

Tropical Cyclone-Humid Heat Compound Events in the Philippines

Vince Jay S. Seda

Adviser: Dr. Rafaela Jane P. Delfino

Institute of Environmental Science and Meteorology, College of Science, University of the Philippines – Diliman

ABSTRACT

Under climate change, the occurrence of extreme events is expected to increase, including combinations of concurrent or sequential extremes known as compound events. One emerging compound hazard is Tropical Cyclone–Humid Heat (TC-H), characterized by elevated humid heat conditions associated with tropical cyclone (TC) passage. TC-induced damage to power infrastructure can deprive affected populations of essential adaptive cooling mechanisms, potentially forcing vulnerable communities to undertake post-TC recovery under extreme thermal conditions and increasing the risk of heat-related morbidity and mortality. Despite extensive research on conventional TC hazards, humid heat events associated with TCs remains underinvestigated. Although studies have examined TC-H events globally, particularly in the Western North Pacific, research focusing on the Philippines remains limited. To address this gap, this study will identify and characterize TC-H compound events in the Philippines from 1995 to 2024 using daily heat index (HI) calculated from synoptic station observations and TC metrics (intensity, track, translational speed) from IBTrACS (at least tropical storm intensity). The study will further examine the spatiotemporal evolution of HI during TC passage using gridded HI data from CHIRTS-ERA5. Finally, the synoptic conditions and physical drivers favorable for TC-H occurrence and development will be investigated using ERA5 reanalysis data and the HYSPLIT model. Ultimately, this study aims to provide actionable insights for improving pre- and post-TC heat stress forecasting, supporting targeted disaster response, and reducing health risks during post-TC recovery.

Keywords: tropical cyclones, humid heat, heat index, compound events