Geophysical Research Abstracts
Vol. 15, EGU2013-11619, 2013
EGU General Assembly 2013

Extratropical transitioning in the RMS Japan typhoon wind field model

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Given its meridional extent and location within the Pacific basin, Japan is regularly impacted by strong winds from cyclones at different stages of their lifecycle. To quantify the associated risk of damage to properties, catastrophe models such as the ones developed by RMS aim to simulate wind fields from thousands of stochastic storms that extrapolate historical events. In a recent study using 25 years of reanalysis data, Kitabatake (2011) estimated that 40 % of all Pacific tropical cyclones completed their transition as an extra tropical system. From a cat modelling point of view it is the increase in wind field asymmetry observed during these transitioning episodes that is critical, with examples like typhoon Tokage in 2004 showing the potential for damaging gusts on both sides of the storm track. In this context a compromise has to be found between the need for complex numerical models able to simulate wind field variability around the cyclone during its entire evolution, and obvious running time constrains. The RMS wind field model is based on an optimized version of the Willoughby parametric profile (Willoughby et al., 2006) which requires calibration against targets representative of cyclone wind fields throughout their lifecycle. We here present the different sources of data involved in the development of this model. This includes (1) satellite products to characterize wind fields from fully tropical storms, (2) high resolution simulations of key transitioning events using the WRF mesoscale model to complement the database at other stages (i.e. for transitioning and fully extra tropical wind fields), and (3) reanalysis data which can be used with Hart (2003)'s cyclone phase space methodology to provide an estimate of the mean duration of transitioning episodes in the Pacific.

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