TROPICAL CYCLONE MAINTENANCE AND INTENSIFICATION WITHIN THE PHILIPPINE ARCHIPELAGO

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Tropical cyclones (TCs) are expected to weaken after landfall, primarily caused by the loss of moisture from the oceanic surface and the friction due to land surface interaction disrupting its circulation. However, TC observations in the continental United States and northern Australia as well as TC modeling with varying land cover suggest that TC maintenance or intensification (MI) inland is possible. A global survey conducted in 2013 identified 16 MI events from 1978-2008, but the study required a TC to be completely cutoff from the oceanic surface to be considered as an MI event. As a result, TCs crossing into archipelagos such as the Philippines were excluded from consideration. In this study, I perform a similar spatio-temporal study with adjusted criteria for the Philippine setting. The International Best Track Archive for Climate Stewardship dataset from 1978-2023 was utilized to determine possible MIs and record MI frequency in the country. ECMWF Reanalysis version 5 data on surface-level land latent and sensible heat fluxes and topsoil moisture were analyzed to determine energy and moisture contribution from the surface. Lastly, archipelagic sea contribution in the Visayas and the effect of varying land cover in Luzon were investigated through the Weather Research and Forecasting model.

For the duration considered, Luzon and Visayas were found to have 8 and 25 MI events, respectively. A majority of the MI events recorded were of tropical storm strength traversing Northern and Central Luzon and over the Sibuyan and Sulu Seas in Visayas. Daily mean surface-level land heat fluxes and topsoil moisture showed little difference between MI TCs and non-MI TCs of similar trajectory and seasonality over a two-week antecedent period. This result suggests upper-air characteristics instead is the primary driver for MI. From WRF model runs, archipelagic sea contribution to MI was found to contribute up to 50 kt increase in wind speed and 20 hPa decrease for typhoons and 30 kt increase and 10 hPa decrease for weaker systems. Luzon land cover variations meanwhile showed little difference in the control and modified model runs, indicating that a different mechanism may be predominant for Luzon TC MI events.