



Temporal Variability of Tropical Cyclogenesis: A Climatology of the South Pacific

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The total number of tropical cyclones (TCs) occurring across the South Pacific each year traditionally exhibits significant temporal variability. For example, in 1998, 24 TCs were recorded, whilst in 1988, only eight TCs were recorded. Socially, this temporal variability results in increased vulnerability for the 15 island nations of the South Pacific. Therefore understanding what causes this year to year variability is particularly important in combatting this issue. In this study, the South Pacific Basin is analysed in its entirety and across a series of zones over a 67-year period (1945-2011) using the Joint Typhoon Warning Centre (JTWC) Best-Track Dataset. Based on the Overall Mean Centre of Cyclogenesis (OMCC) (15oS, 167.5oE), the Basin was zoned by drawing axis based on the four cardinal directions from the OMCC, creating four quadrants; north-east, south-east, south-west and north-west. Trend analysis was then completed to establish if the number of TCs have changed over time over the entire Basin and within these quadrants. It is shown that, Basin-wide, the number of TCs has decreased over time, a result consistent with many studies. However, when the same analysis was completed for each of the four quadrants, two were actually shown to have increasing TC activity over the same time period, (the north-east and south-east quadrants). Interannual variability was also particularly evident across all four quadrants.

The attribution of climate driver induced variability on the frequency of TCs is also explored. The various phases of Pacific and Indian Ocean climate drivers (positive, negative, neutral) are used in this study, including; El Niño/Southern Oscillation (ENSO), ENSO Modoki (EMI), Interdecadal Pacific Oscillation (IPO), Southern Annular Mode (SAM), Indian Ocean Dipole (IOD) and Indonesian SST variability (II). In comparison with the overall mean of 11.2 TCs per year, TCs that occurred during a positive IOD and negative IPO saw the two most significant increases in TC activity per year (an additional 1.5 and 1.1 TCs per year respectively). A positive II (warmer Indonesian SSTs) and a neutral IPO result in a decrease in the yearly number of TCs by 1.7 and 1.2 TCs per year respectively. The study suggests the possible reasons why this relationship has occurred and draws upon the underlying oceanographic/atmospheric variables responsible for tropical cyclogenesis.