



TROPICAL CYCLONES IN THAILAND

HISTORICAL DATA 1951-2010

Climatological Center, Meteorological Development Bureau

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FREQUENCY OF CYCLONES ENTERING THAILAND

Based on weather data regarding the 185 tropical cyclones¹ which made landfall in Thailand over a sixty year period from 1951 to 2010 (Table 1). Thailand is struck on average by three tropical cyclones annually, with the highest storm frequency occurring in October (51 out of 185) and the lowest in April (1 out of 185). The country is free from tropical cyclones from January through March. Almost all of 185 tropical cyclones fall into the category of “tropical depression”, the least severe of storm classifications. Only thirteen of the 185 cyclones are classified as tropical storms and one as a typhoon (Figure 1 and Figure 2).

Table 1: Frequency of Tropical Cyclones Entering Thailand during 1951-2010

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|-------------|-----|-----|-----|------|-----|-----|-----|------|------|------|------|-----|-------|
| 1951 | | | | | | | 1 | | 1 | | | | 2 |
| 1952 | | | | | | | | 1 | 1 | 4 | | | 6 |
| 1953 | | | | | | 1 | | | | | | | 1 |
| 1954 | | | | | | | | | | 1 | | | 1 |
| 1955 | | | | | | | | | 1 | | | | 1 |
| 1956 | | | | | | | | | | | 1 | | 1 |
| 1957 | | | | | | | | | | 1 | | | 1 |
| 1958 | | | | | | | 1 | 1 | 1 | 1 | | | 4 |
| 1959 | | | | | | | | | 1 | 1 | | | 2 |
| 1960 | | | | | | | | | 1 | 1 | 1 | | 3 |
| 1961 | | | | 1 | 2 | | | 1 | | 2 | | | 6 |
| 1962 | | | | | | | 1 | | 1 | 1 | 1 | | 4 |
| 1963 | | | | | | | 1 | | 2 | 1 | 1 | | 5 |
| 1964 | | | | | | | | | 2 | 4 | 2 | 1 | 9 |
| 1965 | | | | | | | | 2 | 6 | | | 1 | 9 |
| 1966 | | | | | | 1 | | | | 2 | 2 | 1 | 6 |
| 1967 | | | | | | | | | 1 | 3 | 1 | | 5 |
| 1968 | | | | | | | | 2 | | 1 | 1 | | 4 |
| 1969 | | | | | | 1 | 1 | | 2 | 1 | 1 | | 6 |
| 1970 | | | | | | | | 1 | 2 | 2 | 2 | | 7 |
| 1971 | | | | | | | 2 | | 1 | 1 | | | 4 |
| 1972 | | | | | | 1 | | | 2 | 1 | | 1 | 5 |
| 1973 | | | | | | | 1 | 1 | 1 | 1 | 2 | | 6 |
| 1974 | | | | | | | | 1 | | 1 | 1 | 1 | 4 |
| 1975 | | | | | 1 | | | | 2 | | | | 3 |
| 1976 | | | | | | | | | | | | | 0 |
| 1977 | | | | | | | | | 1 | | 1 | | 2 |
| 1978 | | | | | | | 1 | 1 | 2 | | 1 | | 5 |
| 1979 | | | | | | | | 1 | 1 | | | | 2 |
| 1980 | | | | | 1 | | | | 2 | | 1 | | 4 |
| 1981 | | | | | | | | | | 1 | | | 1 |
| 1982 | | | | | 1 | | | | 1 | | | | 2 |
| 1983 | | | | | | 1 | | | | 3 | 1 | | 5 |
| 1984 | | | | | | 1 | | | | 1 | 1 | | 3 |
| 1985 | | | | | | | | | 1 | 2 | | | 3 |
| 1986 | | | | | | | | | 1 | 1 | | | 2 |
| 1987 | | | | | | | | 1 | | | | | 1 |
| 1988 | | | | | | | | | | 1 | | | 1 |
| 1989 | | | | | 1 | | | | | 2 | 1 | | 4 |
| 1990 | | | | | | | | 1 | | 2 | | | 3 |
| 1991 | | | | | | | | 1 | | 1 | | | 2 |
| 1992 | | | | | | | | | 1 | 2 | 1 | | 4 |
| 1993 | | | | | | | 1 | 1 | | | | 1 | 4 |
| 1994 | | | | | | | 1 | | 1 | | | | 2 |
| 1995 | | | | | | | | 1 | | | | | 1 |
| 1996 | | | | | | | | | 1 | 1 | 2 | | 4 |
| 1997 | | | | | | | | | 1 | | 1 | | 2 |
| 1998 | | | | | | | | | | | 1 | 1 | 2 |
| 1999 | | | | | | | | | | 1 | | 1 | 2 |
| 2000 | | | | | | | | 1 | 1 | | 1 | | 3 |
| 2001 | | | | | | | | 1 | | | | | 1 |
| 2002 | | | | | | | | | | | | | 0 |
| 2003 | | | | | | | 1 | | | 1 | | | 2 |
| 2004 | | | | | | 1 | | | | | 1 | | 2 |
| 2005 | | | | | | | | | 3 | | | | 3 |
| 2006 | | | | | | | | | | 1 | | 1 | 2 |
| 2007 | | | | | 1 | | | 1 | | 1 | | | 3 |
| 2008 | | | | | | | | | 1 | | | | 1 |
| 2009 | | | | | | | | | 1 | | | | 1 |
| 2010 | | | | | | | | | | | 1 | | 1 |
| Freq. | | | | 1 | 7 | 7 | 12 | 20 | 47 | 51 | 31 | 9 | 185 |
| Avg. | | | | ~0.0 | 0.1 | 0.1 | 0.2 | 0.3 | 0.8 | 0.9 | 0.5 | 0.2 | 3.1 |
| Rel Freq(%) | | | | 0.5 | 3.8 | 3.8 | 6.5 | 10.8 | 25.4 | 27.6 | 16.8 | 4.9 | 100 |

Source: Climatological Center, Thai Meteorological Department, 2011.

¹ By international agreement, tropical cyclones are classified as (i)Tropical depression (maximum wind at its center less than 34 knots) (ii)Tropical storm (maximum wind at storm center 34 to 63 knots), and (iii)Typhoon (maximum wind at storm center greater than 63 knots). (1 knot = 1.853 km/hr)

Figure 1: Frequency of Tropical Cyclones Entering Thailand(1951-2010)

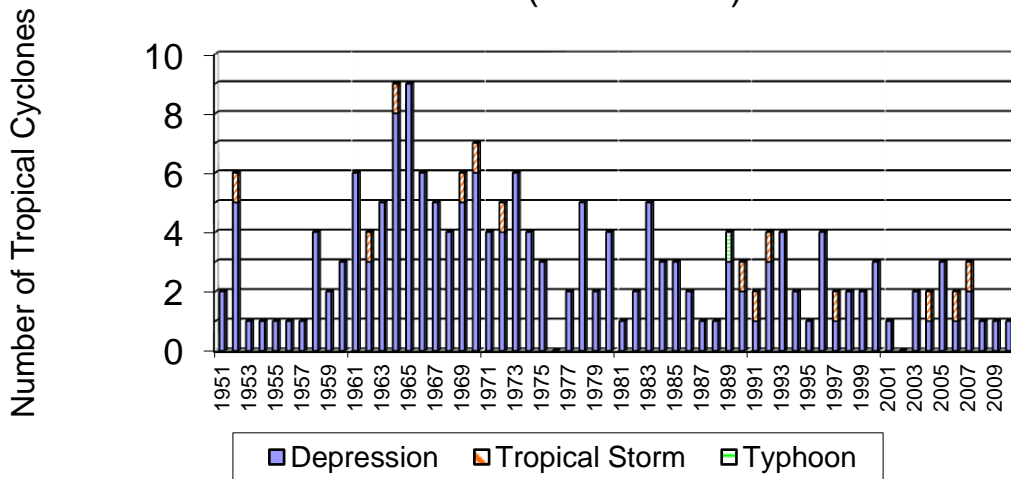
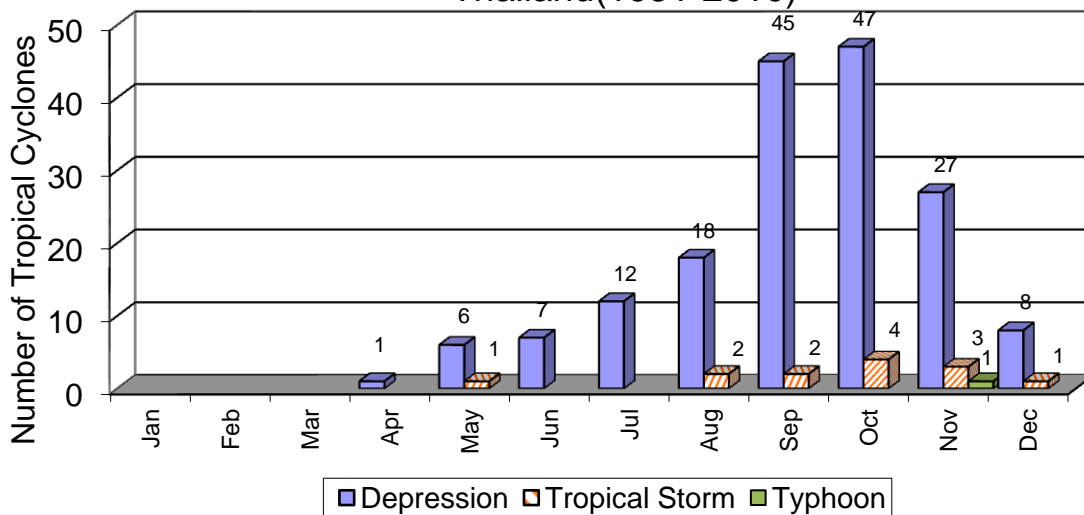


Figure 2: Monthly Frequency of Tropical Cyclones Entering Thailand(1951-2010)



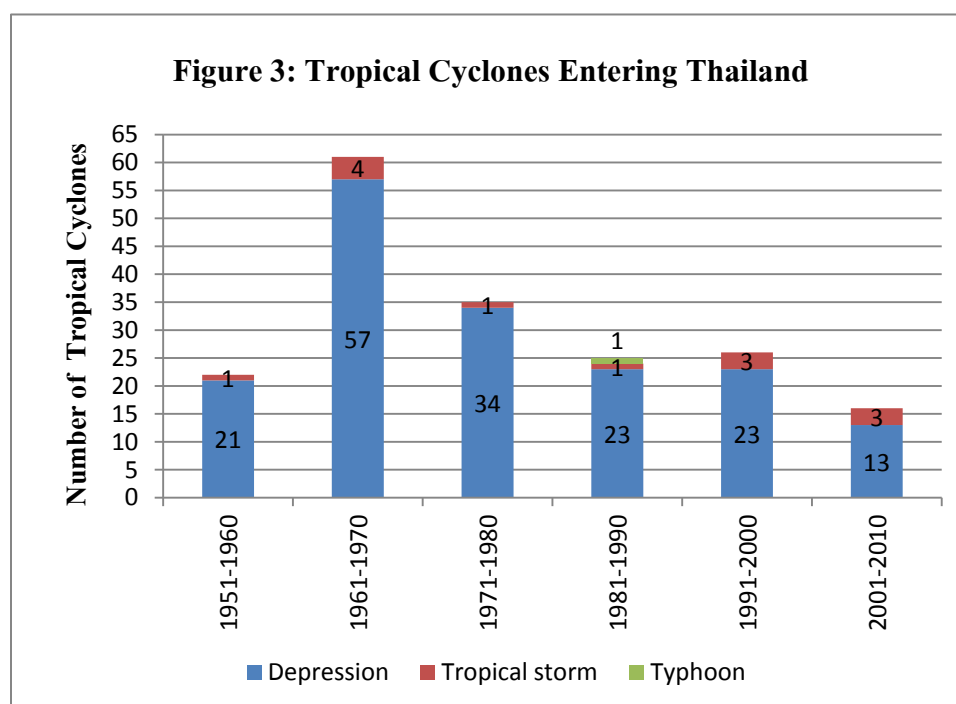
Source: Climatological Center, Thai Meteorological Department, 2011.

In the D1 (1951-1960) (Table2), twenty-two tropical cyclones passed through Thailand. During the six decades for which records are available, the highest number of tropical cyclones occurred in the D2 (1961-1970), when sixty-one storms passed through Thailand. The cyclone frequency during the D3 (1971-1980) was about one-half of the D2 figure, while in the D4 (1981-1990) and D5 (1991-2000), twenty-five and twenty-six cyclones passed through the country respectively. The lowest number of tropical cyclones was sixteen in the D6 (2001-2010) which the annually average of one to two tropical cyclones. In 2005 and 2007, the maximum number of tropical cyclones to occur in one year was three, while in the rest years, only one or two tropical cyclones occurred, excepted in 2002 was free from tropical cyclone throughout the year. For the intensity of tropical cyclones (Figure 3), the proportion of severe storm in the D6 (2001-2010) was highest during the six decades; while in the D4 (1981-1990) only one typhoon occurred in 1989.

Table 2: Decadal Frequency of the Tropical Cyclones Entering Thailand

| Decade | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Sum | Avg. |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| D1(1951-1960) | | | | | | 1 | 2 | 2 | 6 | 9 | 2 | | 22 | 2.2 |
| D2(1961-1970) | | | | 1 | 2 | 2 | 3 | 6 | 14 | 16 | 12 | 3 | 61 | 6.1 |
| D3(1971-1980) | | | | | 2 | 1 | 4 | 4 | 11 | 5 | 5 | 3 | 35 | 3.5 |
| D4(1981-1990) | | | | | 2 | 2 | | 2 | 3 | 12 | 4 | | 25 | 2.5 |
| D5(1991-2000) | | | | | | | 2 | 4 | 5 | 5 | 7 | 3 | 26 | 2.6 |
| D6(2001-2010) | | | | | 1 | 1 | 1 | 2 | 5 | 3 | 2 | 1 | 16 | 1.6 |
| Total | | | | 1 | 7 | 7 | 12 | 20 | 47 | 51 | 31 | 9 | 185 | 3.1 |

Source: Climatological Center, Thai Meteorological Department, 2011.



Source: Climatological Center, Thai Meteorological Department, 2011.

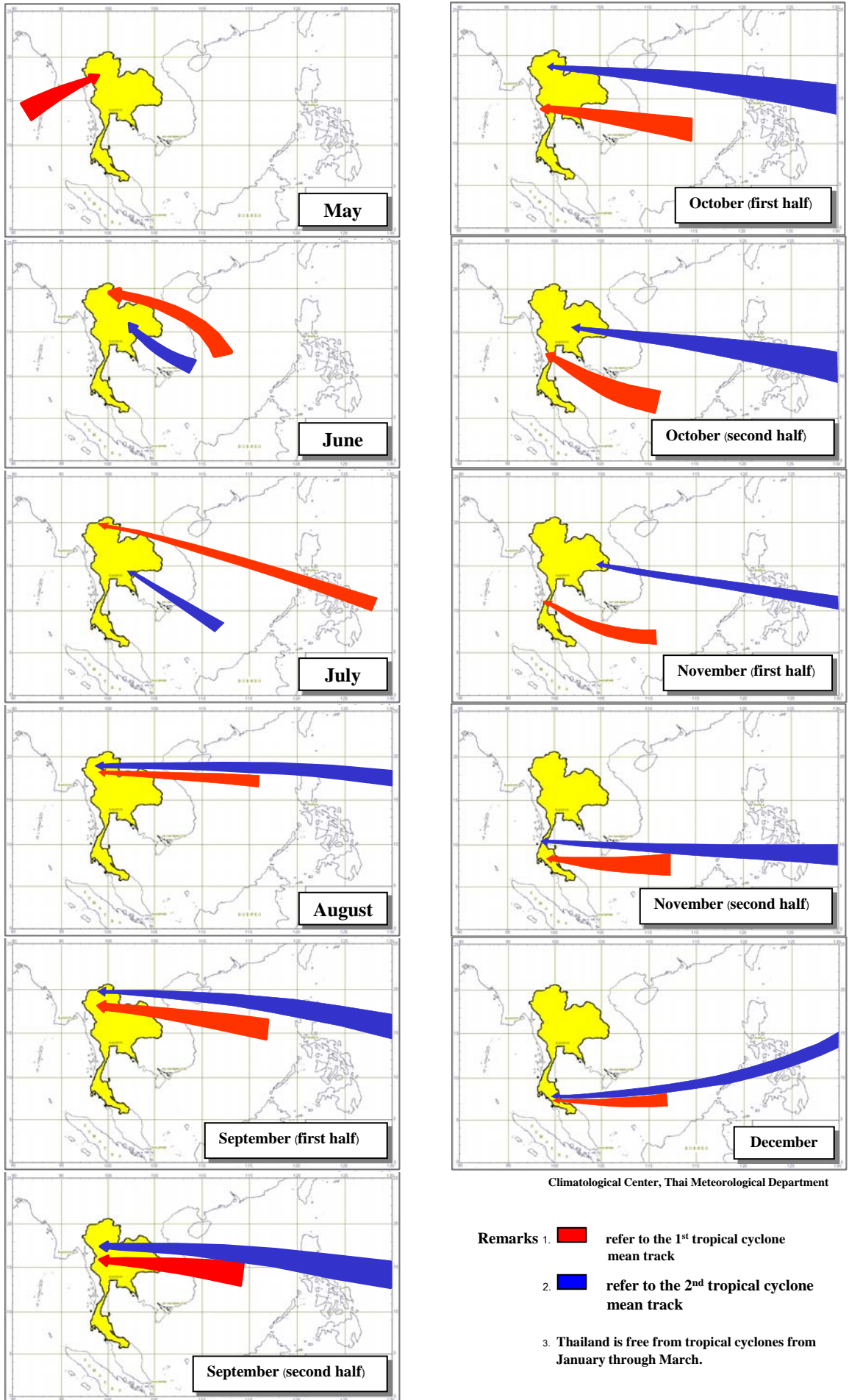
TRACKS OF TROPICAL CYCLONES

Thailand is located between two major sources of tropical cyclones: The South China Sea and the Bay of Bengal. The typical paths followed by cyclones from these sources can be summarized as follows:

Tropical Cyclones Originating in the South China Sea

An analysis of tracking data indicates that most tropical cyclones affecting Thailand originated in the West Pacific Ocean and /or the South China Sea (see Figure 4). These cyclones moved westward toward Vietnam, Laos, Cambodia and Thailand. From June to August, the mean track of the tropical cyclones crosses Northeastern and Northern Thailand. The mean track during September and October moves southward across the lower portion of the Northeastern, Eastern and Central regions, toward the upper portion of Southern Thailand. The mean track continues to move southward in November and December, across the southern peninsula and south of Chumphon Province.

Figure 4: Tracks of Tropical Cyclones entering Thailand



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- Remarks 1.  refer to the 1st tropical cyclone mean track
2.  refer to the 2nd tropical cyclone mean track
3. Thailand is free from tropical cyclones from January through March.

Tropical Cyclones Originating in the Bay of Bengal

Before the onset of the southwest monsoon season, most tropical cyclones which develop in April in the Gulf of Thailand move through southern region toward the Andaman Sea. In May, tropical cyclones in the Indian Ocean and/or the Andaman Sea move through the Bay of Bengal toward Myanmar and Thailand. The mean track of tropical cyclones during these months lies along the west of the country, especially in the vicinity of border between Thailand and Myanmar (Figure 4). Tropical cyclones entering Myanmar have great influence on some areas of the lower northern, central and southern regions of Thailand, where heavy rainfall and flash flooding often take place during these cyclones.

VULNERABILITY TO TROPICAL CYCLONES

Almost all of the 185 tropical cyclones recorded from 1951 to 2010 in Thailand fall into the category of “tropical depression”, the least severe of storm classifications. Only thirteen of the 185 cyclones are classified as tropical storms, and one as a typhoon (Table 3).

Table 3: Tropical Cyclones with Scale Greater Than Depressions Occurred Since 1951

| Tropical Storm or Typhoon Name | Date Entering Thailand | Track of Storm Within Thailand |
|---|-----------------------------------|---|
| VAE ^{1/} | 22 October 1952 | Trat, Chanthaburi, Chon Buri |
| HARRIET ^{1/} | 29 October 1962 | Nakhon Si Thammarat |
| TILDA ^{1/} | 23 September 1964 | Nakhon Phanom |
| DORIS ^{1/} | 3 September 1969 | Nakhon Phanom |
| RUTH ^{1/} | 30 November 1970 | Surat Thani |
| SALLY ^{1/} | 5 December 1972 | Chumphon ,Surat Thani, Ranong |
| GAY ^{2/} | 4 November 1989 | Chumphon |
| BECKY ^{1/} | 30 August 1990 | Nong Khai, Nan and Phrae |
| FRED ^{1/} | 17 August 1991 | Nakhon Phanom, Sakon Nakhon, Udon Thani, Loei |
| FORREST ^{1/} | 15 November 1992 | Nakhon Si Thammarat, Surat Thani, Phang-nga |
| LINDA ^{1/} | 4 November 1997 | Prachuap Khiri Khan |
| CHANTHU ^{1/} | 13 June 2004 | Ubon Ratchathani, Yasothon, Roi Et, Kalasin, Udon Thani, Nong khai |
| XANGSANE ^{1/} | 2 October 2006 | Ubon Ratchathani, Yasothon, Roi Et, Surin, Nakhon Ratchasima |
| LEKIMA ^{1/} | 4 October 2007 | Nong Khai, Loei |

Remark: ^{1/} Tropical Storm, ^{2/} Typhoon

Source: Climatological Center, Thai Meteorological Department, 2011.

Tropical cyclones originating in the southwestern part of the North Pacific Ocean usually develop their greatest strength while over water, as moisture from the ocean surface feeds cyclone activity. As these cyclones move westward through Vietnam, Laos and Cambodia, toward Upper Thailand, they tend to lose much of their strength, as passing over dry land. Thus, most of tropical cyclones entering Upper Thailand are generally of diminished strength, usually falling under the classification of tropical depression or low pressure cell (tropical disturbance). Though diminished in strength, these cyclones typically bring heavy rain, moderately to strong winds and extensive cloudiness.

Unlike Upper Thailand, the southern or peninsula region is not protected from severe weather by any significant geological features. Coastal areas in this region face the full impact of cyclones moving landward from the ocean. Only as the cyclones advance further inland is their strength diminished. Great amounts of rainfall and widespread destruction of property often occur when these tropical cyclones reach coastal areas. For example, typhoon “GAY” which struck Chumphon in 1989, demonstrated clearly the destructive power of severe tropical cyclones, resulting in loss of human life, along with extensive crop and property damage (Table 4 and 5).

Table 4: Ten of the Tropical Cyclones that caused the heaviest damage to property in Thailand.

| No. | Year | Affected Period | Source | Episodic Area |
|-----|------|-----------------|---------------------------|--------------------------------|
| 1 | 1980 | 6-7 Sep. | Depression | 47 Provinces in Upper Thailand |
| 2 | 2009 | 29Sep.-2 Oct. | Depression “KETSANA” | 40 Provinces in Upper Thailand |
| 3 | 1990 | 19-23 Oct. | Depression “LOLA” | 38 Provinces in Upper Thailand |
| 4 | 2006 | 1-2 Oct. | Tropical Storm “XANGSANE” | 36 Provinces in Upper Thailand |
| 5 | 2001 | 9-13 Aug. | Depression “USAGI” | 35 Provinces in Upper Thailand |
| 6 | 2007 | 4-6 Oct. | Tropical Storm “LEKIMA” | 32 Provinces in Upper Thailand |
| 7 | 2008 | 30 Sep.-1 Oct. | Depression “MEKKHALA” | 31 Provinces in Upper Thailand |
| 8 | 2005 | 13 – 15 Sep. | Depression | 30 Provinces in Upper Thailand |
| 9 | 1991 | 17-20 Aug. | Tropical Storm “FRED” | 29 Provinces in Upper Thailand |
| 10 | 1990 | 5-9 Oct. | Depression “IRA” | 28 Provinces in Upper Thailand |

Source: Climatological Center, Thai Meteorological Department, 2011.

Table 5: Ten Most Destructive Tropical Cyclones that Affected Thailand in terms of death.

| No. | Year | Affected Period | Source | Episodic Area | Dead |
|-----|------|-----------------|---------------------------|---------------------------------|------|
| 1 | 1962 | 24-26 Oct. | Tropical Storm “HARRIET” | Southern part | 935 |
| 2 | 1989 | 31 Oct.-5 Nov. | Typhoon “GAY” | Southern part | 602 |
| 3 | 2001 | 9-13 Aug. | Depression “USAGI” | Upper Thailand | 177 |
| 4 | 2010 | 31 Oct.- 4Nov. | Depression “JAL 05B” | Southern part | 78 |
| 5 | 2008 | 30 Sep.-1 Oct. | Depression “MEKKHALA” | Upper Thailand | 26 |
| 6 | 2006 | 1-2 Oct. | Tropical Storm “XANGSANE” | Upper Thailand | 22 |
| 7 | 2007 | 4-6 Oct. | Tropical Storm “LEKIMA” | Upper Thailand | 17 |
| 8 | 1985 | 12-13 Oct. | Depression | Southern part | 10 |
| | 2005 | 27 Sep.-9 Oct. | Depression “DOMREY” | Upper Thailand | 10 |
| 9 | 1997 | 1-4 Nov. | Tropical Storm “LINDA” | Central and Southern parts | 9 |
| 10 | 1982 | 6-8 Sep. | Depression “HOPE” | Northern and Northeastern parts | 6 |

Source: Climatological Center, Thai Meteorological Department, 2011.