Geophysical Research Abstracts
Vol. 17, EGU2015-4882, 2015
EGU General Assembly 2015

Estimating hypothetical present-day insured losses for past intense hurricanes in the French Antilles

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On the islands of the French Antilles, the period for which systematic meteorological measurements and historic event loss data are available is short relative to the recurrence intervals of very intense, damaging hurricanes. Additionally, the value of property at risk changes through time. As such, the recent past can only provide limited insight into potential losses from extreme storms in coming years. Here we present some research that seeks to overcome, as far as is possible, the limitations of record length in assessing the possible impacts of near-future hurricanes on insured properties.

First, using the archives of the French overseas departments (which included administrative and weather reports, inventories of damage to houses, crops and trees, as well as some meteorological observations after 1950) we reconstructed the spatial patterns of hazard intensity associated with three historical events. They are: i) the 1928 Hurricane (Guadeloupe), ii) Hurricane Betsy (1956, Guadeloupe) and iii) Hurricane David (1979, Martinique). These events were selected because all were damaging, and the information available on each is rich.

Then, using a recently developed catastrophe model for hurricanes affecting Guadeloupe, Martinique, Saint-Barthélemy and Saint-Martin, we simulated the hypothetical losses to insured properties that the reconstructed events might cause if they were to reoccur today. The model simulated damage due to wind, rainfall-induced flooding and storm surge flooding. These ‘what if’ scenarios provided an initial indication of the potential present-day exposure of the insurance industry to intense hurricanes.

However, we acknowledge that historical events are unlikely to repeat exactly. We therefore extended the study by producing a stochastic event catalogue containing a large number of synthetic but plausible hurricane events. Instrumental data were used as a basis for event generation, but importantly the statistical methods we applied permit the extrapolation of simulated events beyond the observed intensity ranges. The event catalogue enabled the model to be run in a probabilistic mode; the losses for each synthetic event in a 10,000-year period were simulated. In this way, the aleatory uncertainty associated with future hazard outcomes was addressed.

In conclusion, we consider how the reconstructed event hazard intensities and losses compare with the distribution of 32,320 events in the stochastic event set. Further comparisons are made with a longer chronology of tropical cyclones in the Antilles (going back to the 17th Century) prepared solely from documentary sources. Overall, the novelty of this work lies in the integration of data sources that are frequently overlooked in catastrophe model development and evaluation.