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From Global Climate Modelling to Catastrophe Modelling: a risk assessment supply chain made possible through the Willis Research Network

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Using the application of simulated tropical cyclones as a case study, we will present a critical review of the end-to-end process of taking scientific research through to cat model development for the insurance industry. We will look at lessons learned, and the outlook for the supply chain developing from academic research to industry.

Relying on a limited period of observed data to conduct tropical cyclone risk assessment would ignore the non-stationary nature of the climate system. Simulated tropical cyclones are extracted from multi-decadal to multi-century, high-resolution global climate model (GCM) integrations using a feature-tracking algorithm. We have found that GCMs with a horizontal resolution higher than 100km are able to realistically reproduce observed tropical cyclone numbers, location and interannual variability. Using a co-developed tropical cyclone hazard lab, we compare the hazard event-sets created from an historical tropical cyclone database alongside those created from simulated tropical cyclone databases. The simulated storm event-sets, derived from a dynamical, global model, are complementary to the existing hazard event-sets, and provide a way to explore the impact of natural variability on tropical cyclone risk. These event-sets are imported into a modular and user-friendly catastrophe model platform, which allows the various parties along the cat modelling supply chain to test sensitivities at each stage of the catastrophe modelling processes, including exploring the use of different hazard models. The interactive framework allows more transparency and intercomparison of information from very different sources (i.e. observed, dynamically simulated, statistically simulated).

Our collaborative research with other members of the WRN is essential to the successful integration of the simulated tropical cyclones into the catastrophe risk assessment process. For example, we work closely with statisticians at the University of Exeter to explore bias correction methodologies, required to bring our simulated tropical cyclone intensities to observed levels (although with increased GCM resolution, and consequently increased simulated storm intensity, we become less reliant on bias correction). Other WRN partners also explore GCM simulation of tropical cyclones and allow us to undertake an inter-comparison between hazard event-sets and resulting tropical cyclone risk.