



A probabilistic flood model for continental China

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Flooding is the driving cause of economic loss from natural catastrophes in China due to a combination of significant flood hazard and fast-paced growth in flood-exposed areas. This has been brought into focus in recent years, with significant flood events occurring annually. For example, the summer of 2016 brought the most destructive flooding to the country since 1998 and caused over USD38 billion of economic loss.

Although the share of properties that has insurance cover is low, there is rapid growth in insurance take-up, and flood events in China have growing potential for impact on global reinsurance markets. There is considerable interest in the re/insurance industry to close the protection gap, but it has been difficult to assess flood on the national scale without an appropriate catastrophe model. With increased computational performance, ever more detailed meteorological, hydrological and high-resolution Digital Elevation Models (DEMs), as well as the improved documentation of economic values (e.g. buildings) and national research on vulnerability, the development of a national/continental scale flood model has become a realistically achievable goal.

We will present the results of a first of its kind probabilistic flood risk model for China, designed to estimate present-day flood risk for both economic and insurance applications. Building on an existing global suite of flood hazard maps and a global stochastic flood event catalogue and supplemented with extensive data on built environment and flood vulnerability in China, the model includes national-scale river and surface water flood hazard as well as tropical cyclone and non-tropical cyclone driven stochastic events. It covers continental China, excluding the western-most provinces of Qinghai, Tibet and Xinjiang Uyghur and including Hong Kong and Macao.

We demonstrate the challenges in achieving a meaningful estimate of the economic and insured risk from flooding for China, and benchmark losses against loss experience in the region (economic loss databases like CATDAT, EM-DAT, Munich Re's NATHAN, etc.). With an economic portfolio representing USD38.5 trillion of exposure, the annual average loss from the model with non-tropical cyclone events is USD8.6 billion and the 1 in 200-year loss USD50.2 billion. With Tropical Cyclone events included, the annual average loss from the model is USD24.3 billion and the 1 in 200-year loss USD102.9 billion. This shows that even given the strong investment into flood risk mitigation by the Chinese government over the past decades, extreme scenarios of flooding are still possible and may be under-estimated in their impact on the economy.