Frontiers

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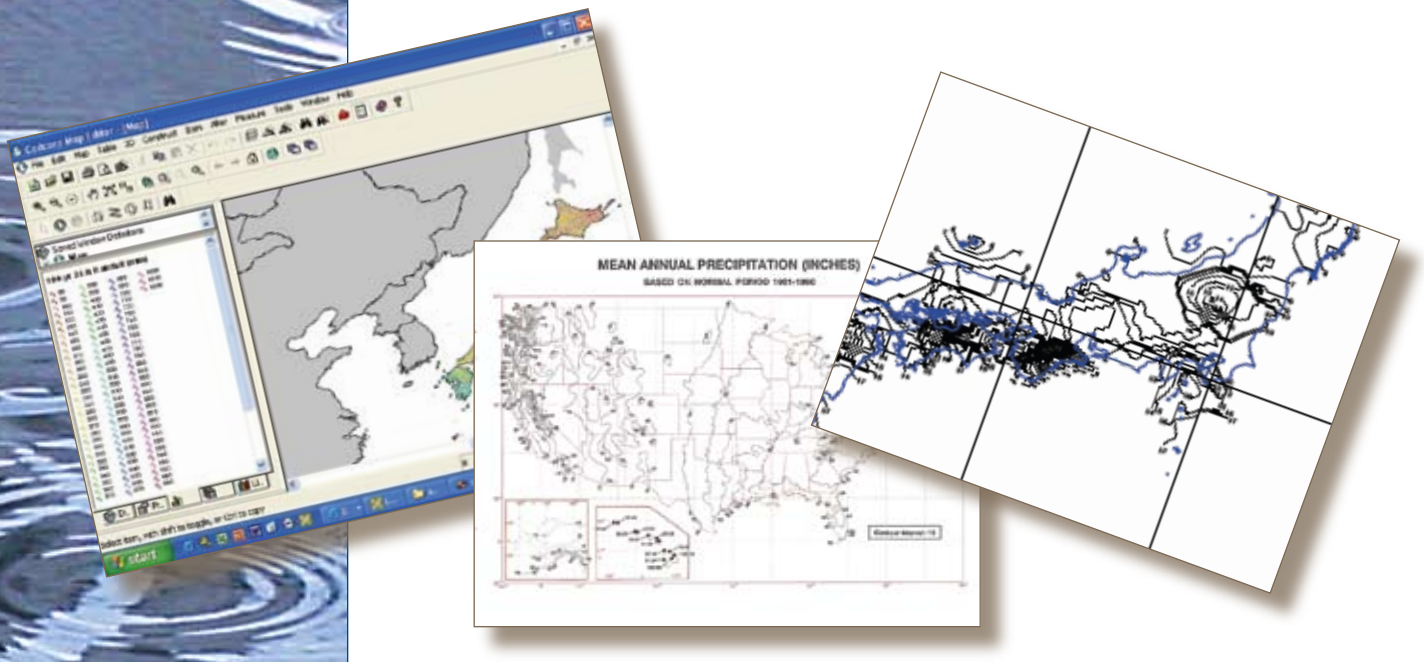
A publication reporting on FM Global's recent advances in property loss prevention research

It's Raining Research!

Maps and models—another weapon in the fight against flood



You can't entirely predict the weather, though most experts agree devastating storms like Hurricane Katrina are inevitable, and the powerful wind, storm surge and torrential rain are standard features.

While the cyclical nature of weather patterns and climate change are established facts, the mechanisms and exact timing of these changes are not fully understood.

But just because you can't predict the weather, doesn't mean you can't prepare for it.

"FM Global has worked hard on many fronts to help clients better prepare for severe weather events such as those witnessed during the recent hurricane season," said Clive Goodwin, assistant vice president, flood engineering and underwriting. "Rather than react to events, we adhere to a far more proactive strategy: following an approach to flood and wind risk that has proven successful for us in fire and explosion property loss prevention."

Tried and true

One of the building blocks to FM Global's success throughout its 170-year history is the application of research and engineering principles to reduce property loss, which has driven fundamental research, standards development, loss prevention guidelines and product testing to prevent loss from natural and man-made disasters. The lessons learned during Hurricane Andrew in 1992, which resulted in insurance losses of more than US$20 billion, strengthened existing wind-related research, and were used to develop new test protocols for products, improved standards and the development of wind-resistant products for building envelopes.

"The advances we've made over the years and those made following Andrew have been proven in real-world practice," Goodwin said.

A flood of interest

FM Global has understood for years that proper site location and construction is fundamental to protecting against

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— Mike Scheffler, senior research specialist

flood. For sites already exposed to flooding, it is important to develop a flood emergency response plan (FERP) to respond in the event of an impending flood. This plan can include steps such as flood-barrier protection (see page 8), and efforts are underway to develop scientifically tested Approval Standards for flood-barrier products. However, these steps are only good if used in concert with proactive measures such as site planning, which relies on an extensive understanding of the nature of flooding in general and its impact on specific sites and locations.

Research efforts are underway to develop, improve and expand the use of modeling and mapping to identify and assess the aggregate risk from flooding. This will allow for better understanding of the flood exposures in a particular area and the potential effects of this hazard on facilities. The ultimate goal is to achieve a level of knowledge that will help reduce losses through engineering measures.

Senior Research Specialist Mike Scheffler is currently working to refine FM Global's modeling accuracy and extend it for use in other global regions.

"We have a pretty good handle on the major drainage basins and coastal flood zones," Scheffler said. "We are working now to add even greater detail and provide the capability to model

Increased Hurricane Activity

Most experts agree, since 1995, we have been in a period of increased Atlantic tropical storm and hurricane activity which is predicted to continue for the next 20 years.

FM Global prepares a detailed assessment of each hurricane season to review what took place, lessons learned and ponder any detectable trends.

Following the overactive 2004 season, the 2005 season has been recorded as the most active hurricane season in history. It produced 27 named storms including 14 hurricanes, seven of which became major hurricanes (category 3 or higher). This continued above-average tropical cyclone activity can be explained as part of the multi-decadal cycle. The contribution of global warming to the observed enhanced activity is still a matter of debate.

The most recent assessment notes various perspectives on the global warming issue, but concludes the latest increased hurricane activity is directly linked to warm sea surface temperatures and weak vertical wind shear (the difference in speed and direction of winds at varying altitudes) in the main development region (MDR). This region consists of a portion of the tropical Atlantic Ocean and Caribbean Sea. About 70 percent of hurricanes and 93 percent of major hurricanes in the Atlantic basin were formed in the MDR from 1995 through 2005.

scenarios more easily. For instance, 1972's Tropical Storm Agnes was a huge flood event for many Atlantic states and particularly for some northeastern states. What if that event had struck 50 miles to the west or 50 miles to east? What would have been the impact?"

Another important element for the big weather picture is rainfall, particularly when the event reaches extreme conditions. Jeff McCollum, senior research scientist, is helping to strengthen the flood mapping toolset by adding detailed data on U.S. and global precipitation.

"For the FM Global flood aggregation modeling project, we're gathering the most detailed historical rain-gauge information we can find and using it to analyze and model the rainfall that led to extreme flooding events. We want to both understand what led to those events and examine 'what if' scenarios," McCollum explained.

Rainfall data used in the new modeling project is obtained from both The National Oceanic and Atmospheric Administration (NOAA) and the U.S. Geological Survey (USGS). "Our best data are from 1949 to the present," McCollum noted. "We look at three types of natural events: hurricanes/tropical storms, heavy rain and snowstorms. Flooding is such a complex process, with so many variables; the more information we can incorporate into the model, the more accurate our projections will be."

In an effort to better understand the driving forces and major patterns of precipitation throughout Europe, McCollum recently completed a study using European rain-gauge data to develop contour maps showing the 100-year, 24-hour rainfall. This precipitation amount is defined as the 24-hour value that has a one-percent chance of being exceeded in a particular year.

The detailed report provides country-by-country descriptions of climate characteristics, rainfall extremes and sample flood events. The written report in combination with the 100-year, 24-hour rainfall maps helps assess locations.

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Despite all this, Goodwin said, you cannot rely on flood maps and modeling alone. FM Global data indicate that properties located within the one-percent zone are more than twice as likely to experience a flood loss than a fire or explosion. Maps and flood zones paint a flood picture that is "black and white" Goodwin said, when the reality is not so clear-cut.

"The development of maps and modeling scenarios does not always paint the entire picture," he said. "These two elements should always be used in concert with a detailed on-site study and proactive property protection measures."

Computer modeling, engineering field analyses, surveys, studies, standards, flood emergency response plans and site-specific recommendations should all be used to reduce loss. Ongoing research efforts into climatological trends and efforts to enhance mapping and modeling scenarios will add to FM Global's understanding of the potential for flood damage.

"The FM Global engineering and research approach is based on the philosophy that the majority of property loss is preventable," Goodwin said. "This philosophy extends to climate-related risks, including hurricanes, tropical storms, extreme rainfall, snow and flooding. Armed with the right information, FM Global can help mitigate losses and reduce the potential for downtime as a result of disaster." ▪