

Storm surge analysis in the eastern region of the Philippines

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Tropical cyclones (TCs) rank the deadliest amongst the natural hazards in the world, mainly because of the associated storm surges. In the Philippines, coastal areas in the east are said to be the most vulnerable but actual records have been sparse. In this study, data from 5 tide gauge stations in the eastern Bicol, Samar, and Leyte (Jose Panganiban, Virac, Catbalogan, Tacloban, and Guiuan) were analyzed to identify occurrence and magnitude of storm surge during the passage of 2016 TCs Carina (International name, Nida), Karen (Sarika), Marce (Tokage) and Nina (Nock-Ten). Meteorological data from synoptic stations and satellite data were also examined to determine the TC parameters that contributed to the surge. Water level abnormally above the predicted astronomical tides, defined as storm surge, were observed for TC Nock-Ten for stations closest and situated at or north of the TC track. Nock-Ten induced a 101.8 cm surge at Virac, highest among the tropical cyclones due to intensified wind towards the coast (40 m/s). Tokage, Sarika, and Nida generated winds weaker than Nock-Ten and produced a surge of less than 50 cm. Interestingly, a 0.36 m surge was recorded at Virac station a day after Tokage's landfall. The cyclone's winds interacted with the northeast monsoon, intensifying the easterly component of the wind as the eye of Tokage was 216 km from the station. For the subset of TCs studied, it has been found that high velocity winds towards the coast are crucial for storm surge to occur and that intensification of perpendicularly-directed winds toward the coast may also induce elevated water levels even when the TC is way past the station location.