



The probability of tropical cyclone landfalls in Western North Pacific

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The Western North Pacific (WNP) is the most active basin in terms of tropical cyclone and typhoon occurrences. The densely populated countries that form the western boundary of WNP basin – e.g. China, Japan and the Philippines – are exposed to extreme wind gusts, storm surge and fresh water flooding eventually triggered by Tropical Cyclones (TC) events.

Event-based catastrophe models (hereafter cat models) are extensively used by the insurance industry to manage their exposure against low-frequency/high-consequence events such as natural catastrophes. Cat models provide their users with a realistic set of stochastic events that expands the scope of a historical catalogue. Confidence in a cat model ability to extrapolate peril and loss statistics beyond the period covered by observational data requires good agreement between stochastic and historical peril characteristics at shorter return periods.

In WNP risk management practitioners are faced with highly uncertain data to base their decisions. Albeit 4 national agencies maintain best track catalogues, data are generally based on satellite imageries with very limited central pressure (CP) and maximum velocity (VMAX) measurements – regular flight reconnaissance missions stopped in 1987. As a result differences up to 20 knots are found in estimates of VMAX from different agencies as documented in experiment IOP-10 during Typhoon Megi in 2010.

In this work we present a comprehensive analysis of CP and VMAX probability distributions at landfall across the WNP basin along a set of 150 gates (100 km coast segments) based on best track catalogues from Japan Meteorological Agency, Joint Typhoon Warning Center, China Meteorological Agency and Hong Meteorological Agency.

Landfall distributions are then used to calibrate a random-walk statistical track model. A long simulation of 100,000 years of statistical TC tracks will ultimately constitute the central building block of a basin-wide stochastic catalogue of synthetic TC events fully characterized in terms of their wind and rain footprints.