

Analysis of the Seasonal Size-Intensity Relationship Among Tropical Cyclones in the Philippine Area of Responsibility

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ABSTRACT

The Philippines annually sees about 20 tropical cyclones (TCs) enter its area of responsibility. Approximately nine of these TCs eventually make landfall bringing with them various hazards that affect both coastal and inland communities. These hazards are exacerbated specifically upon the evolution of two TC metrics: size and intensity. The relationship between these two metrics varies among the global tropical basins considering the difference in the synoptic patterns that modulate TC evolution as well as the adopted definition of the metrics used in previous studies. Existing literature suggests a generally weak relationship between TC size and intensity, which has also been observed for TCs that form in the WNP basin where the Philippines is located. However, this relationship has not been yet explored for TCs that formed in or entered the Philippine Area of Responsibility (PAR). For this study, the relationship between TC size and intensity among PAR TCs was investigated as well as the potential influence of land on this relationship. Additionally, the seasonal aspect of this relationship was also assessed considering the synoptic patterns that modulate the TC environment exhibited seasonal variability based on existing literature. Using the reconstructed TC size and intensity dataset developed by Xu et al., (2024) based on IBTrACS and ERA5 data, the relationship between the two TC metrics was determined among PAR TCs that passed the selection criteria. Interaction with the Philippine islands on the size-intensity relationship was also considered with respect to seasonality. Finally, the influence of various environmental variables such as sea surface temperature, relative humidity at low-mid levels, and vertical wind shear was also analyzed. All results are subjected to

significance testing at 95% confidence level. The findings of this study may provide additional understanding regarding the relationship between TC size and intensity in a local setting particularly during instances when TCs traverse the Philippines. The study may also contribute meaningful considerations for size and intensity forecasts concerning PAR TCs that could pose impacts on land and its population.

Keywords: Tropical cyclone, PAR, size, intensity, seasonality, sea surface temperature, vertical wind shear, relative humidity