Comparing the sinuosity of tropical cyclone tracks across major ocean basins

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Tropical cyclones normally deviate from a straight-line path and ‘meander’ during their migration from lower to higher latitudes. This meandering nature means that measuring the *sinuosity* of cyclone tracks provides a useful tool with which to compare the migratory behaviour of cyclones in both spatial and temporal dimensions. For instance, examination of track sinuosity within an individual ocean basin helps to reveal common geographical patterns, while studies through time across many cyclone seasons indicate long-term fluctuations and trends. Comparisons can even be made across multiple basins to investigate whether cyclones generated in different parts of the globe possess major similarities or differences in track shape. In spite of this potential for analysis, however, sinuosity has so far been under-utilised as a metric in studies of cyclone track morphometry.

This presentation will synthesise over a decade of analysis on cyclone track sinuosity characteristics, carried out on best-track data from multiple ocean basins. Findings are drawn from the North Pacific, South Pacific, North Atlantic, South West Indian Ocean and Arabian Sea basins. Fundamentally, no evidence is found for underlying long-term trends in cyclone track sinuosity over recent decades. This suggests an absence of climatic-change forcing on track morphometry at the basin scale for any major cyclone region. Yet, large inter-annual variability and notable episodes of cyclic swings in average track shapes are observed. Pronounced seasonality in track shape is also identified, such that some phases of the cyclone season consistently produce either straighter or more sinuous tracks. There are also zones of cyclogenesis associated with certain track shapes. Such combined influences are important for the vulnerability of certain geographical areas and coastlines at risk of landfall. Overall, cyclones following more sinuous tracks (e.g. with loops and complex backtracks) generally live longer and cover greater distances than cyclones with straighter trajectories. Sinuously-tracking storms therefore pose a greater threat of damage over wider areas.

The example of Cyclone Winston that devastated the Fiji Islands in February 2016 is described. This category-5 system followed an unusually sinuous track and became one of the strongest storms in history for the South Pacific.

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