

## **Skilful predictions of multi-year US hurricane damages by decadal prediction systems**

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North Atlantic tropical cyclones are the costliest natural hazard affecting the US, capable of causing hundreds of billions of dollars of damages in a single season. Tropical cyclone activity has been observed to show considerable decadal variability, linked with variations in sea surface temperatures in regions of the North Atlantic such as the main hurricane development region (MDR) and sub-polar gyre (SPG).

In this presentation we show that a multi-model ensemble of initialised climate models, known as decadal prediction systems, can skilfully predict north Atlantic hurricane activity and consequent US damages on multi-annual timescales, with a correlation coefficient of approximately 0.7 for both measures. Rather than tracking tropical cyclones directly in the dynamical models, we calculate an index based on predicted temperatures over the north Atlantic. Linear regression based on past observations is then used to calculate a probabilistic hurricane activity forecast. The US damage forecast, however, uses a modified regression method to take into account the non-linear relationship between the model index and damage.

The skill of this dynamical-statistical hybrid forecast outperforms persistence, and could aid decision making for the (re)insurance industry over the US. As part of the Copernicus Climate Change Service, a publicly available probabilistic forecast of 5 year mean north Atlantic hurricane activity and US damages has been produced.