



China Historical Flood Loss Database: Development and use for Insurance applications

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In the past China has experienced frequent and costly flooding. Major events like the 1998 floods in the Yangtze River basin have led to massive investments into flood risk reduction measures over the past two decades. Yet, economic flood losses in 2016 still amounted to \$20bn USD (Munich Re, 2017). There has been substantial interest in better understanding the actual risk of flooding in China both from an economic as well as from an insurance perspective. Over the past 1.5 years, we have developed the first fully probabilistic flood risk model for China (EGU2019-8557) for insurance and reinsurance applications. For validating the model, historic loss data played a pivotal role.

Historic flood loss data throughout China had so far been characterised in a number of existing databases including EM-DAT, DFO, ADRC, other smaller databases, and various industry databases like e.g. Munich Re's NatCat Service, SwissRe's Sigma and more recent AONs global reports. However, a consistent database for China has not been established previously and some of the most important systematic Chinese sources and inventories (e.g., China Meteorological Yearbooks, Chinese Flood Yearbooks, Big Book of China Meteorological Disasters, and others) have not been exploited. Further, for catastrophe model validation more detailed knowledge is needed on the type of flooding (e.g., river flood or typhoon induced), the spatial and temporal event characteristics, and the economic sectors impacted by any flood event. Normalising losses of the past to account for vulnerability and exposure changes is a key challenge. So far, various approaches are used in the existing databases, often adding substantial uncertainty to the loss estimate. Methods are required that better reflect the specific socioeconomic developments of a country.

We present a customized database for flood losses in China. For this, the existing CATDAT historic loss database was used and updated with historic inventory of flood damage and socio-economic loss data from Chinese sources and homogenized with all other known databases. The CATDAT China Flood Loss Database lists damaging flood events from 1950 onwards and flood frequency and yearly loss summaries from 1850 onwards. It includes both direct and indirect losses from historical events. The historical sectoral distributions were examined as part of past events, using generic rules as well as the various Chinese Loss Standards for direct and indirect economic losses post-disaster. Importantly, we attempt a correction of the past losses by including the investments in flood defences as a proxy for reduced vulnerability.

We compare the losses of the new database against the individual other databases and against modelled loss. Specifically, we highlight the impact of normalisation and vulnerability reduction on the timeseries of loss and exceedance probability curves for annual maximum losses and annual aggregate losses. With this study we demonstrate the importance of considering country specific sources (both, event archives as well socioeconomic data) for event catalogue completeness (both, event occurrences and event descriptors) and, eventually, for catastrophe model validation.