



UNIVERSITY OF THE PHILIPPINES

Master of Science in Meteorology

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*Investigating Sea Surface and Vertical Temperature Variability in Philippine
Upwelling Sites Using a Three-Dimensional Global Ocean Reanalysis*

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ABSTRACT

Upwelling brings colder, saltier, and nutrient rich water from the deep ocean to the upper ocean, in turn affecting local weather, ocean circulation, and productivity. In the Philippine setting, upwelling activities are mostly wind-driven and enhanced during the northeast monsoon due to the interaction of winds with islands and coasts. Using the GLORYS12V1 ocean reanalysis, this study investigated upwelling variability and trends along the waters of Northwest Luzon, Palawan, and Zamboanga Peninsula. Winds from ERA5 dataset were also used to compute for upwelling indices based on net transport along the coast (UI_{ET}) and based on upward velocities from wind stress curl (UI_{EP}). Temperature at 0m (surface), 56m, 92m, and 186m depth as well as the upwelling indices were then subjected to Empirical Orthogonal Function Analysis and the resulting dominant modes were correlated to the Multivariate El Nino Southern Oscillation Index to assess interannual variability of upwelling intensity per domain.

Upwelling was observed with manifestation of subsurface cold temperature doming northwest of Luzon at 56m depth and isotherm incline and near-shore low temperature excursion along the coasts of Palawan and Zamboanga at 8m and 40-56m depths respectively. The upwelling index UI_{EP} was found to be more predictive of temperature anomalies than UI_{ET} . However, UI_{ET} is more able to resolve differences in upwelling intensity especially along the coast of Palawan.

Temperature anomalies at lower levels were found to be more sensitive than surface anomalies to variability caused by ENSO. During the ENSO warm phase, Luzon and Palawan had warmer anomalies offshore and nearshore respectively while Zamboanga had colder nearshore anomalies indicating that warm ENSO phase has a slackening effect on Luzon and Palawan and enhancing effect on the Zamboanga domain.