

Proposing a New Index for Quantifying the Morphology of Tropical Cyclone Tracks in the Pacific Basin

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This paper introduces a new metric for tropical cyclone track shape applicable to the South West Pacific (SWP) and North West Pacific (NWP) basins, based on track sinuosity ratios investigated for all storms over the last four to six decades. A Sinuosity Index (SI) is developed by normalising the distribution of measured sinuosity values using a simple cube-root transformation. Findings suggest that track SI is an important parameter influencing the potential vulnerability of Pacific coastlines and island archipelagoes to cyclone strike. Sinuously-moving cyclones tend to survive longer and a greater proportion of cyclones forming in the western SWP basin tend to follow sinuous tracks, affecting greater areas, rather than cyclones generated farther east. In the NWP basin, it is revealed that later months of the typhoon season (September to December) produce more sinuous tracks compared with earlier months. Long-term patterns illustrate strong inter-annual variability as the principal feature of sinuosity change through time, although not necessarily driven by ENSO, and allow anomalous years to be identified. Quartile division of the SI data enables the grouping of cyclone tracks into an ordinaly-named four-category system: 'straight', 'quasi-straight', 'curving' and 'sinuous', which facilitates the conceptualisation of cyclone-track morphology and improves on traditional binary groupings for track-shape description.

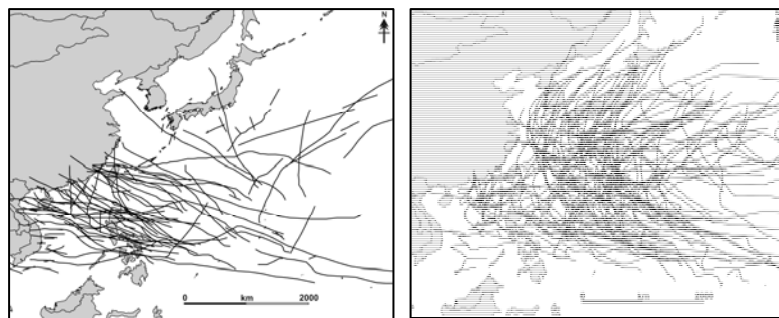


Figure 1. A selection of North Pacific typhoon tracks falling within straight (left) and sinuous (right) categories. Note: only top and bottom 15% in each category are shown.