Geophysical Research Abstracts
Vol. 21, EGU2019-3137, 2019
EGU General Assembly 2019

Global Tropical Cyclone Wind Footprints

James M. Done (1,2), Ioana Dima-West (3), Ming Ge (1), Samuel Phibbs (3), Geoffrey R. Saville (2,3)

(1) National Center for Atmospheric Research, Boulder CO, US, (2) Willis Research Network, London, UK, (3) Willis Re, London, UK

Assessing tropical cyclone (TC) wind risk is challenging in many regions due to a lack of historical TC wind data. In addition, traditional approaches to wind risk modeling may miss important physical effects of coastal hills and changing surface friction. In combination, this can lead to regions of unknown vulnerability and a poor understanding of the viability of re/insurance markets.

This collaboration between academia and the reinsurance industry has led to the development of a physically-based approach to model TC wind footprints that can be applied across scales from a single local event to global TC wind risk assessments. The modeling system simulates the evolution of the low-level wind fields of landfalling TCs, accounting for terrain effects like changes in surface roughness.

The approach fits a parametric wind field model to historical or synthetic TC track data, and brings the winds down to the surface using a 3-dimensional numerical boundary model. Based on the dry primitive equations, and using prognostic turbulence kinetic energy, the boundary layer model spins up a steady state boundary layer wind structure in balance with forcing from the parametric pressure gradient field and surface friction.

The resulting wind footprints for historical US hurricanes compare favorably to surface station observations, available reanalyses, and high-resolution numerical simulations using the Weather Research and Forecasting model. A growing dataset of global historical wind footprints may be used to support event set generation in regions of sparse historical data, understanding inland wind risk in regions of complex topography, and inform near-term and long-term views of wind risk accounting for climate variability and change.