8th century AD, commercial routes crossing the Issykul and Semirechie territories grew in importance. Medieval "copper roads" connected the Ulytau and Sary-Arka regions along the Sarysu River, and both were connected with Semirechie and the northern piedmonts along the Chu valley. Wheat was imported by Kimak tribes from the Talas valley to the Irtysh basin. Along the so-called "mink-road", Siberian furs were transported across the central part of Lake Balkhash during its regressive phase of the 9th to the 13th century AD, and along the Ili delta to Semirechie. Silver and gold mining brought the rapid development of the Talas valley and from there precious metals were exported along the Northern Tienshan piedmonts to the west and to the east, to Transoxiana and to China. As such, in the 8th century AD, under the impulse of these trading activities, the first primitive trading bases of Semirechie developed into walled settlements supported by local agro-pastoralist production. Their forms, simple and geometrical but massive, are clearly preserved up to the present day. They reflect the planned practical character of structures built in a few decennia in the context of large business purposes. The military strength of their robust defense walls is not surprising considering that their location faced huge wild expanses populated by habitual and non habitual plunderers. However, even these walls were not sufficient to protect the urban structures from being sacked a few times each century. Surely they were surrounded by villages, farms and seasonal camps, which all together constituted an integrated complex of which the systemic character has not yet attracted enough attention from archaeologists and historians. The main tendency for roads was to run along wet corridors and for settlements was to grow in areas endowed with water facilities and agro-pastoralist potential, so that roads and towns developed together in the same areas. Some tortkuls, when straightly aligned (like those between the Ili valley and the Jungarian piedmonts) must be interpreted as being purely functional to travel, transport and interregional commerce.

In general, we can say that in the case of Semirechie, more than agricultural activities, the development of roads and commercial opportunities between eastern, western and northern regions was the main factor that caused the sudden transformation of primitive camps and villages into large planned walled tortkuls from the 8th to the 12th century AD. In the same way, not military destruction but the commercial crisis and the pastoralist conversion that followed the Mongol invasion of the 13th century AD were the main factors that caused the sudden abandonment of the Semirechie urban park. As a whole, the urban system of Semirechie accomplished specific interregional functions of commercial and political character, which explains its chronological dependence on the development of the surrounding regions, its military morphology, and its high vulnerability to the economical and political crises of its neighboring regions.

Regarding the socio-political character of the Semirechie urban complex as a whole, it is possible to say that here, more than in the surrounding regions of Chu, Talas and NE-Tienshan, and surely more than in the hydraulic civilizations of Zeravshan and Tarim, the urban management of the first wave of medieval urbanization was not controlled by a political state-like centralized structure, but rather by an arising class of town-dwellers and farmers that were building and controlling individual towns in cooperation and conflict

with a solid class of tribal shepherds converted into interregional commercial agents and armed speculators. By contrast, the second wave of urbanization witnesses the presence of the solid centralized planning not just of individual urban units but of the whole strategic urban complex.

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# Problems in Studying the History of the Economic-cultural Mastery of South Balkhash during the Second Half of the 2nd Millennium

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South Balkhash, or Semirechie, occupies a vast geographic space in inner Eurasia. For many centuries until the mid-18th century, it was a gigantic transit corridor, serving regular migrations of multiple nomadic hordes from the abyssal regions of Central Asia towards the north and northwest of the continent. Migrating through the continent, large nomadic groups were accommodated in Semirechie, and came into close contact with local nomadic and sedentary tribes, playing an important role in the development of the culture and history of the region.

The south region differs from the Northeast Aral and Central Kazakhstan in its wide variety of natural landscapes. There are three main landscape zones in the area:

- *arid deserts*, immediately adjacent to the southern and western shores of Balkhash (deserts Sary'yesik'atrau, Taukum, Chu-Ili Mountains);
- *piedmont woody semi-deserts* (piedmonts of the Zailisky Alatau range and the Djungarsky Alatau, inter-mountainous depressions Kegen, Zhalanash, Tekes and other);
- *mountains with vertical belting*, e.g. Zailisky and Djungarsky Alatau, Uzynkara (Ketmen), Kungei Alatau and a small piece of the north slopes of the Terskei Alatau range.

In the historical past, some special types of the distribution of population, life style and ways of utilization of natural resources were characteristic to each zone. The mode and span of area utilization for economic, social, and cultural purposes were shaped by the economic, migrational and confessional policy of certain states, which occupied Semirechie during certain periods. We distinguish six periods in the last 500 years in the history of the economic-cultural mastery of the South Balkhash landscape zones.

A major criterion for distinction are the geopolitical factors expressed in the change of subjects of possession and management, dynamics and vectors of migration processes, in the change of the ethnographic composition of the local population and the resulting discrepancies in modes and degree of utilization of water and vegetation resources by different ethnic-cultural groups.

With the help of these indicators, we will monitor the following historical periods:

1. Emergence and development of the Kazak khanate, second half of 15th to the 16th century.
2. The Djungar khanate, 17th to the mid 18th century.
3. The Kazak "reconquista", 1758–1814.
4. The socio-economic life of the Semirechie Kazaks under the Kokand khanate, 1815–1852.
5. The conquest of southeast Kazakhstan by Russia and its historical development within the geopolitical space of the Russian Empire, 1853–1917.

6. The Soviet period, 1920–1992.

The study of the first three periods is substantially hindered by the utmost scarcity of relevant written sources and the available sources being scattered in foreign archives. This hinders the possibility of revealing the main laws of the people's interaction with nature during many centuries of history; hence, it is necessary to find and involve various cartographic, historical-toponymic, archaeological, ethnographic, folklore, genealogic and other materials in the scientific research, in order to make a synthesis which would allow the production of a complete and multi-dimensional picture.

***The first period (second half of the 15$^{th}$ till the 16$^{th}$ century)*** includes the history of abandoning the North and Central Kazakhstan by part of nomadic Turkic-speaking tribes headed by the sultans Kerei and Janibek to West Semirechie and the establishment of a new polity of nomads - the Kazak khanate - in 1465 together with the further expansion to the inner Eurasian continent (1465-1598).

The Kazak khanate had emerged in the area of the Chu-Talas interfluve, sites of Chu and Kozybashi; and in the beginning, occupied a relatively small part of Semirechie, its adjacent steppes and the semi-desert landscapes of Central Kazakhstan and the lower Syrdaria. By the end of the XVI century, thanks to the pragmatic and consistent outer policy of the Kazak khans, their territory now covered the whole Chu-Ili region and the northern parts of East Semirechie extending down to the lake of Alakol. At the same time, the piedmonts and the mountainous belt belonged to Mogolistan, or Kashgaria, which included the sedentary and nomadic groups of local Turkic-speaking tribes [1].

The population of the Kazak khanate consisted of the steppe Turkic-speaking Kazak nomad tribes, traditionally occupied with pasturing livestock. The Kazak nomadic society was formed on a genealogic principle out of three large tribal groupings (the Juz): the Senior juz, the Middle juz and the Junior juz. The juzes were subdivided into generations and tribes (families). Historically, the area of the North Semirechie, from the Chu River in the west to Lake Alakol in the east, and from Lake Balkhash in the north to Zailisky and Djungarsky Alatau in the south was a settlement areal of the Senior Juz. This Juz included large genealogic groups, namely: the Jala'ir, Dulat, Sary Uisun, Alban, Suan, Shaprashty, Oshakty and Ysty, and was subdivided into smaller kin groups. Each of them owned appropriated seasonal pastures, and each year they moved from one pasture to another following strictly regulated routes [2].

During their year-round pasturage, the Kazak nomads systematically utilised four types of pastures: winter (kystau), spring (kokteu), summer (jailau) and autumn (kuzeu), each of which differed in seasonal temperatures and vegetation for feed crops. To pass from winter pastures to spring and summer pastures, and then from the summer ones to autumn and winter pastures, the Semirechie nomads practiced meridian, radial and vertical modes of migration. The first two were spread mostly in the Chu-Ili mountainous and low-hill massif, where the Kazaks wrangled in winter and summer time on the slopes and gorges of small mountains, and on the piedmonts in the spring and autumn. The third type of migration was chiefly characteristic of those Kazaks groups which traditionally moved in the high mountain ranges and foothills. In the winter and early spring they roamed on the plains, in the piedmont valleys or on the extensive Balkhash deserts of Taukum and Sary'esik'atrau, and in the late autumn and winter they climbed the mountains of Jaili and Zailisky Alatau, Uzynkara

(Ketmen), Kungei Alatau and others [3].

As a rule, all steppe nomads followed the principle of the zonal-seasonal cycle and highly valued the winter pastures – kystau - where they settled for the longest period of the year, about 4 to 5 months. The winter season was the most extreme period with the lowest temperatures, forceful winds, repeated ice-slicks and snow storms. At this time of the year, the economic value of surrounding landscapes which could preserve and feed the livestock rose sharply.

The most favourable for winter stock-keeping were those pastures providing fresh water with a constant water flow, abundant stands of grass and natural protection from the winds and foul weather. We should bear in mind that the nomads of the Chu-Ili Mountains and the vast sand deserts of Taukum and Sary-esik-atrau had to constantly endure major shortages in water resources and productive pasture lands under the extreme climatic conditions of arid inner continental Eurasia.

For normal grazing, the pasturage radius, centred at the watering place, should not exceed: 8 – 10 km for camels, 4 – 5 km for sheep, and 2 – 2.5 km for cattle [4]. In North Semirechie, the winter and summer migrations were following rivers, such as the Chu with its tributaries: Zhyngyldy, Kopaly, Sarybulak and Ashisu in the area of the Chu–Ili Mountains; the Ili and Karatal Rivers with their tributaries and the water basin of Aksu, Lepsy and Emel in the east of the region, etc. Normally, the nomads in Semirechie did not go too far away from rivers.

Thanks to their optimal life conditions and their long stay at the kystau, the Kazaks could occupy themselves with crafts, undertake construction in the winter area (constructing adobe or stone enclosures, stationary dwellings, wells, etc.) and execute rites and important social rituals. It is not by chance that they buried their kin at the kystau, which in time were transformed into big necropolises; because of great importance of the winter pastures. The Kazaks thoroughly guarded them against possible encroachment by remote kin or foreign neighbours. The winter camps drew the eye of the Mongol-speaking Oyrat nomads when they attempted the conquest of Semirechie in first half of the 17th century, and two centuries later under the Kokand khanate (1809–1876).

Both states strived to seize and secure for themselves the winter pastures of Kazaks and Kyrgyz: for there they could station their military troops and frontier guards and construct reinforced structures of stone or adobe. Upon the seizure of the most fertile lands with ample water supplies by the Oyrats, all the Kazak tribes that traditionally roamed in the north part of Semirechie, had to move far west of Kazakhstan. Based on that, it follows that the stationed outposts of the Oyrats, and later of the Kokand nobility, represented not only the local control-observation points but also the base for the strategic military and economic domination of the Djungar and the Kokand khanates over large pasture areas. Thus, the seizure of winter pastures by neighbouring tribes/ by large, predetermined eventual success of territorial claims by these invaders to the whole area of year-round migrations of the former possessors [5].

The history of the Kazak khanate from the 16$^{th}$ century to the begining of the 17$^{th}$ century is poorly recorded in written Persian- and Turkic-language sources of the period. In addition, they contain almost no information on the socio-economic life of the Kazak nomads. The study of the problem is further complicated by a lack of information regarding the immovable nomadic monuments and the sedentary population of medieval Semirechie. All of that prevents us from getting a

clear picture of the degree to which the various landscape zones of the region were populated and the character of their economic-cultural development prior to the conquest of the Ili River basin by the West Mongols.

***The second period, 17th mid-18th century***, encompasses an epoch of a long stay by the Mongol-speaking Oyrats nomads in the region, who established their own nomad state, the Djungar khanate in 1635. It is characterized by the large-scale migrations of the Oyrat tribes from the Mongol Altai and the basin of the Ili River to South Balkhash and further to the north and northwest of Kazakhstan.

In first quarter of the 17th century, the Oyrats seized the Djungarsky Alatau and adjacent desert plains to the east of the valley of the mid- and lower Ili River. In the period from 1635–1658, the Djungar khans spread their power to all of the left bank of the Ili River basin, to the area of the Chu-Ili Mountains and the Chu-Talas interfluve up to the lower Talas River and the west bank of Balkhash. Because of the military victory of the Oyrat princes over the Kazak khans and the following mass move of the Oyrat tribes to Semirechie, its population consisting of the Kazak tribes of the Senior juz had to leave their pastures and migrate to the left bank of the Talas and to the northern foothills of the Karatau range [6]. The major outcome of the war and the migration processes in Semirechie were cardinal changes in the subjects of control and the use of natural resources, which shaped the new way of mastering the piedmont and arid landscapes of the region.

From the 17th century till the middle of the 18th century, the main inhabitants of South Balkhash were the Oyrats, who, like the Kazaks, practiced seasonal pasturage and similar modes of year-round migrations, based on the topography and characteristics of Semirechie nature and climate. Additionally, the Kazak and Oyrat societies had similar social structures built on a strict genealogic hierarchy of composite “Senior” and “Junior” families and tribes. The difference was in a more centralised political organization in the Oyrat society, prepared by the conquest in 1678 by the Djungar khanate of South Mogolistan, or Kashgaria, and the consequent assimilation of its people and economical and cultural sedentary traditions for establishing local authorities in the subdued regions. This can be seen in particular, in the Djungar system with the creation of fixed checkpoints on the outer frontiers of the nomadic area of the Oyrats, and inside the khanate itself. The practice of the Oyrat nobility to use Uighurs and Sarts, forcefully resettled from Kashgaria and the Syrdaria region, for the construction of defense installations and Lamaist temples is another example of the higher degree of centralization and consequent assimilation [7].

The Oyrat nomadic state, in comparison with the Kazak khanate and other polities of Eurasian nomads, had a hierarchic system of Buddhist religious-cultic centers, which began to form in the first half of the 17th century. A network of Lamaist centers of “yellow cap” Gelugpa school (sume) functioned in the Djungar khanate, in tight liaison with each other and the main Tibet religious centers for about 130 years. They were chiefly located at the winter and summer camps of the Oyrat princes, at healing sources and the transit crossroads. They implemented the ideological function for the social integration of the Oyrats and spread spiritual Buddhist values. The Oyrat monasteries, sume, as a rule, had small settlements of kashgarian Sarts and Uighurs who grew crops on temple lands for the Buddhist monks, made handicrafts and built cultic and irrigation structures. These were local centers which supported translations and the creative and spiritual life of the various Oyrat

local groups. In essence, they were the only centers of sedentary culture in Semirechie from the 17th century untill the middle of the 18th century [8].

The Djungar historical period of mastering nature in the South Balkhash is somewhat better recorded than the preceding historical epoch. Very important evidence of the spatial distribution of Oyrats and steppe camps of Oyrat nobility is in the historical biography "The moon light. A history of rabdjan Zaya-pandit" written at the end of the XVII century by a student of a famous Oyrat enlightener, Radnabhadr [9]. Similar information is found in the Chinese historical-geographical works of the Ch'ing Empire, "Jinding huangyu xiyu tuzhi", "Dai Qing shengzu renhuangdi shilu", and several others, written during the mid-XVIII – first quarter of the XIX centuries [10]. An important addition to the above are the materials of Russian envoys to the Djungar khanate during the XVII – mid-XVIII centuries; in particular, the thematic chronological magazines by I. Unkovsky, L. Ugrimov and K. Miller from 1722–1743, which contain valuable data on the geographic location of a number of seasonal camps of the ruling Oyrat elite, the stationed Djungar outposts and the Lamaist sume [11]. The historical toponymic data of 10-versta-maps from the beginning of the XX century for four uyezds: Verny, Djarkentsky, Kopalsky and Lapsinsky [12] and large-scale maps drawn in the past 50–60 years helped ascertain these small locations. Ruins of former Djungar fortifications and temples are normally titled by names such as "Kalmak", "Kalmaktobe", "Kalmakkorgan", "Karaultobe", "Karaulshoky" which reflect the laconic oral folk memory of the Kazaks regarding their past functional purposes and the exterior profiles of the historical places [13].

The Oyrat camping grounds in South Balkhash were unevenly distant from the outer frontiers of the Djungar khanate. Those parts of the khanate that were properly secured against sudden armed raiders by a network of relatively frequent steppe streams and large bodies of water, such as the Balkhash and Alakol lakes were the most densely populated and developed by Oyrat nomads. This is why the boundaries of the Oyrat natural land estates in Northeast Semirechie mainly coincided with their regular roaming areals. The situation was different in the northwest part of the region, varying significantly from the left bank part of the Ili River basin because of the geographical conditions.

The presence of the Djungar in the region for over a century was reflected in the irregular character of land utilisation for stock-raising. Written sources from the second half of the 17th till the middle of the 18th century clearly indicate that the camping grounds of the Oyrat families and tribes were concentrated mainly on the left bank of the middle and upper Ili River (urga), which provided abundant fresh water and rich vegetation, rather than in the desert band of pasture lands adjacent to Balkhash and the south edge of Betpakdala. The mountain slopes and foothills of the Kyrgyzsky Range, ZailiskyAlatau, Uzynkara (Ketmen) and northern Tian Shan were constant locations for Oyrat summer camps. Adjacent flat parts of the Taukum deserts, the middle and upper Ili River valley with numerous tributaries - from the Khorgos River to the Kurty River, the Chu River valley and its upper tributaries - were their winter camps. Numerous documents, archaeological and historical-toponymic materials of the epoch, published by Kazakhstan scientific editions in various years, are illustrative to the long presence of the Djungars here.

Unlike the south and central parts of Semirechie, desert landscapes of the Chu-Ili Mountains extended from the south to the north, from the Kurty River (a tributary to the Ili River) and the Chu River to the southwest shore of Lake Balkhash. It remained scarcely populated during the whole

period of the Djungar domination in Semirechie and out of use by Oyrat nomads. These lands, which were the buffer zone of the Djungar khanate, were a poor economic and cultural area that separated the main areal of the Oyrat tribal areal from the camping grounds of Kazak tribes. At the time, only a network of Djungar military-defensive posts was positioned there to control transit migratory routes from Betpakdala to the upper Ili [14]. The Djungar khuntaidji Tsevan-Rabdan wanted to strengthen his military-political control over the acquired territories of west Semirechie and the nomadic transit and caravan routes that were running there (from the Volga region to Syrdaria steppes, Central Asia and China). At the end of 1790s, he therefore moved his headquarters from south Tarbagatai (winter camp) and Djungarsky Alatau (summer camp) to the upper Ili Valley and its tributaries Sharyn and Khorgos, and to the Tekes River valley.

During the winter periods, the urga of Tsevan-Rabdan, and later that of his son and successor Galdan-Tseren, usually migrated to the lower Khorgos and the left bank side of Ili from the so-called Keretsk crossing and Kozheger place (Kadjiger, Kodjiger, Kotsheger, Khadjiger, etc.) to the mouth of the left tributary of the Sharyn River from November to the end of March. Next, the Khan family headed to the spring camping ground upstream located along the right side of the Sharyn River up to the mouth of the Temirlik River where they roamed from April to the end of May, which was the period when snow rapidly melted in the surrounding mountains. At the beginning of summer, the urga moved to the mountainous gorges, to the south and southeast slopes of the Uzynkara range (Ketmen); the valleys of Kegen, Karkara, Tyup, Zhergalan, Zergess, Tekes, Sumbeh (Alban, Alban-Shibir Albanashba–Kazakhstan) and along the right tributary of Tekes and the Ili River up to its confluence with the Khorgos River. In the upper course of the Khorgos River the year-round cycle of migration of the ruling Choros clan ended in early November [15].

The new camps had more favourable advantages for the “big urga” than all the previous seasonal camps of Oyrat high rulers due to their locations and natural climatic conditions which allowed them to complete the whole round of migration within a relatively small area. Starting from the Tsevan-Rabdan on, the area became a usual place for winter and summer camping for all of the Djungar khans who kept the throne until the time of destruction of the Djungar khanate and its depopulation by the Ch’in army. The area was a densely populated migration areal of the Oyrat nomad tribes up to mid-XVIII century.

Unlike the economic life of the Oyrat families and tribes in the arid zone of South Balkhash, which were described in detail in documents and historical-toponymic materials, the specific features of their development of the piedmont landscapes and mountains of South Semirechie was a difficult problem until recent times. .

A lack of written sources on the history and culture of southeast Kazakhstan, together with the absence and later inaccessibility for Soviet scientists of large-scale geographic maps prevented proper scientific research.

The most representative information source is the famous Djungaria map by J. G. Renat, compiled in 1734–1738 based on the so-called “The Kalmyk map” of the Djungar khan Galdan-Tseren. The majority of researchers know it only as the poor black and white copies published in Russia in 1881 and in Germany in 1911. The full-colour original has since a long time been kept in in the

Manuscript Fund at the Uppsala University Library in Sweden [16]. Thanks to the kind help shown to us by Norwegian and Swedish colleagues, the Archive of the Kazak Scientific Research Institute on Problems of Nomadic Cultural Heritage now has an electronic copy of the Swedish original map by J.-G. Renat in its possession. It clearly shows all the Oyrat geographic names in Latin transliteration, as well as a caption for the winter camps of Djungar khans and other Oyrat stations.

Special symbols, talters (triangles with a vertical hyphen within from its base to the middle indicating an entry), denote the lamaist monasteries and temples on the map. The 65 cult structures spread throughout the Djungar khanate were indicated on the map: 40 of them are in present day Kazakhstan; 7 in Kyrgyzstan; and 18 in the Sinkiang Uygur Autonomous Region (SUAR) of China. The maximum number of Lamaist sites - 27 monasteries and single temples - were available in the migration area of the Djungar khans' urga in the Ili River left side valley or to the east from its tributary Shelek to the mouth of Khorgos, in the basins of Temirlik and Kegen (with its left tributary Karkara), Tekes, Narynkol and around the Lake Issyk-Kul. According to J.-G. Renat's map, in 1733 there were 43 Lamaist complexes in Semirechie, which were the only sources of sedentary farming culture in the region.

It is known that the J.-G. Renat's map is of varying scale: predominantly 1:7,000,000 m in the centre and less than 1:10,000,000 m in the periphery [17]. This prevents the calculation of even the approximate longitudes and latitudes for the cultic structures. However, this shortfall is offset by the large amount of information contained in the map in the form of the accurate outlines of the mountain foothills and valleys with meandering rivers, which attracted the Oyrat Lamaist complexes.

For the successful localisation of prospective sites of Lamaist talters (according to Renat's terminology) in southeast Kazakhstan we have used two methods. Firstly by the visual juxtaposition of mountains and rivers indicated on the Renat map with similar contours of mountains and river valleys on recent maps of Semirechie. Secondly, by comparing previous Oyrat names of various natural objects with earlier or later Kazak historical toponyms, by a principle of similar transliteration and semantics. A 2008 exploration of the sites established that the Lamaist sanctuaries were located in the open at the foothills of high mountain ranges or in the piedmont valleys. They were situated on lands with abundant vegetation near rivers, healing mineral water sources, or stable streams. They lay along main migration and caravan routes, as well as at river crossings, mountain passes and other nodal points of trans-regional nomadic roads. Their locations were chosen to allow the Lama teachers to easily communicate the teachings of the Gelugpa school to the largest number of believers.

The monasteries and adjacent agrarian settlements populated with Sarts and Uighurs, numbered from tens of people to 200-300. The Sarts and Uighurs constructed buildings, water collectors and irrigation systems. The set-up and lasting functioning of such centres for irrigated agriculture and sedentary culture in the piedmonts of Djungar Alatau and in the upper Ili River basin during the mid $17^{th}$ century and the first half of the $18^{th}$ century had been confirmed in the numerous historical records of the time and later periods. It had also been verified through the field survey of the southern region conducted by officials of the Turkestan military district and the Semirechie oblast administration during 1870s – 1890s.

This information provides evidence of the existence of a developed practice of land use in the piedmont zone and the low belts of the Kyrgyz range, Zailisky and Djungarsky Alatau, and northern Tian Shan under Djungar domination. It also indicates that there was very little utilization of the land by the Oyrats for sedentary agriculture.

***The third period of economic-cultural mastery of the region began in 1758 with*** the historical date of the total destruction of the Djungar khanate by the Manchu army ***and ended in 1815 with the adoption*** by Adili-Khan (d.1815), ruler of the Semirechie Kazaks, of the patronage of the Kokand khanate. In the 1750s the escalation of war between the Djungar and the Ch'in army let the Kazaks return to their old pastures which had been abandoned by their enemies, and by 1763 they had reclaimed much of the lands of the mid- and lower Ili River basin and its tributaries, as well as other river valleys in Northeast Semirechie [18].

The population of North Tian Shan by Kazak nomads during the second half of 18$^{th}$ and the –beginning of the 19$^{th}$ century, was complicated by the activity of the Ch'in administration, which put in place a network of frontier fortresses and outposts, and adopted various military-administrative measures to stop the migration of Kazak tribes to the Ili territories.

Chinese fortresses and pickets were generally set up at the sites of the former winter and summer camps of the Oyrat nobility, which had the vegetation necessary for settlement life and fresh water available for the development of irrigated farming. As a rule, there were Oyrat cult sites and Sart villages in their vicinity. The newly emerged agrarian towns of Sarts and Uighurs continued to be occupied with farming. This information is reflected in the materials of the well-known European traveller and Kazakhstan researcher, I-P. Falk, which were published in 1776 and in travel notes by Russian merchants later on. Thus, during the period under consideration, the Kazak tribal groups did not have free access to the south piedmont zone of Djungarsky Alatau and the low belts of the North Tian Shan range and therefore had to frequently change their pasture lands in these areas.

***The fourth period from 1815 to 1853*** was an epoch of political domination of the Kokand khanate in Semirechie. They seized the Chu Valley, the piedmonts of the Kyrgyz range and Zailisky Alatau; built large fortifications and defensive outposts, e.g. the fortresses of Tokmak, Pishpek, Aksu, Shishtobe, Tauchubek, Merke, Kastek, Ush-Almaty and Itkichu, as bases for sending tax collectors and punitive squadrons to the camping grounds of the Kyrgyz and Kazaks of the Senior Juz. The Kokand fortifications were located at the winter camps of the traditional Semirechie nomads in order to exercise strategic control over large territories. The extreme northern Kokand outpost in Semirechie was a fortification named Itkichu, located at the mouth of the Kuragaty River into Chu. All other fortifications were located in the piedmonts of the Kyrgyzsky range and the Zailisky Alatau, which were the richest in fresh water sources. In the mid-19th century, their garrisons numbered between 50 to 250 occupants, not including the farmers because they were provided with bread, rice and other foodstuffs by the semi-sedentary Kyrgyz of Fergana and from the large military-administrative centers of the Kokand khanate.

At the time, the Kazaks of the Senior Juz had only their seasonal pastures to the north from the lower Chu River and to the northwest from the Djungarsky Alatau. Their main economic occupation continued to be the migratory raising of livestock as best they could in the northern part of

South Balkhash with its scarce water and scanty vegetation.

The history of economic-cultural life of Semirechie nomadic and sedentary population during first half of 19th century was erratically mentioned in passing in Russian documents and the Kokand narrative sources of the time, such as the **"Tarih-i-Shahruhi" by mullah Niyaz-Muhammad Hukandi, "Tarih-i-djadida-yi Tashkand" by Muhammad-Salih** and others. They focused mainly on the military-administrative events inside the Kokand khanate and its nomadic periphery. Writings concerning the traditional economy of the local nomads and sedentary farmers in the region of Zailisky Alatau and the Kyrgyzsky range are fragmentary and fail to deliver a clear picture.

***The fifth period, 1850s till the beginning of the 20th century***, has the most historical records. It was an epoch of the conquest of Semirechie by Tsarist Russia with almost 70 years of development under the imperial administrative-political system. The locations of Kazaks of the Senior Juz and Kyrgyz in the region were dependent on the agrarian and migrational policies of the Russian empire and its administrative-territorial management system.

In 1868, all of the Semirechie population was subdued by the Russian colonial authorities and became part of the Semirechie oblast, which consisted of the Verny, Pishpeksky, Kopalsky, Djarkentsky and Sergiopolsky uyezds (large administrative district). The uyezds were subdivided into volosts (rural district). Each volost' corresponded to certain pasture holdings in common use by a community of either one migrating group or a peasant village, and was clearly identified by the colonial authorities using landmarks in the geographic area of the corresponding administrative division [20]. It helped stabilise the migration areals of the different Kazak families, to a certain degree, although it did not solve the problem of intra-community friction stemming from transboundary pasturelands.

Apart from the Russian administrative-territorial system, an important force behind land and water use in Semirechie was the migratory policy of the Tsarist government, launched in the mid-19th century.

In the 1860–1880s, the local colonial authorities initiated and channelled mass migrations of large groups of the sedentary population, which included Russian peasants, Kazaks, Uighurs and Dungans, to Semirechie from the inner regions of the Russian empire and the Kuldjinsky krai (region) of the Ch'in Empire. Soon it led to the appearance of a number of fixed farm settlements in the piedmont zones and the valleys in the high mountain ranges. Fourteen Cossack villages and remote points had been established in Semirechie by the beginning of 1860s. In 1870, there was a population of around 87.300 who owned 555.900 dessiatinas (an old Russian measure of length; 1 dessiatina = 10,900 sq. metres) of land [21].

By the end of the 19th century, Cossack and peasant villages, as well as Uighur and Dungan settlements existed in all the uyezds of the Semirechie oblast. They occupied the most fertile land plots which had ample water supplies. Together with the sedentary-farming colonisation of the northern piedmonts of Zailisky and Djungarsky Alatau, the first cities in Semirechie were established and extensively developed in the second half of 19th century. Pishpek, Verny, Kopal and Djarkent, later became the most densely populated centres of sedentary culture in this landscape zone as well as for South Kazakhstan.

By the end of the 19th century, there were around 71.900 Russian and Ukrainian settlers in Semirechie, most of them living in the Verny uyezd (35.5 thousand men) and in the Lepsy uyezd (22.1 thousand), the remaining 14.3 thousand living in three other uyezds. In addition, there were 55.8 thousand Uighurs and 15.3 thousand Dungans. They made up 54 communities and 99 settlements in the Verny, Kopalsky and Djarkentsky uyezds of the Semirechie oblast [22].

From 1887 to 1915 numerous groups of peasants moved from European Russia and Siberia to Semirechie. Their influx had increased the Slav population to 118.5 thousand by the end of the pre-revolution period. The majority of Russians and Ukrainians were densely settled in the Verny uyezd where their population was around 72.700 [23].

From the second half of the 19th to the beginning of the 20th century, the Russian peasants, Uighurs, Dungans and other sedentary settlers farmed in the piedmont and mountainous zones of the region. The Kazaks and the Kyrgyz, being hereditary nomadic pastoralists, continued their mobile life styles and lived only in the desert areas of Semirechie. Big groups of these nomads also migrated in the high-mountain ranges and piedmonts, making their camps in many places close to the agrarian settlements of the Uighurs, Russian peasants and Cossacks.

The history of the socio-economic development of the multicultural population of the South Balkhash within the Russian state is recorded in various documents such as the statistical survey materials for the Semirechie oblast dating from 1911–1913 and the large-scale 10-versta (1 versta = 1.6 km) maps of the Turkestan region drawn from the end of the 19th century through the first half of the 20th century. Most of the documents were preserved in the Kazakhstan Central State Archive and the largest Russian archives of St-Petersburg and Moscow as well as in the libraries of these cities and Almaty. Their collections are accessible to foreign scientists.

In general, the history of the colonization and of the economic–cultural mastery of various regions of Semirechie were erratically mentioned in pre-revolution documents and the maps of the time. They give the details about the economies of the nomadic Kazaks, Russian and Uighurs settlers in the piedmont areas of southeast Kazakhstan, while the characteristic features of the nomadic strategy of land use under the extreme conditions in the Chu–Ili Mountains and the Taukum desert are given scant and infrequent attention. The economic–cultural arrangements of the sedentary agrarian settlements in the high mountain areas of Semirechie were given even less attention in the historical documents and maps from those years.

From the above, the necessity of a complex inter-disciplinary approach to the study of the history of human-nature interaction in South Balkhash becomes obvious. Such an approach should involve a wide range of historical records and cartographic materials, archaeological artefacts, demographic survey data from different periods and special natural-science study data. Such an inter-disciplinary approach is needed due to the big gap in the representative factual data on many aspects of the historical process in question. The absence of developed techniques of written transmission of information with former Eurasian nomads and the continued lack of interest concerning their economic life by the sedentary peoples of neighbouring Asiatic countries. Under these circumstances, a complex method would be the only tool effective in revealing the laws of cultural utilization of natural resources in the local migratory and sedentary farming societies of Semirechie

during last centuries. This would also draw us closer to solutions for the several complex environmental issues of the region.


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# Reconsidering the Ili Crisis
# —The Ili Region under Russian Rule (1871-1881)—

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**CONTENTS**



## Introduction

> The lands that comprise Ili (伊犂) are in an area south of Tian Shan mountain and north of Talji (塔爾奇) mountain, with Narat (那喇特) mountain buttressing the east and the Khorgos (霍爾果斯) River running around the west. The terrain here narrows to the east and gradually opens up to the west, almost forming a triangle. For this reason, Europeans call this land the Ili Delta [Hino 1973: 179].

This portrayal of the topography of the area around Yining—a city in the northern part of what today is the Xinjiang Uyghur Autonomous Region in the People's Republic of China—comes from HINO Tsutomu,[i] who visited the city in 1907 when it was known as Ili (Ghulja). The Ili River streaming through this delta emerges from its source at Tian Shan, joins with the Khorgos River that today marks the border between China and Kazakhstan, and flows to its end at Lake Balkhash. The river is 601 kilometers long, with a basin that extends over 61,640 square kilometers. The location made it inevitable that the waterway would play a role in the affairs of Kazakhstan, the Russian Empire, and the Soviet Union, and the area around Ili likewise had deep connections with Russia.

After being freed from the grasp of the Qing by the Muslim rebellions of the 1860s, Ili—which during Qing times had been the seat of the Xinjiang government—and its surroundings were occupied by the Russian Empire from 1871-1881. Previous research on this event—historically referred to as the "Ili Crisis"—for the most part has analyzed it in some sense from an international relations perspective, taking up the rivalry between Britain and Russia, for example, or the crisis' relationship to the Yaqub-bek's dominion that was then seeking to expand its power from its stronghold in southern Xinjiang, or with respect to treaty negotiations between Russia and the Qing.[ii] But despite the reams of data that have been collected about the Ili region when it was under Russian rule, one has the impression that the occupation period itself has not been examined in detail. Consequently, in this article I will reevaluate the international situation of the time in an effort to tease out the significance of this period of Russian rule and clarify the purpose Russia had for occupying the Ili region. In addition, using statistical and other materials I will also shed light on trade and the use of environmental resources (irrigation, agriculture, livestock farming) in the Ili region, particularly with respect to the case of the Taranchis (Uyghur). My objective in this effort is to examine the significance of Russian rule for this region from a micro-level perspective and indicate what made the region unique while drawing comparisons with the preceding and subsequent periods.[iii]

For the period of Russian rule, archival materials regarding the secretariat for the Ili region (*Kul'dzhinskii krai*) remain in Kazakhstan (the fond No. 21 of TsGA RK), but as yet not enough investigation has been done by the author of this article. That English diplomats at the time frequently compiled data from Russian periodicals is quite clear from British Foreign Office (hereafter FO) archival materials, and note should be made of the fact that they can be supplemented to a certain degree by the "*Turkestanskii sbornik*" ("Turkestan collection," hereafter TS).[iv] I want to aggressively make use of the articles included in the TS in this paper.

## 1. Prehistory: The Ili Region during the Qing Dynasty

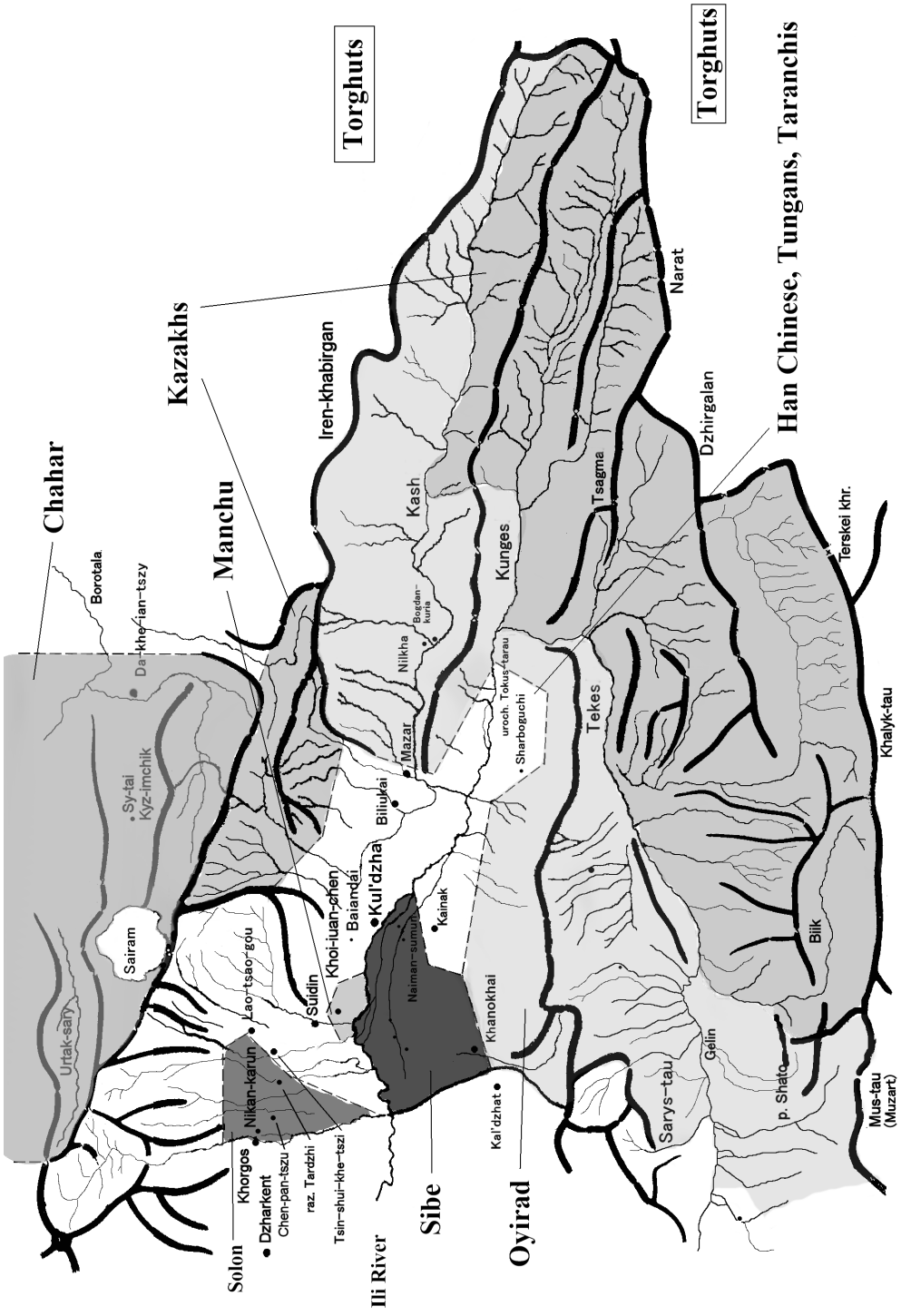
### 1.1. Ili's Makeup

The Ili region today is a part of the Ili-Kazak Autonomous Prefecture inside the Xinjiang Uyghur Autonomous Region. More precisely, it mostly corresponds to the eight counties (Yining, Huocheng, Nileke, Xinyuan, Gongliu, Tekesi, Zhaosu, and Qapqal Sibe Autonomous County) and one city (Yining City) that comprise the "Ili district" [*Xinjiang Yili kaifa*: 11].[v] Since the Russo-Qing border moved slightly eastward under the Treaty of Saint Petersburg in connection with the reversion of the Ili region to the Qing, the term "Ili region" as used in this article refers to a zone that extends beyond the present-day "Ili district" and extends into Kazakhstan.

The population of the Ili district in 1949 stood at 462,655, and reached 1,554,281 by July 1982 [*Xinjiang Yili kaifa*: 14-15]. Reckoning from 1998 statistics, the figure stands at 2,067,372 [*Zizhizhou zhi*: 173]. I will detail this further later, but here it will suffice to say that one of this area's main characteristics is that comprises numerous peoples, including the Kazakhs who give the prefecture its name, the Uyghur, the Mongols, the Sibes, and others.

Historically, the area had been a stronghold of the Junghar people. Ili was the central city even when "Xinjiang" came into being as a frontier province (*fanbu* 藩部) under the Qing following their conquest of Jungharia (northern Xinjiang) and Kashgaria (southern Xinjiang) because the Ili Military Governor who oversaw the whole of Xinjiang was stationed here. The northern parts of Xinjiang saw large numbers of people migrate there as the area had been emptied by the destruction of the nomadic Junghars. Pressured by the Manchu and Mongol Eight Banner garrisons (駐防満蒙八旗, with 4,240 men based at *Huiyuan* City and 2,144 stationed at *Huining* City) and the Green Standard

Army (including *Lüying* 緑営, 3,000 men), 1,837 Chahar Mongols, 1,018 Sibe and 1,018 Solons including Daur (both Tungusic peoples), and 1,200 Oyirads[vi] were settled around Ili around Qianlong 29-30（1764-1765) and, as *Qitun* (旗屯, banner farms), were made to serve as the occupation forces in their respective locations [Wang 1990: 100].[vii] Also, Granted *Jasaq*, the nomadic Torghut people who had migrated from the Volga region made their way in 1771 to the area around Ili.




**Map 1: Rivers in the Ili Region in the early 20th century (bold lines indicate mountain ranges)**[viii]

We should also note the removal of the settled Muslim peoples in eastern Turkestan called the *Huitun* (回屯); more than 6,000 households of Taranchis[ix] (*Taranči*; the name for these people from southern Xinjiang means "a person who plants" in the Oyirad language; known as the Uyghur people today) moved to the region around Ili.[x] The forced relocation of peasants from southern Xinjiang villages such as Aksu and Yarkand to the Ili region to work the land was also seen in the Junghar era. Regarding their society, they are well known to have adopted a "*beg*" administrative system [Saguchi 1986: 281]; the *Hakim beg* who were at its head were individuals linked to the family lineage that had produced a succession of Turfan kings in Xinjiang.

SAGUCHI Tōru, who has already studied Taranchis society of Ili in great detail, deems the lives of the Taranchis to have been harsh; he has estimated that for the 40 *shi* of grain each household harvested from the one *shi*-worth of the seeds of two kinds of barley and the 5 *dou* of grains and wheat they received, each had to pay a levy of 16 *shi*.[xi] The *Xinjiang shilue* records that the total tax levy in the year Qianlong 38 (1774) for the 6,000 Taranchis households was determined to be 16 *shi* per household or 96,000 in total. As Saguchi has already noted, this is consistent with the levy mentioned by Radloff of "8 *cho*" (meaning *hu*, a unit of volume corresponding here to 5 *dou* or 0.5 *shi*) each of barley, wheat, rye, and common millet.[xii] It is no overstatement to say that the very presence of these Taranchis who believed in Islam was to become a remote cause of the Muslim Rebellion in which the Ili region later became entangled.[xiii] Finally, we should note that a diverse society had taken shape around Ili, as—in addition to the Huitun (回屯) and Qitun (旗屯)—the Torghuts and Kazakhs also had lands they roamed in the area.

The structure of the city of Ili had its own peculiarities. Seven cities including *Ningyuan* (also known as *Ghulja* or *Jindingsi*, it is referred to as *Kul'dzha* in Russian sources)—also called *Huicheng* (回城), this is where Muslims were to live—and *Huiyuan* City, which was the government's headquarters, were clustered around here; as such it took on the appearance of complex city.[xiv]

### 1.2. Connections with Russia

From the 1840s onward, it is known that merchants of Russian nationality entered Xinjiang, particularly Ili and Tarbagatai (also known as Chuguchak), and did business despite it all being illegal.[xv] Demand in Russia for tea and textiles was great and the merchants wanted to conduct trade outside of Kyahkta—which had been the exclusive location for such commerce—in the much-closer Xinjiang. The signing of the Treaty of Kulja between Russia and the Qing in 1851 opened Ili and Tarbagatai to merchants of Russian nationality. The authority to appoint consuls and the right of residence were also granted, and Russian consulates opened in the two cities.

From the start, it seems that Russian government offices under the jurisdiction of the Governor-General of Western Siberia in the Alatau District and elsewhere issued passports (*bilet*). Studying one example from 1860 shows that the chief of the caravan (*Karavannyi starshina*) is permitted free passage to Ili and Tarbagatai on the basis of Article 4 of the Treaty of Kulja.[xvi]

Russo-Qing trade entered a new phase [Mi 2005: 61] with this, but an arson attack in the Russian trade zone (*faktoriia*, the Russian trading house) in Tarbagatai in Xianfeng 5 (1855) [xvii] led trade via the city to become unfavorable [Kasymbaev 1996: 83]. In Ili, too, in addition to the withdrawal of merchants and consular staff in response to the Tarbagatai incident, not even normal business was wanted during the confusion of the Muslim rebellions in Xinjiang during the 1860s,[xviii] which will be demonstrated in the following section, and with the closure of the consulate by 1866 having become necessary and other factors trade lapsed into a ruinous state [Paine 1996].[xix] Disorder of this

sort in northern Xinjiang also provided an opportunity for Russia to make advances farther to the north in northwestern Mongolia (toward Kobdo) as well for trade purposes.

Another item Russia directed attention toward related to trade was navigation on the Ili River.[xx] The convenience of being able to go about by boat near the Qing City of Ili and Russia's Fort Vernyi (built 1854, currently the city of Almaty in the Republic of Kazakhstan) was something that could be easily imagined, even if one thought only of transporting cargo. In 1857, the Russian consul requested that goods be transported by boat to the Russian trading house in Ili,[xxi] but the Qing refused. The original document written in Manchu sent by the Ili Military Governor, addressed to the Russian consul is in the Russian State Military History Archive (RGVIA).[xxii]

Paralleling these negotiations between the two, in 1856 a Russian merchant named Kuznetsov loaded a flat-bottomed cargo ship with wheat and such and attempted to make his way from Lake Balkhash up river to an Ili branch village (*Iliiskii vyselok*).[xxiii] In 1872, Fisher went down to the Ili branch village from Kulja (Ningyuan) and conducted research.[xxiv] However, the river in fact does not seem to be suited for navigation, as Yordashev's failed attempt in 1883 and the like show. HINO Tsutomu, introduced earlier in this paper, wrote:

> The water is not of uniform depth in all places, measuring as much as 20 *shaku* [1 shaku = 30 cm] in its deepest and no more than 3 *shaku* at its shallowest. . . . The force of the current is swift, and while it is strong enough to send trees down river, it is otherwise not accommodating for transport. . . . In short, although the Ili River may be useful for water transport as it gradually widens after entering Russian territory, its merits completely disappear within the Xinjiang Province. On the other hand, the benefits of using the river and its tributaries to irrigate the Ili valley are enormous. One sees hamlets in all places alongside it, it is joined to fields and paddies, there are luxuriant trees, and fertile grazing lands. In fact, the Ili creates the most fertile land in Xinjiang.[xxv]

Russia's commercial intentions aside, it may be salutary to take note of the latter part of Hino's account and consider the Ili River's uses for agricultural production.

## 2. The Xinjiang Muslim Rebellion of 1864 and Russo-Qing Relations

### 2.1 The Muslim Rebellion

The Muslim revolt that occurred in 1862 in Shaanxi spread through Gansu to reach Xinjiang, and in Ili, too, *Huimin* (Muslims who spoke the Han Chinese dialect, also known as Tungans[xxvi]) joined with Taranchis to rise up against the Qing. Detailed analyses may be found in various existing works of research,[xxvii] so in this article I would like to focus on the differences in trends for each people.

(1) Taranchis, Tungans: Later became rivals and as I discuss below the Taranchis establish a government
(2) Kazakhs: Join with the Qing in Tarbagatai but sided with the Muslims in Ili [Noda 2006]
(3) Sibe: Later fell in with the Taranchis regime [Diiakov 1908]
(4) Oyirads, Solons, Manchus: Fled to Russian territory in the west[xxviii]

### 2.2. Russia's Posture

The Xinjiang Muslim Rebellion also affected neighboring areas in the Russian Empire. The Oyirad army crossed the border particularly around Tarbagatai numerous times from 1865 onward and made incursions into Russian territory [Terent'ev 1875: 125], and the uprising spread toward Kobdo when the Qing government was restored to power in 1869 [Paine 1996: 120].

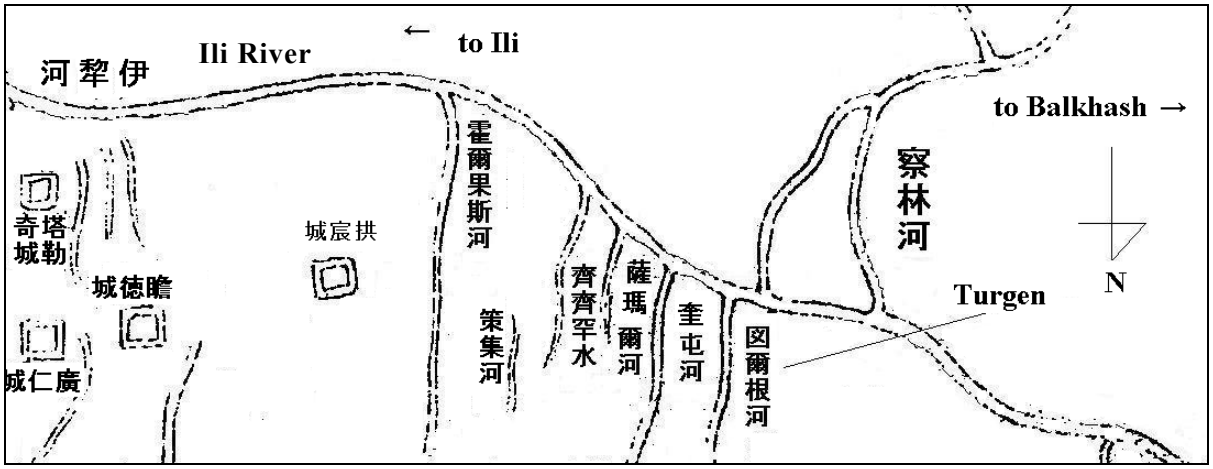
Moiseev has sifted through the Russian archival sources on Russia's response to the Ili uprising. While troops were moved to Borokhudzhir to prevent the flight of Kazakhs to the Ili region on the one hand [Moiseev 2003: 90], Russia adhered to a non-intervention policy when it came to a request for a relief force from Ili Military Governor, Mingxu (明緒) [Gurevich 1982: 429]. Based on the opinions of West Siberia Governor-General Diugamel' and the instructions Foreign Minister Gorchakov sent to Ambassador Vlangali in Beijing, it seems the reason for this was that there were concerns the Tungans would regard Russia as an enemy [Moiseev 2003: 77-79].

Russian scholar of East Asia, Terent'ev (born in 1837), focused on the effect the rebellion had on Russian trade [Terent'ev 1875: 122]. In this monograph, he indicated that as a result of the revolt, "(1) Russian consulates and trading houses in Ili and Tarbagatai closed, (2) trade that had been making spectacular advances in terms of turnover completely halted, (3) hard-up and ruined settlers rushed to Russian territory, and (4) unrest on the border was relentless, there were incursions into Russian territory, and Russian subjects were attacked." He also deemed the Russian army's non-intervention itself to be linked to the collapse of trade, the disorder in neighboring countries—that is, in the Ili region—and the formation of a fanatical Muslim state, and vividly displayed the heavy blow that the loss of international trade with this region was for Russia.[xxix]

Around this time, the Turkestan Governor-Generalship came into being on the Russian side. Established in 1867 with Kaufman as the first Governor-General, the territory was initially created out of the Syr-darya *oblast'* (province) and the Semirech'e *oblast'*; Semirech'e—a word that means "seven rivers" and refers to the Lake Balkhash water system, including the downstream basin of the Ili River—was put under the latter's jurisdiction. More precisely, the Senior Zhuz—one of the three Kazakh tribal unions (*Zhuz*)—that had by this time stood face to face with the Ili region was absorbed into the Russian Empire. The military governor of Semirech'e oblast was Kolpakovsky, the individual who would also be in charge when the Russian army occupied Ili. Many refugees from Qing lands were admitted to Russian territory and negotiations took place between Russia and the Qing regarding indemnities for their return.[xxx] A special committee was set up in Kopal' in Russia to deal with people from Qing lands.[xxxi] As of 1871, 1,095 of them had taken Russian citizenship, and most of the other 15,000 people had migrated toward the Kara-Irtysh River (the uppermost reaches of the Irtysh River east of Lake Zaysan) [Terent'ev 1875: 127].

The Treaty of Tarbagatai was concluded at the height of the disorder to deal the western borders of both Russia and Qing China [Moiseev 2003: 64]. With Russia's advance into Central Asia, the need to make Xinjiang's originally undemarcated western border explicit had become a pressing one. The Treaty of Peking signed in 1860 had provided for the establishment of a western border that accorded with those "permanent" *karun* (border guard posts) that did not shift with the seasons [Yoshida 1974: 234], and based on this, the Treaty of Tarbagatai of 1864 set the borders anew. Russia acquired Lake Zaysan as a result and the border the Qing had been supposing—extending to Lake Balkhash in the west—was moved considerably eastward to the area around Ili as well. Based on the terms of the Russo-Qing negotiations noted earlier regarding navigation on the Ili River, we ascertain that Russia at the very least regarded areas as far as Turgen as Qing territory (See **Map 2**); the provisions of the Treaty of Tarbagatai likewise set the border in keeping with that understanding.[xxxii]

In this way, the frontier between Russia and the Qing was clarified. This signified that the movements of these groups had turned into a matter that had crossed national borders [Noda 2006].




**Map 2: Tributaries of the Ili River (source: *Xinjiang shilue*, vol. 4)**

## 3. The Situation on the Eve of the Ili Occupation

### 3.1 The Taranchis Regime in Ili

Let us first review the process that led to the Ili Crisis from a local perspective. In Ili, the Taranchis and the Tungans at first fought together, working to starve out the garrison at *Mancheng* (Manchu City, *Huiyuan* 惠遠) and forcing its surrender. Enmities subsequently arose between the two parties and in the end the Taranchis established a sultanate (*Sultanstvo*) in May 1867. There is data showing that Aila-khan (also Abil-oghil),[xxxiii] the man who became the sultan at this time, had already been chosen in 1865 as the amir of the Taranchis [Fedorov 1903: 45].

According to Fedorov, who compiled military statistical records regarding the Ili region, what made it inevitable that Russia would bring about the demise of the sultanate was "the sultan's threatening posture, the infringements by the Taranchis against the sanctity of our national borders (*narushenie neprikosnovennosti*), and the considerable possibility that Yaqub-bek regime of Kashgaria would grow stronger by making inroads in Ili" [Fedorov 1903: 50]. Also, as Fedorov has noted, it was nothing less than the attempt by those Kazkahs who were Russian subjects to escape Ili at the end of 1870 that would become the direct trigger of the Ili Crisis. Some 1,000 households successfully got away, but the desertion of a Kazakh township headman named Tazabek[xxxiv] and the refusal by the sultan to hand over any Kazakhs resulted in the dispatch of border guards by Semirech'e Governor-General Kolpakovsky.

In *Xinjiang Jianshi*—a work that may be considered as presenting the official Chinese view—the narrative presents Tazabek as someone who had been loyal to the Qing regime from the start and gives the impression of unlawful incursions by Russia, even though it relies on the account in Terent'ev's *A History of the Conquest of Central Asia*. However, Kolpakovsky sees the root cause of Tazabek's flight to Ili as lying in his not having been selected under Russian rule as township headman after 1871 [Kolpakovskii 1872: 218]; also, since there are records showing he worked with the Russian side, I would tend to think from this that he did indeed have Russian citizenship.[xxxv]

### 3.2. The Presence of Kazakhs around Ili

The Kazakhs had lands they roamed through in the outskirts of Ili, as the fact that Tazabek's move helped trigger the Ili Crisis makes plain. Starting in the mid-18th century when the Kazakhs entered into a formal relationship with the Qing court, Kazakhs—particularly from the clans of the Senior Zhuz—would visit Ili for trade purposes and move to inside the *karun* borders of the Qing to escape the cold winds of winter.[xxxvi] The power holders in Kazakh society (called the sultan or the *tore*) came from the Kazakh khan's family, who were descendents of Chinggis Khan; Sultan Tezek[xxxvii] held power in the Senior Zhuz at this particular time.

Before the Taranchis established their power in Ili, Sultan Tezek was notified that that Tugalak, who was the *Shan beg* (the term indicates a person of authority in Taranchi society) of Ili,[xxxviii] had sent a letter to Russia (October 4, 1866) [TsGA RK, f. 3, op. 1, d. 372, l. 8ob.]. Aristov writes that Tugalak sent the letter to Russian troops deployed in Chunji asking why they had been stationed there but was not able to get an answer [Aristov 2003a: 284].

In September 1868, the Taranchis sent word through Tezek that rumors that the Taranchis' army was going to attempt an attack on Vernyi (present day Almaty) were falsehoods, and that they desired friendly relations with Russia [Aristov 2003a: 284-85]. As to subsequent negotiations between Russia and Ili via the Kazakhs, though other substantive archival materials are believed to exist I have not yet been able to track them down.

As the next section will show, negotiations between the Taranchi regime and Russia did not go well and wound up turning into an excuse for the Russian army to invade Ili.

### 3.3. Relations between the Taranchis Regime and Russia

The *Huimin* Muslims in Ili tried to make contact with the Russian authorities but the attempt ended in failure.[xxxix] Two letters were also sent from the Sultan to Russia [Aristov 2003a: 285], but the envoy was waylaid by Kazakhs of Russian nationality. Dissatisfaction on both sides mounted thanks to unsuccessful exchanges of this sort; finally, Kaul'bars[xl] was dispatched from Vernyi to Ili near the end of 1870, but this intercession likewise failed [Moiseev 2006: 71].

An American traveler, Schuyler (1840-90), who entered Ili by way of Central Asia in 1873 wrote the following about relations between the Sultanate and Russia after the Ili Crisis:

> "[Turkestan Governor-] General Kaufmann had begun to think that the existence of this little principality could no longer be allowed; fears were expressed that it would fall into the hands of Yakub Bek of Kashgar, who was then making great progress in his war against the Dungans of Urumtsi and Turfan. It was for this reason that the Muzart Pass was occupied [by Russia] [Schuyler 1876: 186]

Schuyler saw the Russian army as having masterminded the Ili Crisis in order to curb the Ya-qub-bek regime in Kashgar. Furthermore, in addition to curbing Kashgar, there is also information to the effect Kaufman had advised the Russian government on the necessity of driving out British forces [Rostovsky 1942: 159].

However, as the text record makes clear, Kaufman's report to Minister of War Miliutin spoke of occupying to Ili in order to restore it to the Qing and as a means of *reviving slumped trade* [Voskresenskii 1995: 80; emphasis added]. Similarly, with Foreign Minister Gorchakov, Kaufman spoke of

occupying Ili to revive slumped trade (1870) [Gurevich 1982: 436]. Nonetheless, there were repeated indications that the central government was not open to Kaufman's line and that the invasion of Ili was ordered so as to create a *fait accompli*.[xli]

In fact, at a meeting held April 20, 1871, the central government of the Russian Empire decided it would no longer maintain its non-interventionist stance. Kaufman and the governors-general of Semipalatinsk and Semirech'e stubbornly insisted that neutrality in Eastern Turkestan affairs could no longer continue. This led to the convening of a special committee (*soveshchanie*) in Petersburg on April 20 chaired by Miliutin and attended by representatives of the governors-general of Turkestan and Western Siberia. It was decided at the meeting that Russia would no longer restrict itself to "non-engagement regarding various incidents that occur in neighboring countries." In fact, "due to the harm of all sorts that such events have had on our political designs and trade for seven years, our immediate intervention into matters in western China has become unavoidable."[xlii]

Looking at the impact on the Kashgar regime more closely, we see that an emissary of Borodin who was dispatched to Ili in 1870[xliii] had been in contact with an emissary Yaqub-bek dispatched to Ili, and the Russian side also knew that contact between Yaqub-bek and the Taranchis was taking on a touch of real possibility. Furthermore, Borodin's negotiations with the Sultanate at this time on trade were not meeting with any success [Gurevich 1982: 434]. This resulted in Kolpakovsky sending a report to Kaufman in May 1871 regarding interference and the threat presented by Yaqub-bek [Gurevich 1982: 439].

### 3.4. Russia's Aims and Contemporary International Relations

Previous scholars have already pointed out several factors behind Russia's occupation of Ili in examining the background to the Ili Crisis from a broad perspective. These include (1) the Anglo-Russian rivalry, (2) the Yaqub-bek regime, (3) concerns over the growth of the Muslim forces of the Taranchis, (4) border problems between Russia and the Qing, and (5) protecting trade [Liu 1981: 36-37].

Let us first consider relations between Russia and Britain (1), in between whom the Yaqub-bek regime (2) that held power in neighboring Kashgaria (western Xinjiang) after 1864[xliv] found itself sandwiched. It is well known that Russia (particularly the Governor-General of Turkestan) held negotiations with the Yaqub-bek regime, and Yaqub-bek's envoy, Shadi made his way in 1868 to Petersburg.[xlv]

Meanwhile, the British had surmised that Russia had aims to make a connection with Yaqub-bek;[xlvi] furthermore, in order to build ties in their own right with the ruler, R. Shaw visited Yaqub-bek in 1868 in the guise of a merchant while Forsyth was sent to Kashgar in 1870 and again in 1873.

The Russians, too, were unmistakably worried about the British allying with the Yaqub-bek regime, as records at the Central State Archives of Kazakhstan (TsGA RK) show. Word also reached Russia that Yaqub-bek had tried to entice the Tungans in Ili to join the British ranks.[xlvii] Yaqub-bek originally had been a soldier in the Khanate of Kokand and fought against Russia's conquering army, but later he was sent to Eastern Turkestan (Xinjiang). He took advantage of the Muslim rebellion against the Qing raging in this area to solidify his own power and with that power he was able to drive the Qing out.

Hsu (Xu Zhongyue), who analyzed the Ili Crisis and subsequent Russo-Qing negotiations, wrote the following about Yaqub-bek: "The rise of Yakub Beg posed a difficult problem for the Russian

government. Here was a man who was anti-Russian—having registered the Russian conquest of Khokand a few earlier—and who now had established himself in Sinkiang. His new Moslem state on Chinese soil might become a rallying-point for the discontented elements in the Central Asian khanates that had lately come under Russian rule. It was even possible that with British blessing his kingdom might ultimately develop into a large Central Asian Moslem empire aspiring to include Russian Turkestan. Thus considered, Yakub Beg was ***a threat to Russia***, and an instrument of Britain" (emphasis added here and below) [Hsu 1965: 29]. Kim Hodong likewise indicates Russia's concerns included the notion of the two Muslim regimes in Ili and Kashgar drawing closer and the notion of British influence extending to Jungharia [Kim 2004: 140-141].

Many researchers are thus of the view as the foregoing has shown that the Russian occupation of Ili was meant to check the expansion of Yaqub-bek's power, and furthermore to remove the British influence that lay behind it. We may conclude at the very least as Terent'ev suggests that Russia "could not permit a powerful Muslim kingdom that held the Muzart Pass[xlviii] to establish itself next to Russia or see Ili occupied by Yaqub-bek" [Terent'ev 1875: 129].

One may safely say that interpretations such as this one that are based around the Great Game between Britain and Russia are shared by many. However, this image of a rivalry between the two powers also appears to have been particularly emphasized in documents—numerous examples of which have already been presented—written after the Ili Crisis.[xlix] It is not entirely clear just how self-conscious the antipathy toward Britain, the backer of the Yaqub-bek regime, was in Russia at the time. Russia sent Kaul'bars in 1872 to conclude commercial treaty with the Kashgar regime, but Britain is thought to have also regarded this as important because through this treaty Russia recognized the independence of the Yaqub-bek regime [Rawlinson 1875: 332-333].

One must also note the fact that Soviet-era accounts naturally justified Russia's actions and celebrated resistance to British imperialism.[l] Gurevich, who has also studied the Ili Crisis from the perspective of the history of international relations, saw the occupation as an emergency and temporary development, and endeavored to present the position that Russia had worked to return the region [Gurevich 1982: 441]. As to the ambiguities in Russian perceptions of Britain and the differences of opinion between the center and the provinces (Turkestan and Semirech'e) that are the topic of this section, a close examination of the written record does seem to reveal facts at odds with the conventional narrative. However, I will limit myself as much as possible in this article to simply suggesting the possibilities and proceed with my investigations at the micro-level.[li]

Russian documents as already noted suggest that Russia embarked on its occupation of the Ili region with the goal of restoring trade. Skachkov further stresses that the new treaty of 1881 on the return of Ili made possible trading by surface routes through Xinjiang,[lii] but surely might we see this as having been Russia's main objective. That is to say, Russia had expectations about Ili's role in serving as a portal for exchanging goods with the Qing. The fact that there was activity (1872) in hopes that merchants would be dispatched to Barkol immediately after the Ili Crisis also serves as corroboration of the Russian obsession with trade in northwestern China.[liii]

Terent'ev writes, "If we [Russia] had not intervened, the luxuriant [*plodorodny*] Ili River basin and its good climate might have fallen into the hands of the Tungans or Yakub-bek," [Terent'ev 1875: 130]. This includes the possibility that Russia also had territorial ambitions. In an account similar to the reasons offered publicly at the time, Pantusov assigned responsibility to the Sultanate:

> The reasons [for the occupation of Ili] were . . . the Ili regime's intolerable acts of hostility that finally went beyond the limits of endurance, the pressure it put on our trade, and

its acceptance of plundering by its subjects in areas along our frontier [Pantusov 1881: 1].

Furthermore, while the planned return of Ili to the Qing may have provided the justification, it is not the case that Russian occupation absolutely did not imagine the possibility of the Ili region reverting Russia. This may be understood from Pantusov's introduction, where he states: "The problems of Russian rule . . . thirdly, should the Ili valley become part of the territory of the Russian Empire, how to establish equality and balance among the various peoples of the region in a way that is not without benefit to the Russian government [Pantusov 1881: 1]."

Whatever the case, tensions between the Sultanate of Ili and Russia heightened in 1871, the Taranchis attacked the Russian guard post at Boro-khotszir, and as a result hostilities commenced [Schuyler 1876: 186]. The Russian army captured the Muzart Pass and advanced into Ili. On June 22 (according the "Old Style" Julian calendar then used in Russia, hereafter O.S.), the sultan surrendered and the Ili region entered a brief period of Russian rule.[liv]

What's more, there are also indications that the Russian army was prepared to take on Urumqi as well.[lv] Gaining control of Ili and Urumqi had not been anticipated at the stage when decisions were first being made in the Russian government [Semenov 1910: XLII]. Accordingly, although invading by way two routes through West Siberia and Semirech'e had been envisioned, as Babkov (an official in West Siberia, a territory not under Turkestan's jurisdiction) notes the governors-general of Turkestan and West Siberia did not try to cooperate [Babkov 1912: 527].

Thus, shedding light from a more micro-level perspective on the process that led up to the Ili Crisis reveals that more attention must be directed to Russo-Qing trade and also the productivity of the Ili region itself as background to the crisis. In the next section, I will more sharply focus my analysis on these two points in regards to Ili's Russian period.

## 4. The Local Characteristics of Russian Rule after Establishment of the "Ili Region"

### 4.1. Prior to Russian Occupation

The plentiful water resources represented by the Ili River are what come to mind when we consider what makes the region so bountiful. This waterway is a major river that begins from its three major tributaries—the Kash, Tekes, and Kunges—and joins them mainly with water coming from the melting snows of Tian Shan, flowing eventually into Lake Balkhash.[lvi] The Ili region under Qing rule had already seen been attempts to use the river for reclamation and irrigation projects.

It is known, as Saguchi has shown, that the Taranchis population rose from 6,000 to 8,000 households in the 1830s[lvii] and new lands were opened as a consequence [Saguchi 1986: 266]. On this point, Radloff indicates that taxes for the 8,000 households from 1834 onward totaled 256,000 *cho* (*hu* (斛), more than 2,000,000 rubles).[lviii] That amounts to 128,000 *shi*, and hence the ratio of 16 *shi* per household apparently had not changed.

Regarding reclamation, Radloff first makes mention of a channel-opening project at Tokus Tara. He explained its origins based perhaps on oral accounts, and then pointed out a statement the Hakim and others made in response to an inquiry from a general: "It would be possible to get water from the Ili if a great canal were made to flow from the river in the outskirts at a place near Tokus Tara."[lix] Referring to another document, Radloff noted: "When arable land was parceled out to the new Taranchis clans, the building of a new waterway at Tokus Tara was ordered in 1834 in order to collect legal taxes from them as well. It was built in the space of two years, running south from the Ili River" [Radloff 1893: 333]. Continuing, Radloff said the Taranchis in Boroburgasun and Biläkäi

laid on a new waterway at their own expense. However, since the Tokus Tara waterway did not provide a sufficient volume of water, they were unable to collect taxes from 1,500 households for three years starting in 1836.

In another project whose relationship with the foregoing projects is unclear, water was taken from one of the Ili tributaries, the Kash River, in years 18-24 of the Daoguang era (1838-44) [Hua 1998: 174]. New lands were opened with settlements for Taranchis, including *Tashitubi* (塔什图畢, Taštubi) with 100 households, *Sandaowan* (三道湾) with 500,[lx] and *Alebusi* (阿勒卜斯) with 500 [Saguchi 1986: 264-265; Hua 1998: 177]. While the number of *mu* of land initially allotted to the 6,000 households Saguchi speaks of is not known,[lxi] 16,000 *shi* were paid annually on the 164,750 *mu* (畝) at the time it was newly reclaimed. Furthermore, 16,000 *shi* was also paid annually on 256,493 *mu* of land when Sandaowan and Alebusi were opened [*Yijiang Jizai*: 105].

Taxes were also collected from the Taranchis on these lands; based on what we can tell from a report to the Emperor titled *Yili zouzhe* (伊犁奏摺, Ili Memorial) regarding the levy of Xianfeng 6 (1856) indicating taxes "to be collected from the Muslims of Ili total 25,000 *shi* of barley, 25,000 *shi* of wheat, and 50,000 *shi* of foxtail millet . . . [and] to be collected from the Muslims in such places as the newly reclaimed land of Taštubi total 24,000 *shi* of grains," there is a good chance we can determine even more precise tax amounts from such documents.[lxii]

Thus the waters obtained from the river including through the aforementioned waterway development are connected with the rich productive capacity of the Ili region. Let us next consider the products these lands actually produced. Saguchi as we have seen has provided detailed information about the Taranchis regarding the situation through the mid-19th century. For the subsequent period this article relies on statistical materials from the Imperial Russian authorities. These documents were compiled by N. Pantusov (1849-1909) and cover three periods: the years prior to Russian occupation, 1873, and 1876-77. Pantusov was also a scholar of East Asia and is best known for having compiled documents written in Central Asian languages,[lxiii] but at the time he worked in the Ili region secretariat under the Russian government. Pantusov described the natural environment of the Ili region as follows:

> The dryness of the soil and the air throughout the valley makes the watering of farmland the indispensable condition for agriculture. That depends on irrigation, and the river that flows from the mountains provides every convenience for constructing such. In addition, there are irrigation canals. [Pantusov 1881: 14]

The need for irrigation and reclamation projects noted above may be seen here as well.

Next we look at the Ili region during the era of the sultanate (*Sultanstvo*) that directly preceded the Russian occupation. Pantusovo presents information regarding how many people made up the ruling "*beg*" class; how many people were in each settlement under the *mullah*, or Islamic leaders, and the *Zakat*[lxiv] from merchants; here, however, let us examine how much tax was collected from Kazakhs on sheep and how much grain was levied (see **Table 1**).

| | | |
|---|---|---|
| Kyzai clan | 617 head | |
| Suwan clan | 966 head | |
| Atban clan | 1,571 head | |
| Collections for prayers | 104 head | Total: 3,258 head |

**Table 1: *Zakat* on Sheep from Kazakhs, 1869-70 [Pantusov 1876a: 202]**

The statistics showing the taxes collected from the Kazakhs show that the burden they paid for domestic animals was a heavy one compared to what they had previously paid on tributary horses.[lxv]

Next, grain levy statistics for those settlements where mainly Taranchis appear to have lived are shown on **Table 2** on the following page. Locations that share the name of one-time Taranchis settlements account for most of it.

| Taranchi settlements on *Xinjiang shilue*, vol. 6 [Saguchi 1986: 262] [lxvi] (units: *hu* 戶, households) | Radloff's records [Radloff 1893: 331-332] (units: household) | Settlements of the Sultanate | Barley | Wheat | Oil (Ru. *maslo*) |
|---|---|---|---|---|---|
| 達爾達木圖: 500 (added in 1794) | Dolaty, Galdshang, Dadamty: 600 | Village (*Kent*) of Dardamtu | 263 | 610 | |
| | | *Sotnia* [lxvii] (possibly, of Dardamtu) | 220½ | 631 | |
| 霍諾海: 800 | Chonokai: 400 | Khonokhai | 964½ | 2,081½ | |
| | | *Sotnia* of Gulja | 1,000 | 1,576 | 50 |
| (founded in the *Daoguan* era) | | *Sotnia* of Toguz-tara | 501 | 1,130 | |
| 巴爾托海: 600 | Along the canal, Baitukai: 500 | Bartokai | 263½ | 271 | 42 |
| 塔什圖畢 (founded in the *Daoguan* time: 100) | | Tash-tiube | 267 | 326½ | 106½ |
| 塔什鄂斯坦: 400 | | Tash-usten' | 335 | 434½ | 119½ |
| 哈什: 500 | On the other bank of Kasch River: 500 | Kash | 332 | 412 | 138 |
| 阿勒卜斯 (founded in the *Daoguan* era: 500) | | Araboz | 445 | 776 | |
| 博羅布爾噶蘇: 1100 | Boroburgasun, Biläkäi, Tschulburkai: 500 | Borbogusun | 507 | 801½ | 293½ |
| 呢勒哈 (founded in Jiaqing 9 (1804)) | Riverbank of Nilka: 400 | Nilkhi | 129 | 198 | 34 |
| 鄂羅斯坦: 600 | Along the canal, Ari Östäng: 600 | Arustan | 206 | 447 | 96 |
| 海弩克: 600 | Kainak: 200 | Koinak | 370 | 593 | 157 |
| 三道湾 (founded in the *Daoguan* era: 500) | | | | | |
| | On the right bank of Ili River Olatai: 600 | | | | |
| 済爾噶朗: 900 | Jirgalang 1000 戶 | | | | |
| On the left bank of Ili River, Tarksyl: 100, Koguschi: 200, Jagystai; 200, Bugra: 200 | | | | | |
| | | Total | 5,776½ | 10,288 | 1,036½ |
| Collected in 1870 from the harvest of grain or collected for state-owned land use [Pantusov1876a: 203] | | | 6,069½ *Tagara* | 10,081 *Tagara* | |

**Table 2: Levies of Wheat and Oil by the Sultanate of Ili (1869-70)**[lxviii]

Under the old system, the rule was to collect four *shi* of each type of grain from each household for a total of 16 *shi*; the amount of taxes actually collected also corresponded to this [Hua 1998: 177]. Fedorov writes that of those Taranchis who migrated to Ili during the Qing era, 100 families (*Sotnia* in Russian or *Yuz* in Turkic) were given 1,000 to 2,000 *kho* of land[lxix] while one household in keeping with the quality of the land was given from 15 to 30 *kho* (60 to 120 *mu*) from the *Yuz beg* ("100-household chief"); as compensation, the Qing government was paid 30 *kho* [lxx] of grain (one

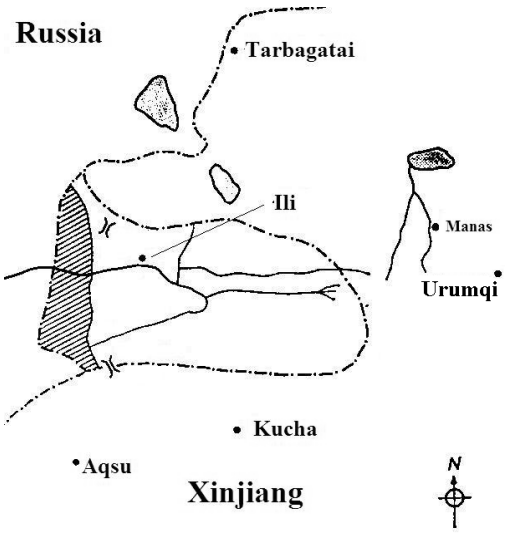
*kho* = three *pood*, 30 *funt* [61.425 kg]) [Fedorov 1903: 34-35] for each household. Two types of *kho* appear here. The *kho* that expresses a unit of area is approximately the same size as the *khu* Kaul'bars mentions: "One *khu* is one lot (*uchastok*), and it is possible to grow three *pood* of seeds there. Two *khu* corresponds to one *chetvert*"[lxxi] [Kaul'bars 1874: 147]. Originally, *kho* was a unit of mass that meant "measuring container," but as the above examples show it also indicated the area of land needed to sow the same amount of grain, and furthermore may also have expressed weight.

Elsewhere, Pantusov discusses the *kho* of the period in the following manner: "The *kho* of the Taranchis equals 100 Chinese *dzhin*; 1 *dzhin* is equal to 1½ Russian *funt*.[lxxii] The *kho* of the Sibe was around 65 to 70 Chinese *dzhin*" [Pantusov 1881: 14, footnote]. There is also data to the effect that each household of Taranchis of Ili made offerings of 16 *tagar* (bags)[lxxiii] of barley, wheat, common millet, and foxtail millet [Saguchi 1986: 278]. If the *kho* used to show units of barley and wheat on Table 2 is the same size as the *kho* of the Taranchis noted above, then the 5,776.5 bags of barley and 10,288 bags of wheat would amount to 346,590 kg and 617,280 kg, respectively. While a simple comparison in terms of weight cannot be done, we can see that the amount of taxes collected had fallen if we compare this to the 128,000 *shi* in taxes paid under the old system.[lxxiv] It is hard to imagine that agriculture in this region, which is thought to have been left in considerable ruin in the wake of the Muslim uprising, would have recovered in 1869-70. Pantusov also points out that little work had been done to tend to and harvest the crops in this district in 1871. People had few opportunities to take up farm work that year as their time was being consumed with being recruited into the sultan's army for military service in the fight with Russia [Pantusov 1881: 13]. Consequently, agricultural recovery in fact must be seen as something that took place at a later date.

### 4.2. The Period of Russian Rule

Following its occupation, Russia established a special secretariat that was to carry out the Semirech'e military governor's orders in the Ili region. The region was divided into several districts. There were four districts at first, but District 3 was done away with in 1874 and its land consolidated with District 1. In 1876, District 4 was abolished, resulting in 2 districts north and south of each other [Pantusov 1881: 2].[lxxv]

Turning to the Qing's views of Ili during the Russian era, we find first a memorial to the emperor in *Chouban yiwu shimo* (籌辦夷務始末) observing that it had been split into four areas: Ghulja (固爾扎城), Boroburgasun (博羅布爾噶蘇), Kainak (海努克), and Suiding (綏定城).[lxxvi] However, we should note that we cannot learn about such factors as social structure, production, and the like from the Qing archival materials that have come to light so far. Also, the territory that Russia occupied, including those places that until then had been considered Qing territory—specifically, those areas ceded to Russia under the Treaty of Saint Petersburg such as Dzharkent, the zone with hatched lines on **Map 3** between Boro-khotszir and Khorgos—does not completely correspond with the "Ili district" in today's




**Map 3: Occupation of "Ili district" by Russia (Source: Hsu [1965: 186])**

China. The situation after the area was finally split into two districts north and south of each other was as follows.

First, based on statistics from 1876 the population included 51,819 Taranchis; 33,828 Kazakhs; 18,318 Sibe; 4,031 Tungans; 2,847 Han Chinese; 15,940 Oyirads (*Kalmyk*), and Torghuts; and 767 Solon; the totals were 82,142 settled people and 49,786 nomads [Pantusov 1881: 9]. Compare this to figures from an earlier point in time: "[T]he Manchurian and Mongol garrison force at *Huiyuan* City totals 4,368 households with 18,369 people. The Manchurian and Mongol force at *Yining* City totals 2,216 households with 8,723 people. The Sibe force number 1,018 households and 4,439 people. Solon forces number 1,018 households and 3,268 people. The Chahar Mongol garrison numbers 1,836 households and 5,548 people. The Oyirad force number roughly 3,516 households and 10,737 people. *Huizi* [Taranchis] number 6,406 households and 20,556 people." Provided we exclude those Manchurian and Mongol force, Solons, Chahar Mongols, and Oyirads who had fled due to the Muslim Rebellion, the figures show the population was growing.[lxxvii]

From the taxation units recorded for each separate population group (1876) we can work out how much each settlement had developed [Pantusov 1881: 142-144].

| | | |
|---|---|---|
| **North District** | Taranchis | Ghulja City (1,367 households); Mazar Village (52 households); outskirts (10 *sotnia*); Tokuz-Tara (10 *sotnia*; Araboz (6 *sotnia*); Borobogosun (5 *sotnia*); Bartokhai (8 *sotnia*); Tashustan (7 *sotnia*); Arustan (10 *sotnia*); Kash township (553 households); Mazar Nilki township (421 households) |
| | Kazakhs | Suvan clan (*volost'*, 1,903 households); Baidzhigit clan (1,213 households); Kyzai clan (1,598 households) |
| | Central Asian merchants | 649 households (residing in Ghulja) |
| | Tungans | Suidun and Chinchakhodzi (1,151 households); Ghulja City (159 households) |
| | Han Chinese | Luutsugun City (327 households); Chimpandzi City (111 households); Ghulja City (628 households) |
| | Solon | Akkent and Dzharkent villages (147 households) |
| | Kalmyks | (Orirad) Arbun-Sumun (1,429 households) |
| **Total** | | 17,826 households |
| | | |
| **South District** | Taranchis | Kainak township (1,170 households); Khanakhai township (1,197 households); Ketmen township (number of households unclear) |
| | Kazakhs | Konurburak township (867 households); Segizsar township (980 households); Aitbozum township (947 households) |
| | Torghuts | (those under the jurisdiction of *gong*) 1,645 households |
| | Kalmyks | Diurbun-Sumun (600 households); Zorgan-Sumun (78 households) |
| | Sibe | 8 niru [lxxviii] (2,449 households) |
| **Total** | | 9,933 households |

These materials make it possible to draw comparisons with the original Taranchi settlements.

The original total for the two districts of 27,759 households had risen by 1877 to 29,794.

The 1877 population figures for the North District may be broken down for each settlement as follows [Pantusov 1881: 152].

| | |
|---|---|
| *Ghulja City | Russians: 55 households; merchants: 675 households; Han Chinese: 608 households; Tungans: 160 households; Taranchis: 1,312 households<br>Total population: 9,413 |
| *Ghulja township (*volost'*) | 4 *kent* [lxxix], 436 households |
| * *Yuz* township in the outskirts (*podgorodnykh soten*) | 10 *kent*, 1,941households |
| *Tashustan township | 7 *kent*, 668 households |
| *Bartukhai township | 8 *kent*, 736 households |
| *Borobogosun township | 6 *kent*, 552 households |
| *Arustan township | 10 *kent*, 1,309 households |
| *Kash township | 5 *kent*, 554 households |
| *Arboz township | 6 *kent*, 462 households |
| *Mazar-Nilki | 5 *kent*, 424 households |
| *Tuguztara | 10 *kent*, 728 households |
| *Suidun township, where mainly Han Chinese dwelled | Suidun City, Chimpandzi City, Tardzhi Village, Luutsugun City, Chimpandzi Village, Mazar Village Total: 1,727 households |
| *Solons | 3 villages, 147 households |

In sum, the district's populace included 46,604 settled people (24,948 men, 21,656 women) in 12,494 households. Locations where nomads resided in the North District included Suvan *volost'* with 2,162 households, Kyzai *volost'* with 1,610, Baizdhi[gi]t *volost'* with 1,409, Arbun-sumun (Oyirad) with 1,430, and Chakar Kalmyks (Chahar) with 300 [Pantusov 1881: 149]. Taranchi accounted for 38,729 people among the 12,500 households of the North District in 1877.

Settled residents in the South District at this time lived in the townships of Kainak, Khanokhai, and Ketmen, as well as Sibe in 8 *niru* (2,428 households); the totals stood at 5,311 households and 31,864 people, with Taranchi accounting for 2,784 households and 13,543 people. Nomads were to be found in Aitbozum township in 1,089 households, Konurburk township in 925 households, Segizsar township in 1,038 households, Diurbun-Sumun in 622 households (with grazing land in Tokuz tara), and Torghut (6 *aul*[lxxx]) in 1,725 households for a total of 5,399 households and 24,857 people [Pantusov 1881: 148-149]. Settlements of nomads in the South District in 1877 aside from those noted above included those in Kainak township (9 aul, 1,168 households), Khanokhai township (12 aul, 1,197 households), and Oyirads living in Zurgan-sumun (78 households) [Pantusov 1881: 156].

If we consider trends in the Taranchi population as one example, then it is clear that the figure had doubled from the earlier noted 6,406 households and 20,556 people to the 1877 numbers showing 11,906 households and 52,272 people.

Next is productive capacity. **Table 3** (see below) shows the quantities of seeds sown and harvest volumes for three districts in the Ili region in 1873.

Since the size of only those areas being farmed by the Taranchis cannot be established, our in-

formation covers the whole of the Ili region. The approximate harvest to seed ratio for common millet stood at 45:1 in No. 1 District, 30:1 in No. 2 District, and 39:1 in No. 3 District for the Taranchis. With respect to spring wheat the respective figures were 17:1, 30:1, and 16:1, and for barley 14:1, 30:1, and 16:1. Of the main four grains, it was Han Chinese and Tungans[lxxxi] who did most of the rice cultivation (because it was basically farmed in Ghulja City and Suiding township, where those groups lived) [Pantusov 1881: 147].

| | | Winter wheat | Millet | Spring wheat | Barley | Rice | Others | Potatoes |
|---|---|---|---|---|---|---|---|---|
| No. 1 District | (seeding) | | 241 | 5,079 | 2,984 | 1,175 | 1,185 | 25 |
| | (harvest) | | 10,845 | 86,343 | 41,776 | 23,500 | 14,220 | 250 |
| No. 2 District | | | 620 | 9,341 | 6,062 | 47 | 482 | |
| | | | 18,600 | 280,230 | 18,1860 | 2,350 | 3,589 | |
| No.3 District (top numbers indicate seed volume, bottom number indicate harvest volume) | Sibe | 58 | 71 | 3,995 | 42 | 716 | 1,781 | |
| | | No reference | 341 | 37,304 | 296 | 10,877 | 30,898 | |
| | Taranchi | 71 | 24 | 2,892 | 1,275 | | 226 | |
| | | No reference | 948 | 46,024 | 20,466 | | 5,365 | |
| | Kazakh | | 130 | 416 | | | | |
| | | | 3,919 | 5,848 | | | | |
| | Oyirad | | 87 | 483 | 50 | | 72 | |
| | | | 2,120 | 5,716 | 528 | | 1,350 | |

**Table 3: Statistics from 1873 [Pantusov 1876b: 166-167]**[lxxxii]

Pantusov wrote the following regarding production in the Ili region (North District).

> Agriculture developed after [the occupation of Ili in 1871]. According to data from 1876, 110 *chetvert'* [hereafter *ch.*] of winter wheat, 68,666 *ch.* of spring grains (mainly wheat, followed by barley, rice, and finally common millet) and 256 *ch.* of potatoes were planted, resulting in a harvest of 1,034,873 *ch.* of spring grains, 864 *ch.* of winter wheat, and 2,478 *ch.* of potatoes. The harvest ratio for spring grains stood at 15-fold, for the winter grains 8-fold, and for potatoes 9-fold; this works out to 7 or 8 *ch.* of cereal grass per person [Pantusov 1881: 13-14].

Looking for example at the five "one-hundred households" in the North District, township of Kash, we see the Taranchis in 554 households with 2,290 people planted 13,560 *pood* (Ru. *pud*, 1 *pood* = 16.38 kg) of wheat, 4,452 *pood* of barley, and 360 *pood* of common millet, resulting in harvests from each respective grain of 871,300 *pood*, 45,500 *pood*, and 10,860 *pood*. The harvest volumes clearly stood at 64:1, 10:1, and 30:1, respectively, considerably raising the average amount [Pantusov 1881: 147].

Next I present details from the statistical materials of 1876 that Pantusov summarized. Kaul'bars took special note of the rich natural environment of the Ili valley and referred to the higher productivity of the northern areas [Kaul'bars 1874: 133], which is consistent with the conditions reported on **Tables 4 and 5**. However, there appears to have been frost damage in 1876: "In the South district, 561 *kho* of wheat planted by the Sibe and 731 *kho* by the Taranchis was completely destroyed by hail, preventing a larger harvest. For the Taranchis, the same situation also prevailed for 200 *kho* of barley plantings" [Pantusov 1881: 14, footnote]. The harvest ratio for 1877 in the South District improved for this reason.

| | Winter wheat | Millet | Spring wheat | Oak | Barley | Rice | Other Spring grain | Potatoes |
|---|---|---|---|---|---|---|---|---|
| North District seeding | 110 | 2,871 | 25,180 | 80 | 7,850 | 1,968 | 2,866 | 256 |
| harvest | 864 | 100,842 | 455,418 | 742 | 118,112 | 37,158 | 40,075 | 2,478 |
| South District seeding | | 812⅛ | 19,407 | | 1,768½ | 1,581 | 4,282½ | |
| harvest | | 18,264 | 161,390½ | | 29,503 | 13,541 | 59,828 | |

**Table 4: Agricultural Production in 1876 [Pantusov 1881: 122-123] (units = *chetvert'*)**

| | Winter wheat | Millet | Spring wheat | Oak | Barley | Rice | Other Spring grain | Potatoes |
|---|---|---|---|---|---|---|---|---|
| North District seeding | | 2,821½ | 18,781 | 150 | 5,940 | 1,842½ | 3,126 | 328 |
| harvest | | 118,522 | 484,387½ | 2280 | 77,676½ | 36,878 | 40,638 | 3,280 |
| South District seeding | | 830 | 20,100 | | 2,870 | 1,582 | 4,283 | |
| harvest | | 38,700 | 241,200 | | 34,440 | 15,820 | 55,689 | |

**Table 5 : Agricultural Production in 1877 [Pantusov 1881: 180-183] (units = *chetvert'*)**

The data needed to investigate the original productivity of the land regarding the area under cultivation and agricultural technology (farming implements and methods) used at that time could not be obtained. Also, it is difficult to make the most of the statistical materials introduced here. Consequently, our focus in this article is on presenting a broad outline of the production situation in the Ili region.[lxxxiii]

The following data have been obtained with reference to livestock farming. The statistics for 1876 show that livestock owned in both the north and south districts plus Ghulja all told included 78,357 horses, 60,217 domesticated horned animals, 543,954 sheep, and 53,968 goats, adding up to 748,254 animals [Pantusov 1881: 121]. Cows and sheep were exported to Russia in later years [Hino 1973 v. 2: 138]. Modern statistics for the whole of the Ili Kazakh Autonomous Prefecture show there were 3.06 million head of livestock in 1949 and 12.31 million in 1998, with wool sheep accounting for 70 percent of the total [*Zizhizhou zhi*: 443-444].

The Russian authorities imposed a poll tax (*podat'*) of 3 rubles on each household on this agriculture and livestock, collecting 70,000 to 80,000 rubles every year. A local tax (*zemskii sbor*) was introduced separately starting in 1874 [Pantusov 1881: 35]. This was for the troops who were stationed in the Ili region; the amount was about 20 percent that of the poll tax.[lxxxiv] To judge how much of a burden these taxes were, note first the nine townships in the Northern District where the Taranchis lived in 1877 had 7,345 households with 30,774 people. That year, they planted 108,384 *pood* of wheat with a crop of 3,410,140 *pood* (30-fold); 34,015 *pood* of barley yielded a harvest of 452,473 *pood* (13-fold); and 8,688 *pood* of common millet produced a crop of 358,466 *pood* (41-fold). Dividing the total harvest volume of 4,221,079 *pood* by the number of households, the ratio works out to 574 *pood* (9,402 kg) of grain per household [Pantusov 1881: 147]. Estimating from contemporary price lists for grain,[lxxxv] it seems safe to say that the tax burden had declined substantially since the 3.6 ruble burden on each 1 household corresponded to no more than 3 *chetvert'* or around 6 *shi* and furthermore the harvest volumes themselves had also risen.

Turning to trade, a particular obsession of Russia in its relations with Xinjiang, the total value of imports to Ili in 1873 stood at 210,819 rubles, with fabrics (*Daba*) in particular accounting for around half. Inferring from 1875 statistics, much of this was Kashgar-made Muslim cloth (*huibu*), and they show that as had been the case prior to the Muslim Rebellion it was necessary to redirect it in order to satisfy demand in Ili and surrounding areas. Exports for 1873 totaled 240,655 rubles. The items that accounted for particularly large transaction volumes included cotton goods (*Bumazhnye tovary*), cotton goods from the area, grains, wheat and other agricultural products, silver ingots (*yuanbao*), and livestock [Pantusov 1876b: 168-171].

Trade data for 1875 shows imports totaled 440,207 rubles, for a transaction volume roughly double that of 1873 [Pantusov 1881: 93]. Information regarding which goods were obtained from which city is recorded in the statistics for this year. Special note should be made of the data on textile goods, which show that the amount coming from Irbit, one of Russia's three great seasonal markets, had risen to 61,100 rubles. This shows that the Ili region had, in short, become a market for goods from domestic Russian factories. As noted earlier, cotton fabrics from Kashgar accounted for most of that type of good. The total value of exports for this year was 240,167 rubles. A unique feature here is the fact that many items were diverted for consumption in both districts of the Ili region [Pantusov 1881: 96-97]. The total value of imports for 1876 amounted to 389,740 rubles and exports stood at 208,033 rubles.

Given Russia's aims regarding trade, Russia's interest in goods produced in Ili itself should also be given considerations. There are indications that fruits were the main products exported to Russia.[lxxxvi] We can infer from the statistics that Ili instead played the role of a midway point through which imports from Russia traveled on their way to Jinghe and Tarbagatai.

Finally, I want to look at how residents of Ili at the time saw Russia's occupation of the region. Documents such as a memorandum by a Han Chinese named Liu-Tsun'-khan' who wrote "this incident [the Ili Crisis] was welcomed with joy by all the Han who remained alive" [Grum-Grzhimailo 1896: 15] and the recollections of certain Sibe [Diiakov 1908] suggest that there were many who welcomed Russia's occupation. However, accounts of this sort are seen consistently in the Russian literature; more detailed investigation is required. There is also a study on this period that shows local residents wanted Russian control and, according to a report from Aristov, the Taranchis and Tungans were also satisfied with it [Gurevich 1982: 443].[lxxxvii] Li Sheng's summation, however, leaves us with the impression that the Russia's rule of Ili overemphasized interventions by Russia into local society [Li 1995: 51-56]. Careful investigation is required. [lxxxviii] It is certainly the case

that during the Russian era a judicial system was developed and work on developing the infrastructure in Ghulja City took place [Fedorov 1903: 56-58]; this is thought to be the product of Kolpakovsky's experiences in Semirech'e.

As the foregoing illustrates, it is possible to learn about the development of the Ili region at a micro-level during the occupation period from the data collected by Russia.[lxxxix] Supplementing Fedorov's survey and the work of Li Sheng with Pantusov's statistical materials can help us to see the socio-economic situation from all angles. This also gives us the prospect of drawing comparisons with the preceding and subsequent periods while conducting more detailed research including on taxation amounts particularly with respect to the agricultural economy—the product of using the waters from the Ili and its tributaries—in which the Taranchis were involved. **Map 1** presented above may serve as a reference regarding the scope of land used by each people, including that used for roaming and pasturage. The *Yili Hasake Zizhizhou zhi* (2004) is available for drawing comparisons with conditions after Xinjiang Province was established and with the Yining of today.

## 5. Matters Learned from Subsequent Russo-Qing Negotiations

### 5.1. Negotiations with the Qing Dynasty

Russia's rule produced a certain degree of stability in this region as has been seen, but to the Qing the actions of the Russian army meant that their territory was being threatened. Relations between the two powers became tense.

First, the West Siberia Governor-General sent a telegram to Russian Ambassador Vlangali in Beijing notifying him that Ili had been occupied on *Tongzhi* 10.5.17 (O.S. June 22, 1871; Gregorian July 4). He also signaled the Russian government's aims to Office for the management of affairs with all foreign countries (*Zongli Geguo Shiwu Yamen*, abbreviated to *Zongli Yamen*), which at the time dealt with Qing foreign relations. The contents of his message were fetched to the Zongli Yamen on 7.13 (O.S. August 16).[xc] The Russian march was expressed as "Ili has been recovered" in a formal report to the emperor regarding Russia's move. The communication from Russia was likewise construed as saying: "Taking seriously the long years of friendliness with your country, our troops were dispatched and they have recovered Ili on behalf of the Qing" [*Chouban yiwu shimo*: vol. 82, 9]. In short, as far as the Russian government was concerned, its position was that on behalf of the Qing it had brought under control a Ili region that was in chaos. A directive dated July 30, 1871 (O.S.) that Gorchakov, who held the post of both prime minister and foreign minister, had already sent to Vlangali likewise illustrates the view that Imperial Russia had no intentions of incorporating Ili in its territory and that instead receiving privileges for Russian trade was more important.[xci]

The Qing Emperor issued a court letter or secret edict (*Jixin shangyu* 寄信上諭) on 7.25 (O.S. August 28) regarding Russia's occupation of Ili. The report to the emperor (dated 8.8) that Zuo Zongtang sent in response said, "That Ili has been recovered is, all things considered, a matter of taking advantage of a particular moment under conditions in which only the fit survive," bluntly displaying his wariness of Russia [HYD Tongzhi 10.early Aug.: 085-086]. The first report from the scene in Xinjiang was a report of Wenshuo (文碩), the vice-minister of Kobdo, saying "Russia has recovered Ili."[xcii] A similar understanding obtains in an imperial secret edict dated the same day that this report to the emperor was received, which uses the expression: "Ili was recovered on our behalf" [*Chouban yiwu shimo*: vol. 83, 18]. On the other hand, one also notes the fact that the Qing had planned to draw reinforcements from the northeast in order to recover Ili [HYD Tongzhi 10. late

Sept. (1871): 021].

The first report to Britain regarding the Ili Crisis was that from British Ambassador to Russia, Buchanan in St. Petersburg (August 23) [Hsu 1965: 32]. His following report said that the Qing government was dissatisfied with a proposal from Russia to cooperate on restoring civil order in the region after Ili had been occupied.[xciii] Also, a copy of the *Saint Petersburg Journal* dated August 24 (O.S.) was appended to a separate report to illustrate that the details of the Ili Crisis were already widely known throughout Russia.[xciv] Thus, we see that Britain collected information through diplomatic channels, but a detailed examination of FO records remains necessary in this regard.

As for the Qing, a local government official (*zhangjing* 章京) was dispatched to Verniy,[xcv] after which then Ili Military Governor Rongquan (榮全) was sent to Russia to handle negotiations. Rongquan made for Sergiopol (today Ayagoz) by way of Tarbagatai.[xcvi] There had already been words in the imperial edict to the effect that "The Russians have taken possession of Ili, and Tungans, Taranchis, and Torghuts are trapped"; the unjustness of Russia's occupation had become evident. [xcvii]

The negotiations in Sergiopol' between Rongquan and Russia's plenipotentiary finally took place on *Tongzhi* 11.4.13 (O.S. May 7, 1872). The person dispatched from the Russian side to represent the Foreign Ministry was Boguslavsky.

Russia's policy included five points: (1) explain the situation in the Ili region to Rongquan and expound on the point that the objective of occupying the Ili region was to preserve it for the Qing; (2) communicate to him that the Ili region can first be returned when Qing forces arrive; (3) find out from him what sort of policy the Qing government has in mind for governing the Ili region; (4) make no mention of indemnities for the cost of dispatching troops; and (5) do not touch on the issue of demarcating borders with the Qing that are too Russia's advantage [Terent'ev 1875: 132-133]. In his later work, *A History of the Conquest of Central Asia*, Terent'ev would append to item (4) a note that read "Instead of seeking indemnities, spell out more generous terms for free trade," a deeply interesting passage from the perspective of sorting out Russia's aims [Terent'ev 1906: 56]. In fact, the summary of Boguslavsky's statement that Rongquan memorialized to his government contains the passage, "Russian merchants wish to go to and trade in Kobdo, *Buluntuohai* (布倫托海), Hami, Barkol, and Kashgar, among other places throughout Xinjiang," demonstrating that the Russian side had made a request regarding trade.[xcviii]

According to Voskresensky, who has analyzed this meeting using both Russian documents and the Qing's "*Chouban yiwu shimo*", Boguslavsky explained that Russia had occupied Ili to protect its borders and secure an advantage for the Qing in an area where they had been losing sovereignty. He also told them the Ili region could not be returned until the Qing had assembled enough forces to maintain order and promised not to charge those individuals involved in the Muslim Rebellion.[xcix] The justification for this lay in the impressions Boguslavsky had obtained on site. In his report to the *Kantsler* (chancellor), the war minister, and Turkestan Governor-General Kaufman, he expressed the view that "the Tungans and Taranchis have a fierce hatred toward the Manchurians' government, and we cannot speak of returning Ili so long as that does not go away."[c]

Consequently, the meeting ended without an agreement being reached on Ili's reversion; the stage for continuing negotiations then shifted to Beijing [Gurevich 1982: 445]. As to the reversion of people living the Ili region to Russian jurisdiction, there was a report that: "There is a passage among the correspondence from [the Semirech'e governor] in Almaty that reads, 'Last year Russia sent in troops and recovered Ili. All of the Taranchis have already renewed their allegiance, and the Torghut nomads attached to Ili are also doing the same." The Qing appeared to have rushed to re-

cover the Ili region.[ci] Furthermore, this report to the emperor also demonstrates that the Russians were trying to resolve matters in the negotiations in Beijing, too, by treating Ili's reversion and trade negotiations as a single package.

### 5.2. The Ili Region Afterward

There was activity from Zuo Zongtang as well; he brought down the regime of Yaqub-bek and the Qing restored their power in Xinjiang. Negotiations subsequently took place between Russia and the Qing. The Treaty of Livadia (1879), which was crafted with terms extremely disadvantageous to the Qing side, was not ratified. This was replaced by the Treaty of Saint Petersburg (1881), and in this the Ili region—though without the lands west of Khorgos[cii]—was returned to the Qing. The Ili Military Governor entered Suiding City and Russia's occupation army in all probability pulled out after 1882.

Articles in *TS* can tell us more about the debate in Russia over whether or not the Ili region should be returned. For example, an article titled, "Should Ili [*Kul'dzha*] Be Returned to China?" (1878), while reviewing on the pages of a Russian periodical the pros and cons[ciii] of returning the Ili region also looks at the benefits should it be joined with Russia and conditions in case it was to be returned.[civ] Numerous other studies were written around that time and may be of value for reinvestigating the Russian Empire's Central Asia policies.

## Closing Remarks

While we confined ourselves in this article to raising various questions and problems regarding the process that led up to the Ili Crisis that was examined in the first part, I expect that it will be possible to sort through the points of debate in future studies. In particular, one gets the strong impression that after Ili had been occupied too much emphasis was placed on the Great Game between Britain and Russia in the literature written from the late 19th century through the first half of the 20th. However, this article represents a first attempt to work toward a different angle of analysis, in short, to investigate it from a more local perspective.

Russia, the occupier of Ili, wound up ruling the region for 10 years. One of its objectives certainly came from the fact that it had trade with the Qing that went through Ili. Russia sought to stabilize the region as a relay point for goods, bringing about improvements in productivity for local society and a degree of calm as a result. After the Treaty of Saint Petersburg[cv] was concluded, Russo-Qing trade flourished still more.[cvi]

Furthermore, one important development that occurred after Ili's reversion was the movement of the Taranchis trying to escape Qing territory by heading toward the Russian lands [Rumiantsev 2000: 224]. Two years after the treaty was concluded, the Russian Empire had laid-down a policy of non-interference with regards to movement from Qing to Russian territory [Fedorov 1903: 67-68]. The population of Taranchis in Ili declined as a consequence; this is believed to have affected the region's productive capacity as well, but this is another issue I would like to address in near future. It also goes without saying that movements of this sort were linked to the creation of new ethnicities in the Russian Empire such as the Taranchis (and later the Uyghur) and the Tungans.[cvii]

The *Xinjiang Shengchan Jianshe Bingtuan* (Xinjiang Production and Construction Corps) who entered Xinjiang after the People's Republic of China was created were truly a modern-day colonial militia; comparing their efforts with the means by which colonization took place in the Qing period

and sorting out their place in history will also be needed. I hope to address these issues, too, in the future while making use of the materials, especially those found in the archival documents of TsGA RK.

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**NOTES**

[i] Hino was a major in the Army General Staff Office at the time of his visit to Xinjiang. There are indications that he was influenced by the observations of HAYASHIIDE Kenjirō and HATANO Yōsaku, who visited to Ili before he did [Fujita 2000: 89]; I hope compare his work with the

records they left behind at some future date.

[ii] Considerable research has been done already regarding treaty negotiations over reversion of the Ili region as well as regarding CENG Jize, who played an important role at the time for the Qing.

[iii] Regarding agricultural development in Xinjiang, including Ili, during the Qing period, please see [Wang 1990] and [Hua 1998]. However, note should be made of the fact that they make little mention of the period of Russian rule.

[iv] For an overview of the TS, please see [Obiya 2008].

[v] The total area of the Ili district today measures 56,339 km$^2$. The "Ili region" during the era of Russian rule covered 1,302 square Russian miles (71,317 km$^2$) [Fedorov 1903: 67].

[vi] The people originally from Ili and those who fled from the Kazakhs and the Kirghiz constituted the right column, while the people from Rehe comprised the left [*Zongtong Yili Shixuan*: 203-204].

[vii] There were military colonies (*Bingtun* 兵屯), who were made up of Green Standard soldiers, and civilian colonies (*hutun*), which included the *hutun* discussed below as well as merchants [*Yijiang Jizai*: 104-105].

[viii] My description is based on the maps produced by Lt. Col. Fedorov, who in 1902 was attached to the General Staff of the Russian Army's Governor-Generalship of Turkistan [Fedorov 1903: maps appendix].

[ix] Radloff reports that they referred to themselves as *Järlik* ("local people," *Einheimische*) [Radloff 1893: 331]. Radloff, a Russian linguist, went to Ili via West Siberia to carry out research from 1862-63. Dates from Russian-language archival materials hereafter will be rendered as written in accordance with the Old-Style (hereafter, O.S.) Julian calendar then used in Russia. Add 12 days to 19th century dates and 13 to 20th century dates to find the date in the New-Style (N.S.) Gregorian calendar.

[x] [Wang 1990: 209]. For details regarding the number of Taranchis who were moved, see [Wu 1993].

[xi] [Saguchi 1986: 273, 284]. [Wang 1990: 226] obtains the same figure, though by means of a different calculation method. Note: 1*shi* (=10*dou*) is approximately 100 liters. Analyses of the perceptions the Taranchis themselves had regarding Qing rule include that of [Hamada 1983: 391-397].

[xii] [Saguchi 1986: 275]. Saguchi relies for the most part on [Radloff 1886], but a similar account also appears in [Radloff 1893: 331].

[xiii] There are reports from the Russian period on the existence of *waqf* lands in Ili [Kaul'bars 1874: 147] and the number of mullahs in each Taranchis settlement [Pantusov 1876a: 198].

[xiv] The seven cities in Ili were Suiding, Xichun (Chengpanzi), Huining (Bayantai), Taleqi, Zhande (Qingshuihe), Guangren (Lucaogou), and Gongchen (Huerguosi). (Traditional place names are presented in parentheses.) See also [Guan 2000: 112].

[xv] For details of Russo-Qing trade relations, see Noda 2009.

[xvi] Dated September 20, 1860, and addressed to caravan leader Dzhienbai of the Adban clan (*volost'*) [TsGA RK: f. 3, op. 1, d. 372, l. 14].

[xvii] On the 16th day of the 7th month, *The Memorials of Yingxiu and others* [*Qingdai zhong'e*: 169-170]. See also [Nomiyama 1977: 227].

[xviii] "Russo-Qing trade with Xinjiang by way of East Kazakhstan had clearly declined in connection with the uprising," to quote Kasymbaev [Kasymbaev 1996: 87].

[xix] Regarding the disappearance in caravan traffic after 1865, see [Kaul'bars 1876: 142].

[xx] See [Rumianstev 2000: 111] and [Fedorov 1903: 221] regarding the characteristics of and navigation on the Ili River. Ferry traffic on the Ili River following the Qing suppression is said to have been seen starting in the third month and ending in the ninth [*Yijiang Huilan*: 75]. [Qi 1998] presents a history of transportation on the Ili River from the Qing period to the 1960s.

[xxi] The *Ili memorials (Yili zouzhe)* includes documents dated Xianfeng 7, intercalary 5.6 (June 15, 1857 O.S., June 27 N.S.) sent from the Russian consul in Ili to the Office of the Military Governor of Ili [Nomiyama 1977: 208]. The Russian consul is shown in them to regard areas east of Turgen village (recorded as "*Selenie*" in Russian translation) as Qing territory.

[xxii] Dated Xianfeng 7.6.18 (1857) [RGVIA: f. 1449 (Independent Siberian Corps, 1825-64), d. 63, ll. 82-83 ob.] (A copy may also be found in the *Ili zouzhe* [Nomiyama 1977: 215-216]). The Lifan Yuan (Court of Colonial Affairs) sent its note of rejection to the Russian Senate on Xianfeng 7.7.25 (O.S. September 1, 1857) [*Qingdai zhong'e*: 367-368]

[xxiii] Kuznetsov, a merchant from the Omsk No. 2 guild, claimed in his request (March 1856) that sailing a steamship to Lake Balkhash and the Ili River would be benefit Russian trade [GAOmO, f. 3, op. 3, d. 3485, l. 47].

[xxiv] [Fisher 1872] is the record of that expedition.

[xxv] [Hino 1973 vol. 2: 28-29]. Information regarding the water's depth appears to be based on the account of NISHI Tokujirō, believed to be the first Japanese to visit Ili (*Chūōajia kiji* [Travels in Central Asia], vol. 1, 1886, p. 63).

[xxvi] Russian language archival materials use the spelling "Dungan."

[xxvii] [Wu 1991] and [Kim 2004] are particularly important. The revolt and the issue of the Kashgar regime (that is to say, that of Yaqub-bek) that followed caught the attention of the European and American publics, and these matters have been discussed in countless works. Among the more important of the earliest literature are [Terent'ev 1875], [Schuyler 1877], and [Boulger 1878]. These were followed by works whose arguments hinged on the Anglo-Russian conflict, including [Frechtling 1939] and Lattimore [1951]. From China there are [Wu 1991] and [Li 1995]. [Kim 2004] presents research that adopts a stance closer to that of the local society, while [Gurevich 1982] and [Moiseev 2003] are notable for coming from the context of Russo-Qing relations.

[xxviii] [Hino 1973 vol. 1: 180] writes, "At the time of the Tongzhi Hui uprising, Manchurians and Solons fought with all their might and for the most part died in battle, while Sibe colluded with the Muslim rebels and barely escaped danger."

[xxix] Even Fedorov [1903: 49] also writes that the halt of trade spoiled Russia's long years of successful diplomatic negotiations.

[xxx] As Rongquan (榮全)—who was both a representative of the military governor of Ili and the

councilor of Uliyastai—was writing his letter dated Tongzhi 6 8.18 addressed to the Russian military general of Semipalatinsk (総管斜米等處) , the West Siberia Governor-general informed Russian Ambassador Vlangali, "Since the outbreak of the rebellion, both warriors and commoners along China's western border have been abandoning their fields and homes and streaming one after another into Russian territory." He informed him that 13,861 Mongols, Solons, and Sibe were living Russian territory at Kopal and Alatau [TsGA RK: f. 44, op. 1, d. 3, l. 41]. A document dated April 2, 1868, shows that 2,528 Han Chinese (*Kitai*), 910 Solons and Sibe, 4 Manchurians, and 5,497 Oyirads (*Kalymyk*) were counted in Vernyi [TsGA RK: f. 3, op. 1, d. 585, l. 141].

[xxxi] See [Uyama 2006: 32] regarding prosyletization of Russian Orthodoxy to this population.

[xxxii] The Turgen River is a tributary of the Usek. The treaty states: "The border will follow the Turgen' River, and then pass among the *karun* at Boro-khotszir, Kuitun, Tsitsikhan, and Khorgos until it arrives at the *karun* at Ili-bilai-tsikin" [Skachkov; Miasnikov 1958: 47].

[xxxiii] For details on this lineage see [Semenov 1910: note 45].

[xxxiv] According to [Rumiantsekh 2000: 97], Tazabek (or *Tazybek*) was the chief of a branch of the *Alban* (alternately, *Adban*) clan. See also [Moiseev 2003: 86]. A report from the assistant director general of the Alatau district to the director general dated March 3, 1867, details the cooperation Tazabek gave to Russian officials [TsGA RK: f. 3, op. 1, d. 275, l. 43ob.].

[xxxv] "Tazabek, chieftain of the Kazakh Alban clan originally affiliated with China, opposed Russian colonial rule in the area newly occupied by the Russians. He rose up an army, but unfortunately they failed. The approximately 1,000 nomads led by Tazabek fled to China and made their way to Ili by way of Chunji" [*Xinjiang jianshi*: 145].

[xxxvi] See [Noda 2008a]. According to [Aristov 2003b: 295], the Kazakh population in areas surrounding Ili stood at 5,500 households with 22,340 people. The Kyzai clan roamed the areas around Lake Sayram and the Barluq mountains, while the Suwan clan roamed the right and left banks of the Ili. According to [Rumiantsev 2000: 97-98], after 1864 (according to regulations introduced in 1867, Russian governance was extended to cover the Kazakhs in Semirech'e Oblast' as well) the Alban and Suwan clans shifted to the side of the Sultanate in Ili and launched attacks on Russian sentry posts.

[xxxvii] In 1868, he would be imprisoned for the crime of plotting to attempt to cross the border to move to Qing territory [Khafizova 2002: 12]. According to a report of October 7, 1869, sent to the military governor of Semirech'e by the leader of Altyn-emel' volost', Tezek was extremely unhappy that he had not become the head of the township with which he had been affiliated already for quite some time [TsGA RK: f. 44, op. 1, d. 29185, l. 5].

[xxxviii] He was in command of the Taranchis army in Ketmen at the time of the Russian Army's invasion [Kolpakovskii 1872: 225].

[xxxix] [Paine 1996: 119]. There is also a letter (August 1869) the Tungans in Urumqi sent to the Russian authorities asking to be protected from Yaqub-bek's attacks [Moiseev 2006: 187-188].

[xl] A.V. Kaul'bars (born 1844) worked for the army and in 1872 led the mission to Kashgaria.

[xli] See, for example, [Paine 1996: 121]. Also, according to [Rostovsky 1942: 159], the Russian For-

eign Ministry was perplexed by the report from Kaufman.

[xlii] For a copy of the meeting minutes, see [Semenov 1910: XL]. [Moiseev 2006: 74] cites documents in the hands of the RGVIA that contain the same material. Contrary to this document, Matsuzato [2008: 315-316] argued that Kaufman's occupation of Ili district without the permission of the central government revealed the shortcoming of the Governor-generalship system, which caused the extreme separations of power. Thus, this issue requires further investigation.

[xliii] According to [Aristov 2003b: 290], this was in August 1870.

[xliv] On the basic structure of the regime, see [Shinmen 1987].

[xlv] Poltoratsky, the military governor of Semipalatinsk in 1867, traveled to Naryn to deliver a letter to Yaqub-bek [Moiseev 2006: 39]. Shadi-Mirza was the return envoy from Kashgar, who traveled with a caravan on its return to Vernyi in August 1868 [Moiseev 2006: 47]. Also, Reintal', who was attached with the Russian Army, went from Tashkent in October to visit Yaqub-bek [Boulger 1878: 184]. I note that at this point Russia did not recognize Yaqub-bek's authority [Rawlinson 1875: 330].

[xlvi] *Affairs in Central Asia, Central Asia* No. 2 (1873), Correspondence respecting Central Asia, no. 15, November 2, 1869 (printed in London, 1873), sent from Ambassador Buchanan in Petersburg to the Earl of Clarendon. The text of the letter from Forsyth to Buchanan enclosed to this correspondence reads as follows. "If Yakoub Bey proved a good neighbour, the Russians would be happy to trade with him, and possibly hereafter, if he entirely established his independence, they might be induced to enter into negotiations with him."

[xlvii] Report No. 169 of March 3, 1867 sent by the assistant director general of the Alatau district to his director general reads as follows: "I have received the following information regarding the situation in East Turkistan. ***Yaqub-bek*** [emphasis added], the ruler of Kashgar, Yarkand, and Khotan, had thus far been subordinate to however many maharajah in Kashmir. However, now that the British are captivated with Kashmir and this ruler sees the Qing army drawing nearer to quell the uprising, he has entered relations with the British and it appears as though he has aligned his [towns of] Kashgar, Yarkand, and Khotan and their territories with the British. I have also been told that he sent seven men from his lands to Yaqub-akhun, chief of the Tungans in Ili, to say he has made Kashgar, Yarkand, Khotan, Aksu, and Turfan subject to the British and ask whether or not the chief would join them as well. From what we hear, the Ili Tungans sent their agreement to this proposal and for that reason Yaqub-bek has pledged to send reinforcements after the spring." [TsGA RK: f.3, op.1, d.275, l.43]

[xlviii] Also known as *Mustau*. Situated to the southwest of the Ili region, it is the only pass that runs south to Aksu.

[xlix] According to [Lattimore 1951: 46], initially there were no plans either in Britain or the Governor-General of India to get deeply involved in Xinjiang affairs.

[l] The Soviet-era account that Sakamoto [1967: 167] cites (*Е. М. Жуков*, Международные отношения на Дальнем Востоке (1840-1949), Москва: Государственное издательство политической литературы, 1956) reads as follows: "The purpose of the Russia's occupation of Ili

was to prevent the unrest from spreading into Russian territory in Central Asia, to restore profitable commercial relations with Xinjiang, and so that Ili would not be occupied by ***Yaqub-bek, who Britain was attempting to turn into a tool for their aggressive plans*** [emphasis added]."

[li] Paine [1996: 120] links Russia's intentions with opposition to the territorial ambitions of the Taranchis sultan, a claim whose validity will require further investigation.

[lii] "I will not get into the political aspects of the new treaty that resulted in the reversion of the Ili region to China. However, we should note that while Russia put the Ili region under its protection in 1871, it did not refuse to return it to China. But political issues aside, this does not mean we should not pay special attention to the terms of the new treaty that relate to our overland trade in northwestern China" [Skachkov 1881: 367].

[liii] Correspondence of Tongzhi 12.1.25 from the Zongli Geguo Shiwu Yamen to Russian Ambassador Vlangali [QWD: 01-20-028-03-004] (俄商赴科哈伊犂等処貿易案). There is reference to Russian merchants asking to go to Barqul to conduct trade. The Russian merchant Kuznetsov was headed for Urumqi to conduct a market survey in 1871 (in fact he got no farther than Manas) [Fedorov 1903: 58].

[liv] Before the occupation, the Russian army issued a proclamation that blamed the sultan. Russia was so worried about his influence over the local people as to confine him leniently in Vernyi, the report of Semirech'e military governor to Turkistan Governor-General, dated May 8, 1872 [TsGA RK: f.21, op.1, d.20, l.19].

[lv] See [Boulger 1878: 277-303] .

[lvi] The average flow measures 374 $m^3$/second, and the annual flow including tributaries reaches 14.8 billion $m^3$ [*Xinjiang Yili kaifa*: 13].

[lvii] The population reached 34,300 during the Jiaqing era [Hua 1998: 168].

[lviii] [Radloff 1893: 331]. The translation in [Saguchi 1986: 280 note 21] that analyzes this same point is incorrect. These taxes amount to more than 250 rubles per household.

[lix] [Radloff 1886: 31]. See also [Saguchi 1986: 266] for a summary.

[lx] Regarding Sandaohe, also known as Ak-su, see [Fedorov 1903: 194].

[lxi] [Wang 1990: 215] estimates it at 180,000 *mu* (1 *mu* is approximately 600 $m^2$).

[lxii] The memorial of Zhalafentai, dated Xianfeng 7, intercalary 5.11 (this is a slightly revised version of the translation that appears in [Kato 1986: 7]).

[lxiii] Including such works as *Tārīkh-i shahrukhī* and *Tārīkh-i amnīya*.

[lxiv] The word originally meant "charity" or "alms," but here it was used perhaps more generally to refer to taxes.

[lxv] Records show that the tribute collected in Daoguang 29 (1849) stood at 20 horses, and in Daoguang 30 at 17 [*Qingdai zhong'e*: 11].

[lxvi] This includes those newly established at some point during the *Jiaqing* (嘉慶) period. See also [Saguchi 1986: 262]. In addition, *Wulankutule* (烏蘭庫圖勒), *Wuliyasutu* (烏里雅蘇圖), and *Chunji* (春稽) were newly established in Jiaqing 9 (1804).

[lxvii] *Sotnia* (lit., "one-hundred doors" or "one-hundred households") is a name that was given solely

as a unit for administrative purposes and absolutely does not refer to an actual number.

[lxviii] [Pantusov 1876a: 202]. The units for barley and wheat are glossed as "*Kho* or *Tagara*."

[lxix] According to Fedorov, 1 *kho* = 4 *mo* (mu), and 1 *mo* = 132 square *sazhen* [approx. 602 $m^2$] and 42.4 square *vershok*.

[lxx] Similarly, according to Fedorov, the Han Chinese took 16 *kho* (8 *kho* of wheat and 8 *kho* of common millet) from each clan, but the Sibe wanted an award and placed burdens on residents to bribe the government; for that reason the tax burden stood at 30-32 *kho*. In this instance, a *kho* appears equivalent to 1 *shi*.

[lxxi] Since one *chetvert'* was an area measuring 5,460 $m^2$, 1 *khu* equaled 2,730 $m^2$. This is close to the 4*1 *mo* (that is, 4*602 $m^2$) indicated by Fedorov.

[lxxii] 1 *dzhin* = 596.82 g. Since 100 *dzhin* was equivalent to 1 Taranchis *kho*, 1 *kho* = 60 kg.

[lxxiii] In accordance with the old system, 1 *tagar* = 1 *shi*. Radloff defines 1 *tagara* as roughly the same as 3 *cho* (in *Versuch eines Wörterbuches der Türk-Dialekte*). The values they represent are said to differ in the northern and southern districts of Xinjiang [Saguchi 1986: 278, 280].

[lxxiv] For reference, in the case of rye 1 *chetvert'* (approx. 2 *shi*) can be converted to 8 *pood* (approx. 130 kg). While the figure differs depending on the type of grain, in general we may consider 1 *shi* to amount to around 60 kg.

[lxxv] The two districts, which were divided by the Ili River, were under the jurisdiction of district (*Uchastok*) directors. The Northern District was administered from Ghulja, and the Southern from Kainak village [Fedorov 1903: 55].

[lxxvi] Tongzhi 11.5 *gengxu*, the memorial of Rongquan and others [*Chouban yiwu shimo*: vol.86, 38].

[lxxvii] [*Yijiang Huilan*: 40-41]. Regarding the population in 1871, records show that there were "approximately 600 Manchu soldiers, 1,400 Green Standard soldiers, 16,996 Sibe, 9,203 Chahar Mongols in both columns, and 7,254 Oyirads" (Tongzhi 10.10 *guiwei*) [*Chouban yiwu shimo*: vol. 84, 10]. The statistics concerning the population of the occupation time are also kept in TsGA RK, according to which, in 1871, the entire population was 99,876 [TsGA RK: f. 21, op. 1, d. 20, ll. 116-117ob.].

[lxxviii] The units that comprised the Eight Banners have also been called *zuoling*. The Sibe force was composed of eight *niru*.

[lxxix] One *kent* was made up of around 100 households. Each *kent* was generally given the name of one of its elders (*strashina*).

[lxxx] Each *aul* was likewise made up of around 100 households.

[lxxxi] [Bartol'd 1964: 334] points out that Tungans introduced rice cultivation to Semirech'e.

[lxxxii] Measured in *chetvert'*. This Russian unit for grain volume is equivalent to 209.21 liters.

[lxxxiii] Turning to the Ili region in modern times, the area under cultivation in 1949 stood at 182,900 hectares and 1998 at 685,900 hectares, with the main crops under cultivation being winter and spring wheat (from Ukrainia) [*Zizhizhou zhi*: 467]. Total production volume in 1949 for the 139,100 hectare area under cultivation for wheat amounted to 110,000 tons, or 54 tons per *mu*. In

1998, these figures stood at 1.1 million tons against 260,400 hectares under cultivation, or 283 tons per *mu* [ibid.: 473].

[lxxxiv] On tax collection, see also [Fedorov 1903: 58].

[lxxxv] The 1877 price list for the South District indicates that 1 *ch.* of wheat was worth 2 rubles, 40 kopecks, while the same amount of barley traded for 1 ruble, 65 kopecks [Pantusov 1881: 186-187]. In the price list for 1876, wheat earned at most 1 ruble, 26 kopecks in the South District and 2 rubles, 20 kopecks in the North. Barley stood at around 1 ruble, 40 kopecks [Pantusov 1881: 124-125].

[lxxxvi] [Kaul'bars 1874: 143]. Regarding abundant fruit production, see [Hino 1973 vol. 2: 135].

[lxxxvii] Fedorov, too, spoke of "going against the desires of its residents and our interests in returning Ghulja" [Fedorov 1903: 69].

[lxxxviii] The period of Russian rule is viewed in an extremely negative light in [Wu 1993: 86-87], though it must be said that his account is lacking in fairness.

[lxxxix] Kaul'bars carried a comprehensive analysis at the time that touched on such matters as the characteristics of the Ili River and environmental conditions [Kaul'bars 1874].

[xc] Tongzhi 10.7.17 (1870), the memorial of the First Prince *Gong* [恭親王] and others [*Chouban yiwu shimo*: vol. 82, 6].

[xci] The RGVIA document cited by Gurevich opines: "What is important to us is for neighboring governments [i.e., the Qing] to grant us material and moral privileges that will make the free development of our trade possible" [Gurevich 1982: 441].

[xcii] The report to the emperor dated 7.20 (O.S. August 23) may be found in [NDD: 108911]. This reached the central authorities on Tongzhi 10.8.10 (O.S. September 12, 1870) [*Chouban yiwu shimo*: vol. 83: 15].

[xciii] No. 242, from Buchanan to the Earl of Granville, September 5, 1871 [FO: 881/2223]. I was able to use FO thanks to the kindness of KATŌ Yūzō (Research Institute for Humanity and Nature).

[xciv] Document attached to No. 243 (September 5), Extract from the *Journal de St. Petersbourg* [FO: 539/9/207].

[xcv] Tongzhi 10 *wuyin*, the memorial of Rongquan [*Chouban yiwu shimo*: vol. 84: 39].

[xcvi] Tongzhi 11.2 *renxu* [*Chouban yiwu shimo*: vol. 85: 34].

[xcvii] Tongzhi 11.4 *wuwu*, the report by Eight Banners Chief Jing Lian in Urmuqi *dutong* [*Chouban yiwu shimo*: vol. 86: 1].

[xcviii] Tongzhi 11.6 *xinsi*, the memorial of the first Prince Gong and others [*Chouban yiwu shimo*: vol. 87: 7].

[xcix] [Voskresenskii 1995: 84]. This is consistent with the conditions that Vlangali had earlier passed on to the Zongli Yamen regarding the Qing proposal for negotiations to be conducted on site ([1] that Rongquan prepared a well-armed military force and [2] that crimes from the time of the *Hui-min* Revolt be pardoned) [Gurevich 1982: 444].

[c] Correspondence from Boguslavsky to the Governor-general of Turkistan, May 21, 1872 [Semenov 1910: XLVIII].

[ci] Tongzhi 11.11 *dinghai*, the report of Rongquan [*Chouban yiwu shimo*: vol. 88, 20-21].

[cii] The area between Boro-khotszir and Khorgos newly decided to be Russian territory measured 220.07 square Russian miles (12,051 $km^2$). The 1082.29 square Russian miles that reverted to the Qing was equivalent to 59,266 $km^2$.

[ciii] For example, the article by V. Vasil'ev that appeared in "*Голос*" (1878, issue 25) [TS, t. 195].

[civ] See Следует ли уступить Китаю Кульджу? // Новое Время, 1878, no. 720., by Вл-. [TS, t. 196, c. 51-59].

[cv] There was a "Revised Overland Trade Charter" as a supplement to the treaty.

[cvi] [Kasymbaev 1996: 107]. Regarding economic relations between Russia and Xinjiang after the treaty was concluded, including in the field of finance, see [Galiev 2003] and [Mi 2005] (note that the two works need to be compared to one another since each is based on only one set of archival materials—Russian or Qing, respectively).

[cvii] According to statistics from 1884, the number of Taranchis in Vernyi Province and the Dzharkent district stood at 45,373, while there were 9,136 Dungans in the two aforementioned areas as well as Toqmaq and Issik-kul provinces (note that the figure for Dungans includes 4,454 people migrants from Kashgar) [Galuzo 1961: 88-89].

# Study of the Ecology of the Ili-Balkhash Region in the Soviet Period

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It is well-known that in pre-industrial societies the main influence on a person's economic activity was nature. In other words, the manufacturing phenomenon is nothing else but the mechanism of interaction of human activity with the natural environment. With relation to culture, this indicates the adaptation of the natural world to human interests. The stability of human economical-cultural activity (particularly at the pre-industrial stages of history) was thus determined by the balance of "society-nature".

The Soviet Marxist-Leninist regime violated this axiom. The ideology of this regime put at its forefront the "revolutionary-reformative force of mode of production". The policy of the Soviets supported the alternative "system" of "state-nature". As a result, different ideas of geographical determination (e.g. environmentalism, possibilism, etc.) were exposed to anathema. By the same reasoning, the influence of ecology was considered as pseudo-science or bourgeois quasi-science.

Ecology is the science of harmonious relations between human society and nature. However the main strategy of the Soviet non-market economy was based on the endless exploitation of nature. The consequences of the policy of irrational exploitation of natural resources were fully evident in Kazakhstan, particularly in the Ili-Balkhash region. The stock-raising business there employed very important organizational and technological functions of the social-economical ecosystem of nomadic practices. The Soviet regime of the 1920s, implementing the idea of "class struggle", tried to demolish the traditional agrarian structure and expropriated the large stock-raising businesses in this attempt. More than 1,000 large stock-raising families were exposed to force deportation, their livestock dispersed among paupers (parcel businesses). [1] Afterwards (as anticipated) all the confiscated livestock was slaughtered for consumption. Nevertheless, the traditional structure, being strong and ecologically organized, for the moment survived. But a new blow then attacked this traditional structure from which it could not recover.

During the second half of the 1920s, the Soviet Union aimed for industrial modernization. The Soviets considered the peasants' labor the main resource necessary for this. Therefore the Soviets began the campaign of total government appropriation of all agricultural property. Millions of private producers (manufacturers) were driven into collective farms (kolkhoz), and their means of production (instruments of labor, livestock) were collectivized.

As for the import of "technological apparat-devices", the "socialists' industrial reconstruction" needed tremendous currency reserves. One of the main sources of this came from the export of grain. The grain was obtained free of charge from government kolkhoz-structures. But the need for grain increased each year. Thus there emerged the question concerning the enlargement of areas devoted to the production of grain. The boundless steppe area of Kazakhstan was considered as one of the most prospective regions. The Government also believed that it was possible to change the way of

life of nomads to a settled existence and thus enlarge the labor sources of grain production.

However the arid area of Kazakhstan was not appropriate for agriculture. It was ecologically suited as a nomadic domain. It was probable that by means of the nomadic way of production (cattle-breeding) it had become possible to utilize and socially adapt the arid landscape of Kazakhstan. However this was ignored by Stalin's regime. This was not a random decision either. The strategy of maximum exploitation of the natural environment, i.e. extensification, was one of the main strategies of the Soviet non-market system. The priority of geographical determinism was set aside (without any thought) in Soviet economic projects.

That's was in order to free steppe pastures for grain cultivation the Government decided to conduct not just collectivization of stock-raising businesses but also the forcible settlement of its people. The Government naively believed that it was possible to change the people from their nomadic ways to a settled existence and thus consequently enlarge the labor resources for grain production.

Of course, the level of development of manufacture and other material-technical components of the pre-industrial Soviet State was not of a standard to allow such a fundamental modernization of traditional cultures. At best, it might have been possible to implement a marginal model or hybrid surrogate. Despite this, the Soviets, in thrall to the power of Communistic abstraction, unwrapped the fighting flag of "bolshevists agrarian revolution".

In 1935 almost all the Kazakh nomads were collectivized: about 400,000 families of cattle-breeders were forced to live a sedentary lifestyle. [2] Stalin's propaganda heralded this forcible transformation as a triumph of socialism. But in reality the totalitarian regime pursued just utilitarian purposes: the destruction of the traditional peasant community and its integration into the Soviet Bolshevist system. Stalin's' "great turning point" in the villages became for the Kazakh peasantry an unparalleled tragedy.

Ignoring the longstanding ecological experience of the nomadic cattle-breeders the authorities blindly followed the principles of extensification. Some pastures were plowed up for production of grain and industrial crops: on other pastures, the concentration of livestock was increased. Sometimes the cattle-breeding kolkhozes would consist of 600 – 800 families whereas the traditional cattle-breeding community usually combined 10 to 15 families.

The result was a catastrophic decrease of the herd. The reasons for the dramatic decrease in the number of livestock were nomads' migration from Kazakhstan; mass slaughtering of livestock (in order not to give the livestock to the kolkhozes); livestock impressments by governmental authorities and so on (for example, in Balkhash district the plan for total state purchase was established at 300,000 cattle, whereas de-facto this district could provide for just 170,000). As a consequence an unprecedented crisis occurred in the cattle-breeding society of Kazakhstan. If we take into consideration the pre-kolkhoz level (in 1928) and the first years of sedentary collectivization we can see the following negative dynamics:

The extent of the disaster was obvious in one of the largest cattle-breeding areas of Kazakhstan – Semirechiye (the Ili-Balkhash basin). The decrease of livestock in the Karatal district amounted to 75%-100 %. In the Taldykorgan district (kolkhoz "Erkin") in 1931 the number of livestock decreased from 550 to 13; in kolkhoz "Paris community" 570 animals decreased to 36; in kolkhoz

"Betpakty", 600 declined to 84 and in the "7-th aul" 2,000 horses were decimated until only 25 remained. [4] The same situation existed everywhere in Kazakhstan. Mass decrease of livestock led to a crisis of provision for cattle breeding families.

The Deputy Head of the Government of the Russian Federation – Turar Ryskulov – in his letter to Stalin (Sep. 29, 1932) informed him that if there were in 1929 one cattle-breeding family with an average of 35 units of livestock, the number had now become catastrophic for stockbreeders. For 2 Kazakh stockbreeder families there was on average only 1 unit of livestock; every 15 stockbreeder families owned only 1 cow; every 40 stockbreeder families possessed only 1 sheep.

Livestock was the only source of support for the Kazakh stockbreeder families. Without livestock, hundred of thousands died of starvation. It is now very difficult to establish the real number of losses. Apparently, about 1,300,000 to 1,600,000 people died of starvation between 1932 and 1933. A lot of indirect sources indicate these data. For example we get the following information from the letter of the Head of Kazakh Statistics Department, M. Samatov, written in 1937: "From 1 July 1930 to 1 June 1933 the rural population decreased with 3,400,000 persons, and the urban population increased with 766,000 people". [6] In other words the decrease of the Kazakh population accounted to more than 2,600,000 people. During this hard period of time about 1,000,000 people migrated outside Kazakhstan. That is why we can suppose that 1,300,000 – 1,600,000 Kazakhs died of starvation [7]. The mass migration of Kazakhs was a real fact. Of more than 1,000,000 migrants, 600,000 never came back to Kazakhstan.

The nomadic migration also occurred in Semirechiye. 3,000 cattle-breeding families (10,000 people) left their lands in Ili district; from Kastek district 2,387 cattle-breeding families (more than 10,000 people) left; from Balkhash district – more than 3,000 cattle-breeding families (12,000 people). From January till April in 1932 about 33,000 – 40,000 cattle-breeding families (135,000-160,000 people) migrated. From the Almaty region, 33,000 – 40,000 cattle-breeding families moved away (135,000-160,000 people). About 200.000 migrating Kazakhs went to Western China. Some people moved to Russia, where the population in comparison with 1926 increased 5 to 6 times more (data on census enumeration in 1937). [8] According to the data from the first census enumeration of 1926, the Kazakh population was more than the other nations. But according to the second census of enumeration in 1937 – just 37.8 % of the population were Kazakhs. From that time until the year 2000, the Kazakhs were not in the majority. Thus, the "Kazakh tragedy" was a fact. Hundreds of thousands of people died, while great multitudes

**Number of livestock in Kazakhstan [3]**
**(1928 – 1932)**

| Type of Livestock | 1928 (Million) | 1932 (Million) | Times less |
|---|---|---|---|
| Horses | 3.5 | 0.3 | 12 |
| Sheep | 18.6 | 1.39 | 13.5 |
| Camels | 1.05 | 0.058 | 18 |
| Cattle(Cows) | 6.5 | 0.96 | 7 |
| Total | 29.65 | 2.7 | 11 |

**The level of provision of Kazakh cattle-breeding families [5]**

| Type of Livestock | 1928 (Million) | 1932 (Million) | Times less |
|---|---|---|---|
| Horses | 3.6 | 0.4 | 9 |
| Sheep | 29 | 0.9 | 32 |
| Camels | 2.8 | 0.3 | 9 |
| Cattle(Cows) | 6.3 | 0.4 | 16 |

left their motherland. It was the price of Stalin's "Great breaking".

The nomadic community was destroyed. Meanwhile, the total decrease of livestock caused a degradation of pasture in the arid region. The plants that were adapted to the livestock and pasture disappeared. In place of the pastures, moss and weeds appeared. They made soil ventilation more difficult, and thus made the soil less absorbent. All these were conducive to desertification. The arid ecosystem became imbalanced.

Sadly, the tragedy of the 1930s failed to warn the Soviet regime which continued its extensive experiments in Kazakhstan. At all times, the harmony of the arid ecosystem of Kazakhstan was determined by the balance between the number of livestock and productive pasture-land. The number of sheep in Kazakhstan always accounted to about 18,000,000 - 20,000,000 units. This limit was regulated by nature (for example, "dzhuts" – You can find this information in an article of Tomohiko Uyama). But in 1970 L. Brezhnev set Kazakhstan a task to increase the number of sheep to 50,000,000. At the beginning of the 1990s, Kazakh pastures accounted for 37,000,000 sheep. The area of pastures decreased because of tselina (Тем более их площадь резко сократилась в результате освоения Целины (wide-ranging ploughing up of steppe-land). 1,127 state agricultural enterprises (kolkhozs and sovkhozs) were functioning in the 1980s in the arid zone of Kazakhstan. 31,000,000 units of sheep, 2,000,000 units of cattle, 800,000 units of horses and camels were accounted for in such cattle-breeding enterprises. In the Almaty region, each 100 hectares of pastures accounted for 46 units of sheep (traditionally, each 7 hectares accounted for 1 sheep).

The livestock over-pasturing precipitated the process of desertification. In 1988 Kazakhstan territory consisted of 63,300,000 hectares of desertificated lands: 54,300,000 of them former pastures. Desertification in Ili-Balkhash basin covered 1/3 of the total area.

The Ili-Balkhash region progressed to its ecological crisis simultaneously with the Soviet policy of economy extensification. The main indicator of the health of the Ili-Balkhash ecosystem is the Balkhash Lake. The water-level of this lake has cyclically changed between 341 m and 342 m of BS (Baltic System). But, in 1987 the level achieved its minimum – 340.65 m. The area of the lake's surface decreased from 21,400 sq. km in 1961 to 17,070 sq. km at the end of the 1990s.

Again this was not a random event. During 1970-1980, the Ili-Balkhash region suffered extensive exploitation. On the Ili river the Kapshagai reservoir was built: capacity - 28 cubic km; on the Chilik River – Bartogai reservoir, capacity – 0.32 cubic km; and other artificial water systems were also constructed. [9]

A rice irrigation systems was set up in Akdaly (area – 31,700,000 hectares, water consumption about 1.3 cubic km per year) and in Shinteldy (area – 15,300,000 hectares, water consumption – 0.166 cubic km). A lot of other industrial-agrarian projects that increased the volumes of water consumption were constructed during those years. In 1990 the total volume of water consumption in the region increased to 7.51 cubic km per year. [10]

The Soviet anti-missile defense systems testing area "Sary-Shagan" (Priozersk), which was created in 1956, contributed to the increase of water consumption. The testing area was located

near the Balkhash Lake. At different periods the number of its inhabitants has been accounted to be about 80 – 100,000 people. Also, the testing area was a great pollutant of the atmosphere. About 400 anti-missiles were launched from its territory; 5,500 guided anti-aircraft missiles and about 900 ballistic missiles were launched.

The Balkhash copper-smelting plant was also a big problem for the whole atmosphere of the region. Analysis of Balkhash water detected that the amount of copper increased to more than 400 times the maximum permissible concentration, sulfur to 7.9 times more and chlorine to 1.5 times more.

So, the ecological history of Kazakhstan, in particular the Ili-Balkhash region points to the following conclusion: the Soviet regime deemed its political interests more important than ecological interests and thus contributed to the destruction of a sensitive environment.

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# Socialist Modernization and Landscape Change in the Middle Reach of the Ili River, Republic of Kazakhstan

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**CONTENTS**



## 1. Introduction

During the 20th century, Central Asian people experienced drastic change in their surroundings. Agricultural and industrial development in the Soviet Union had a particularly great influence on Central Asian life. Following the trend of that time, environmental issues were seen due to the increase in human activity. For example, agricultural developments in the Amu River and Syr River basin that aimed to increase cotton production resulted in a decline in water levels of the Aral Sea.

When faced with environmental issues, the accurate and reliable establishment of cause and effect is crucial. However, we must also remain mindful of the complex systems behind environmental issues, and it is important to also recognize political, economical and social factors. It is within the context of these factors that we examine issues surrounding changes to the human society of Central Asia.

Human activity encompasses many social categories such as personal, group, settlement, states

and nation, and relationships among societal domains and the natural environment is highly variable. The purpose of this paper is to clarify the changes in the landscape of the rural region in the Almaty oblast, Republic of Kazakhstan, during the Soviet era. To this end, we focused on the individuals living in the local society. Based on interviews of people within the survey area, the landscape changes surroundings individual lives and settlements were reconstructed. The actual situations of historical changes to the rural region during the Soviet Era and the socialist modernization's impacts on the Kazakhs people's life and way natural resource use are discussed.

## 2. Survey area

### *2.1. Historical background*

Nomads occupied Kazakhstan before the 19th century. The 19th century saw an increase in agricultural immigrants due to the agricultural (coronial) policies of the Russian Empire. An increase in agricultural land led to a corresponding decrease in pasture land. Consequently, nomadic people at the time were forced to adapt to a semi-nomadic style (Okuda, 1982). According to the population census in 1926, about 67% of total economic units were a product of semi-nomadic culture (Okuda, 1982).


**Fig.1 Survey Area**

Agricultural developments in Kazakhstan had two primary developmental periods. First was the collectivization period (1929-1933). During this period, nomads were forced to settle and entered the kolkhoz (collective farm) as labour. The second period was centered around the 'Virgin Land Program' in the 1950's, and vast agricultural lands were mainly developed in the northern steppe of Kazakhstan (Nobe, 2003). The collectivization and 'Virgin Land Program' drastically changed the Kazakh's traditional lifestyle, regional community, economy and use of natural resources (Okuda, 1982; Olcott, 1995). Agricultural production was ultimately increased during the Soviet era. The eventual collapse of the Soviet Union damaged the agricultural economy in Kazakhstan (Nobe, 2003).

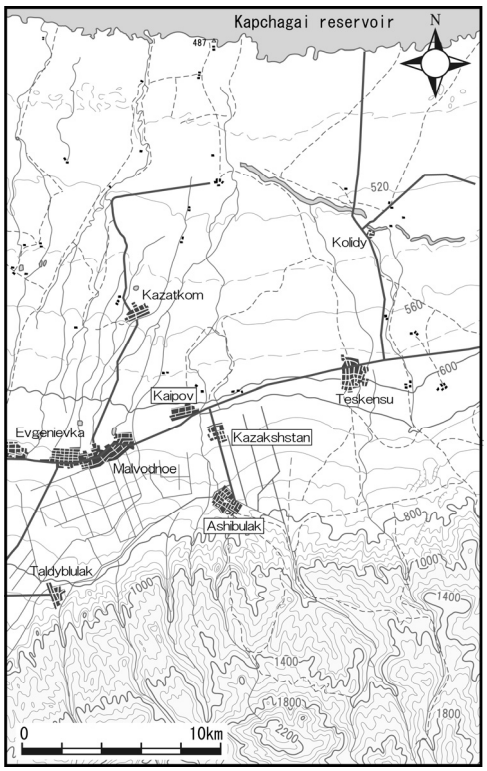


**Fig.2 Topographical Map around former sovkhoz 'Kazakhstan'**

There was a remarkable decrease in the Kazakhstan population between 1910-30's (the collectivization period) and 1990's (the collapse of the Soviet Union period) as well as drastic changes in ethnic composition (Oka, 1999). Before the Russian Revolution in 1917, the Kazakhs represented a majority

of the population, but population rate decrease along with an increase of agricultural immigrants rendered the Kazakhs as a minority (Oka, 1999). However, after the collapse of the Soviet Union, many agricultural immigrants returned to their own countries, and the ethnic composition in Kazakhstan thus changed again (Oka, 1999). In this study, the local changes will be calcified in response to these large-scale (national level) changes.

### *2.2. Survey area*

In this study, the Kaipov village in the Enbekshi Kazakh Raion of the Almaty Oblast, Kazakhstan Republic, is investigated (Fig.1, Fig.2). The survey area is located in the southern part of Kazakhstan, neighbouring the border of China and Kyrgyzstan. Geographically, it is located in the middle reaches of the Ili River that rises in the Tian Shan Mounts. In this region, little blanches flowing to the Ili Basin form alluvial fan complexes.

Kazakhstan agriculture possesses a regional peculiarity along the latitude. It has grain fields in the north, stockbreeding in the middle and intensive irrigation farming in the south (Nobe, 2003). The survey area belongs within the "intensive farming area". Orchard and tobacco fields characterize the landscape of the alluvial fan, at present.

Kaipov village was one of the production bases of the vintage sovkhoz 'Kazakhstan'. Sovkhoz 'Kazakhstan' consists of 3 villages altogether, the Kaipov (old Socialist Kazakhstan), Kazakhstan and Ashibulak (old Anatolievka) (Fig.2). Sovkhoz 'Kazakhstan' is located on one of the alluvial fan complexes, Ashiblak village is located on top of the fan and the other two villages are located in the lower part portion.

## 3. Method

To examine and discuss the historical changes of the individual lives, settlements and productive organizations, we focused on landscape changes. The landscape is defined as 'reflection of the accumulated human lives and behaviours' (Ashikaga, 1982). That is, the landscape reveals the complex system of human activity, the interaction between humans and nature. Therefore, it comprises a significant view for this research. The methods employed in this study included document analysis and interviews. At first, through document analysis, the outline of the formation process and historical changes of the kolkhoz and sovkhoz organization are described. Second, that outline is given body and substances though the landscape analysis based on the interview.

### *3.1. Analysis of the documents and statistics*

Documents, such as the annual report of each kolkhoz and sovkhoz and statistical data that is archived in the *National Archives at Almaty Oblast (Государственный архив Алматинской области: GAAO)* were analyzed. In addition, online data from *the Agency of Statistics of the Republic of Kazakhstan* were also analyzed.

### *3.2. Clarifying the landscape changes in ordinary life through Interview*

In order to examine landscape change, semi-structured interviews with elderly people were carried out. Some of the landscape features were extracted from their narrative. Total number of the

people who interviewed with is 53 at Oct.2009. This paper centres around an interview of an old man who was born and grew up in the Kaipov village and worked in sovkhoz 'Kazakhstan' as a leader of the stockbreeding brigade and agricultural farm until he retired. Landscape factors were extracted from his story and the historical landscape change dynamics of the Kaipov village were reconstructed. In this region, population have high mobility, interviewee who spent a lot of pert of his or her life within the village is very novelty. His story, including almost all history of the village, is very important for this study.

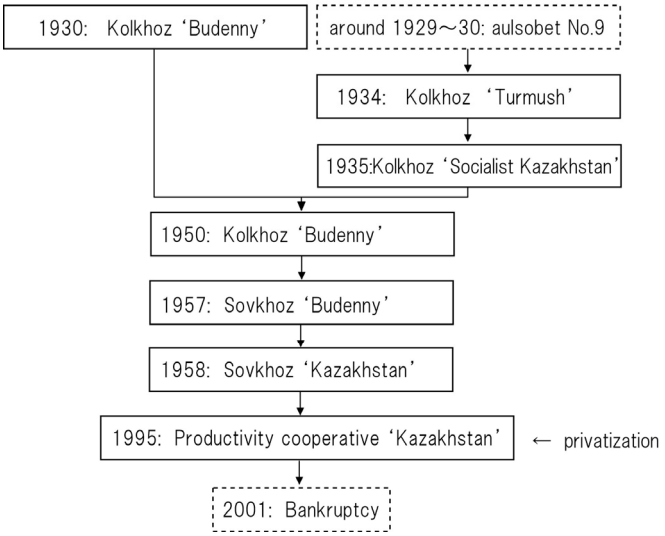


**Fig.3 History of the *sovkhoz 'Kazakhstan'***

The landscape features that we focused on are as follows;

- Agricultural landscapes: farm land, irrigation channel, crops
- Pastoral landscapes: pasture, livestock, feeds
- Ordinary life landscapes: people, foods, houses, educational/cultural institution and lifeline.
- Natural landscapes: rivers, grassland, mountains

The contents of their stories, in a matter of course, include some conflicts with the official documents or annual reports of the sovkhoz or kolkhoz. Because conception of the landscape includes subjectivity in a broad sense, we deferred to his memory when we reconstructed the landscape changes surrounding his life.

## 4. The history of the sovkhoz 'Kazakhstan' based on the documents

This section briefly reviews the history of the sovkhoz 'Kazakhstan' that is mainly based on documents archived in *GAAO* (Fig.3). In this area, many kolkhozes had been established in the 1930's, after collectivization. Around Ashibulak, Kazakhstan and Kaipov village, some kolkhozes were newly established.

At first, kolkhoz 'Buddenniy' was established in 1930 at the Ashiblulak (old Anatrievka) village. Second, kolkhoz 'Turmush' was established in 1935. Kolkhoz 'Turmush' was placed in Kazakhstan village. The name of kolkhoz 'Turmush' was changed to 'Socialist Kazakhstan' in 1935. In 1950, kolkhoz 'Buddenniy' and 'Socialist Kazakhstan' were unified. Finally, kolkhoz 'Buddenniy' was later re-established as sovkhoz 'Kazakhstan' that specialized in vintage, in 1958. In 1995, after collapse of SSSR, sovkhoz 'Kazakhstan' was re-organized into a 'cooperative Kazakhstan' based on privatization policies.

Documents concerning the end of 'cooperative Kazakhstan' were not found. According to the interview, the cooperative ended in 2002.

## 5. Landscape changes in the Kaipov village

This chapter reviews the landscape changes around the Kaipov village through the analysis of the interview. In the text that follows, excerpts from the interview narrative portions are shown in '*italics*'. Furthermore, the sentence without an explanatory note is a story of an old man who was born at Kaipov village (old 9th village, aulsobet No.9) in 1936, and worked in sovkhoz 'Kazakhstan' as a leader of the stockbreeding brigade and agricultural farms.

### *5.1. Ordinary life landscapes*

#### *5.1.1. Foundation of the settlement*

> *'In 1929, my parents moved here from Talgar. They were employed by a rich Russian in Talgar at that time. However, they had to move here after the formation of the Soviet Union (USSR). They come to here with nine families including their relation's…they owned only one cattle and a horse per household. They gathered their cattle and established a commune because it was a convenient way to breed their livestock. The commune was established at 'Kossial' near here. The settlement was named <<9th aulsobet>> from this event…'*

In the late 1920's, his parents were employed by a Russian kulak (rich farmer) as cottagers in Talgar. However, Russian kulak had to relinquish their private property during collectivization. People who worked at the Russian kulak had lost their employment and had to move to new fields. They settled down at the new site and formed a commune, a form of collective farm, at the same time. According to his expression, 'there were no trees, no houses'. This '9th aulsobet (9th village)' was the new settlement that formed in 1929. Confusion caused by collectivization and forced settlement impacted the establishment of new settlements. The formation of new settlements and the collective farms foundation occurred simultaneously.

#### *5.1.2. Migration*

There were some peeks of population inflow and outflow. As referenced above, the first inflow peek in 1929 was connected to the formation of settlements. This inflow was triggered by collectivization and occupied by the Kazakhs people.

> *'... the settlement was called the <<9th aulsobet (9th village)>> until 1937. At the first time, there were no people except the 9 families. However, many people came to this village. When the number of households increased from 9 to 15, the village name had changed to <<Zhana Turmush>>...Because, it was affected by famine at that time, people were wandering and looking forward to moving to a better place. And some of them came into this village. Basically, the wandering people were the Kazakhs. ... In 1947, after the end of the war, the name of the village had changed from <<Zhana Turmush>> to << Socialist Kazakstan>>'.*

The second peek was in the late 1930's. As earlier research pointed out, this period was marked by serious social confusion caused by a natural disaster '*Jut*' and radical forced settlement policy. People died or fled due to starvation during this period. It has been said that 40% of the population in Kazakhstan was lost (Oka, 1999).

*'When fruit cultivation was started in 1957, various ethnic people immigrated. For example Tatar, there is Crimean Tatar, you know…40 households came to this village…In, 1969, 100 households came from Ukraine. However, only 5-6 households remain at present'.*

*'41 years ago, I came from Ukraine with my husband and many other Ukraine people. Many of them had gone back to our home country'. (an agricultural immigrant woman from Ukraine)*

The third peek of population inflow and outflow occurred during the agricultural migration after reorganization of the sovkhoz 'Kazakhstan'. Approximately 40 Tatar households immigrated in 1957 and 100 Ukraine households immigrated in 1969. The fourth peek inflow/outflow was the returning of them to their original lands. Many of these immigrants went back to their own countries following the corruption of SSSR or sovkhoz.

### *5.1.3. Name of Settlement*

There is no description on the documents when the 'aulsobet No.9' and 'Zhana Turmush village'was established. But, it is suggested by the narrative, 'aulsobet No.9' established in 1929, and the name of the settlement changed to 'Zhana Turmush' in 1937. The settlement was renamed 'Socialist Kazakhstan' after the Great Patriotic War (World War II). After the collapse of the Soviet Union, the name 'Kaipov Village' had been established.

Historical change of the settlement name was told in associate with the social events such as increase of households or war.

### *5.1.4. Educational institution*

*'In 1936 or 1935, some villagers who were about the same age as my father build a school by using the materials from the house of 'Bai (wealthy people of the Kazakhs)'. The school was 4 year course school. All students were Kazakhs…I graduated from the 4 year school and went to the school in the Ashisai village that was 20km apart from this village to learn at a higher grade. The name of the village was 'May day' in old times. And there was a school to learn till the 7th grade'*

*'My sons learned for 8 years in this village, and graduated from the 10th grade at the Kazakhstan village. In present time, we have an 11 year course school. That village (Kazakhstan village) and Ashiblack village also have 11 year course school…that is to say that these 3 villages have 11year school'.*

Fig.4 shows a school in the Kaipov village (older Socialist Kazakhstan village). In the 1940's, there were 4-year schools in the Kaipov village. In fact, there were 4-year course schools in each village at the time. Children who wanted to go higher grades had to go to the Ashisai village (Fig.4b).

In the 1950's, there were 8-year course schools in the village. There was a 10-year course school in the Kazakhstan village, next to the Kaipov village. In 1960's, after the sovkhoz 'Kazakhstan' established, each village had 11-year course schools (Fig.4c). Presently, children living in the Kaipov village can finish their compulsory education in their own settlement (Fig.5)

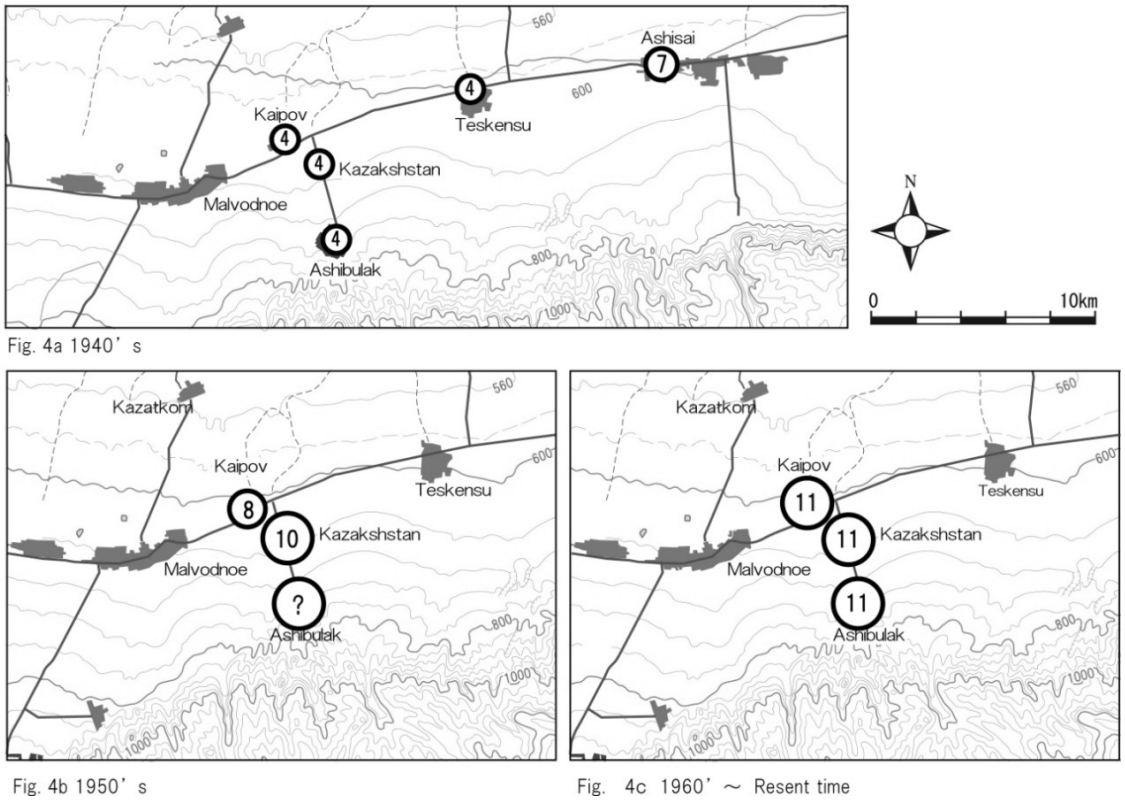


**Fig.4 Historical changes of the school system based on the interview**

*5.1.5. Infrastructure*

Concerning the well

*'The well in front of my former house was 2 m deep. And well water was salty. The well that we are using now was drilled about 35 years ago'. (Female from Ukraine.)*

**Fig. 5 11 years course school in Kaipov village.**

Concerning the well for villagers' potable water;

*'That well was drilled in the 1970's, I think. The same age to the coop near to the well… and the depth of that well is about 70-80m deep, hence the quality of water is good. Deeper water is better'*

Concerning water used for irrigation:

*'We used the water flowing from the mountain in olden days. There were irrigation channels at the orchard farm. Those channels were built in 1980'.*

We were able to obtain only fragmentary information concerning the village infrastructure, as there was inconsistent information across interviews. Nevertheless, the well (artesian well), drilled

in the 1970's was 70-80m deep, and suitable for villagers' potable water.

### *5.2. Agricultural landscapes*

#### *5.2.1. Crop*

> *'At the kolkhoz <<Turmush>> period, we cultivated only grain such as wheat and barley. Fruit was rarely cultivated at that time. In 1957, seeds and seedlings of the fruit were brought into this sovkhoz and we began to cultivate fruits'.*

The sovkhos 'Kazakhstan' is located on the alluvial fan formed by the Dishiblak River flowing from *Tau-Turgen* (Turgen Mts.). Orchards are commonly found along this landscape. However, the narrative from the interview suggests that the harvesting of fruits goes back less than 60 years. From the 1930's to 1950's, the kolkhoz period, only grains such as wheat and barley were cultivated on the lower part of the alluvial fan. There were little fruit orchards at the time. In 1957, *kolkhoz Buddeny* reorganized to *sovkhoz Buddeny (later sovkhoz 'Kazkhstan')*. In February of this year, seeds and seedlings were brought into this area, and fruits farming began in the region.

#### *5.2.2. Cultivation techniques*

> *'When the kolkhoz changed to the sovkhoz, there held a course to study how we should cultivate orchards. The people who had good records at the course proceed to the collage in the urban areas and continued their studies. People who underachieved worked here. Besides, the teacher came to the village to teach skils'.*

It is suggested that the cultivation techniques for vineyards were not conventional or ordinary skills, but were transplanted into this alluvial fan from outside in the late 1950's with seedless and wine-plants.

### *5.3. Livestock farming*

#### *5.3.1. Livestock*

> *'When sovkoze was stabled in 1957, the number of the cattle was 300 heads. There were 600 heads of sheep, 150 heads of horse and 1 milk plant. As the population increased, kindergarten and school were constructed. Because people needed a lot of milk, we increased the number of cattle. Then number of cattle increased gradually, and the milk plant also increased by 6. During 1957 to 1970, the numbers of sheep increased from 6,000 to 15,000 heads'.*

Livestock farming in the sovkhoz was expanded concurrently with agricultural development. As mentioned above, there was only one cattle and one horse per household in 1930's. However, sovkhoz 'Kazakhstan' owned 300 heads of cattle, 6000 sheep, 150 horses and 1 milk-plant. In 1970, the number of livestock increased to 1000 heads of cattle including 400 heads of milk cow, 15000 sheep, 350 horses, and 6 milk-plants. The sovkhoz 'Kazakhstan' provided meats and milk for themselves. Milk was mainly provided to the kindergarten and the surplus was added to the compulsory delivery to the government.

### *5.3.2. Pasture land*

In the Soviet Era, daily cattle and poultry owned by the kolkhoz and sovkhoz around the middle reaches of Ili River were breed in the shed throughout the year. In addition, sheep, horse and beef caw were brought to the pastureland in the mountains and put to grazing during summer season by sheepherders. These livestock went back to the individual winter camps for each group.

> *'Former winter camp was located in the bank of the Ili River, but the recent camp is located in this village. Before the Kapshagi reservoir had been built, there was pasture land. Due to the building of the Kapshagai reservoir, pasture land was lost. Due to less snow covering the Kapshagai reservoir, it served as a good place for a winter camp. Now, we breed our livestock in this village during winter'* .

In the case of the sovkhoz 'Kazakhstan', the grassland in the Tau-Turugen (Turugen Mts.), approximately 2000 m elevations high, was allocated as a summer pasture. The winter camp was located in the bank of the Ili River until 1970. The Ili River bank was an effective winter camp because of the decreased snow cover there. However, reed land around the bank of Ili River was submerged by the Kapshagi reservoir, created for the purposes of generating hydroelectric power in 1970.

## 6. Discussion

Individual landscape factors, social events and policies are unified and shown in Fig.6. The figure shows landscape changes around Kaipov (old Socialist Kazakhstan) village. The territory of the Kaipov village included the middle-to-lower part of the Dshiblak alluvial fan, representative of the landscape change along the alluvial fan.

Fig.6 additionally shows the landscape changes around Kaipov village after the 1920's. There were historical transition periods of landscape change. First was the collectivization period (1929-1933), second was the period of re-organization of the productive system from kolkhoz to sovkhoz (1950-60's) and third was the disorganization of the productive system (sovkhoz 'Kazakhstan') following the collapse of the Soviet Union.

During the first period, new settlements such as *9th aulsobet* were established in 1929 amidst the social upheaval that accompanied collectivization and enforced settlement. According to the interview, no people lived on the alluvial fan at that time. The settlement on the Dishibulak alluvial fan was likely a new landscape that formed after the 1930's.

The second period, the reorganization period from kolkhoz to sovkhoz, can be considered as the time during which the artificial landscape expanded. After the sovkhoz 'Kazakhstan' established, the agricultural land and number of livestock increased. According to the interview, fruit trees were transplanted from the other region. In parallel with the agricultural growth, residential infrastructure and cultural facilities were equipped. Likewise, new machines (drilling machines for well construction and milking machines) or other new techniques were introduced. Similar to that, other regions of the Soviet Union introduced by Takakura (2000), construction processes of the social community, cultural basement and economical basement of the kolkhoz or sovkhoz were carried out simultaneously in this region. Therefore, landscape changes from the 1930's to 1960's had characteristics of socialist modernization.

In addition to these tangible landscape factors such as settlements (buildings), infrastructure, and agricultural land, intangible factors such as agricultural techniques and immigration were also important factors in constructing the landscape in this region.

As mentioned above, orchards for vintage started when sovkhoz 'Kazakhstan' was established. It is important to note that cultivation techniques for vineyards were unconventional, and were transplanted into this region from outside at the same time. Not unlike the other areas of Kazakhstan (Oka, 1999), many Ukraine or Tatar agricultural immigrants came to the Kaipov village to alleviate the shortage of workers there. Indeed, agricultural immigrants played an important role in the agricultural growth of this region. However, following the collapse of the Soviet Union, most immigrants returned to their mother country. As a result, the ethnic composition of the village drastically changed twice. Furthermore, during socialist modernization, new agricultural techniques as well as immigrants influenced the landscape dynamism significantly. It is suggested that the high mobility of the 'intangible landscape,' rather than the tangible that remains after the collapse of the Soviet Union.

Typically, landscape forms voluntarily. However in this region, 'socialistic landscape' was formed by the Soviet Union in a top-down manner. When the Soviet Union collapsed, the power to maintain the production system, i.e. people and the techniques they possessed, departed. From the point of view of the landscape formation process, disorganization of the productive system (sovkhoz 'Ka-zakhstan') following the collapse of the Soviet Union were lead by the detachment of the formation process between 'tangible landscape' and 'intangible landscape'.

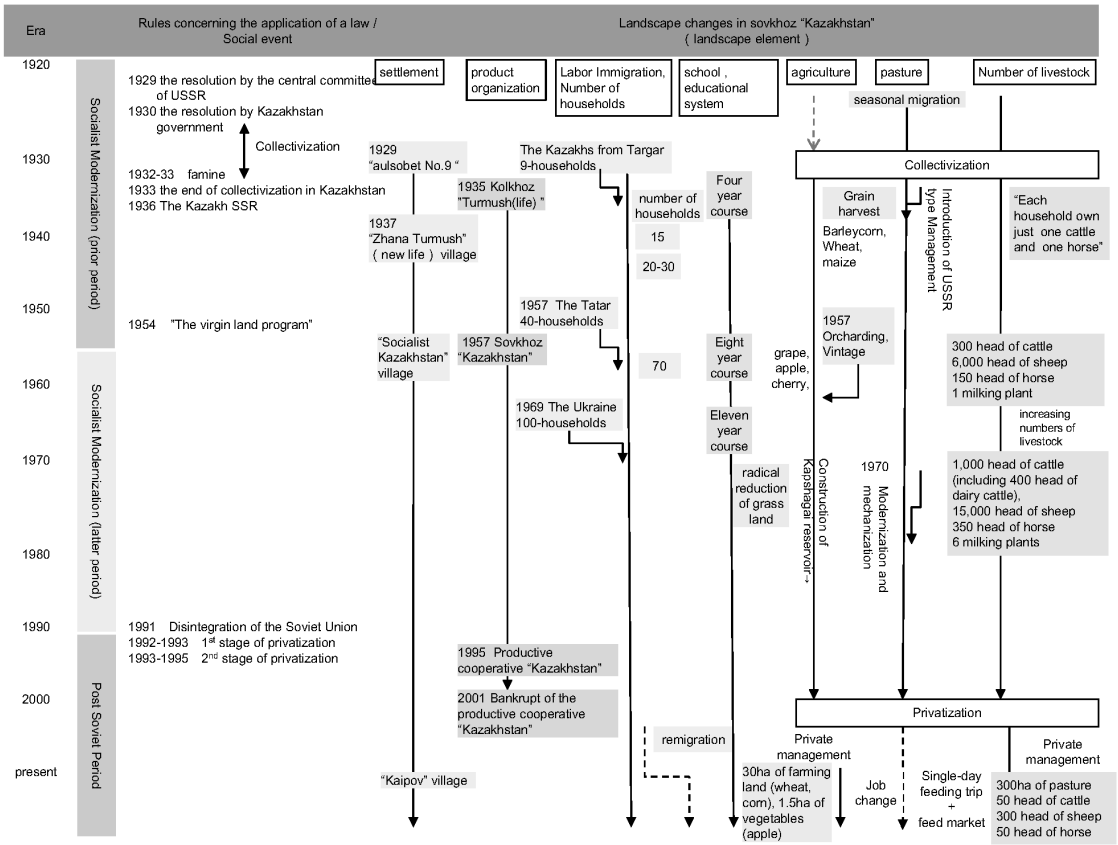


**Fig.6 Landscape change around the Kaipov Village**.

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