Proposed Title: Effect of site-specific chlorophyll-*a* in shallow water bathymetry

Student: Charina L. Villania
Thesis Adviser: Olivia C. Cabrera, Ph.D
Thesis Reader: Bernard Alan B. Racoma, Ph.D

ABSTRACT

The conventional approach to acquiring bathymetric data is associated with limitations related to time, cost, and labor resources, which have impeded progress in ocean mapping and left extensive marine areas uncharted. This scenario is evident in the Philippines. According to the 2016 report of the International Hydrographic Organization (IHO), only 25% of Philippine marine waters below 200 meters have been adequately surveyed. The emergence of remote sensing methodologies addresses the gaps in these limitations, particularly satellite-derived bathymetry (SDB), which utilizes various algorithms to process remotely sensed data. This study focuses on elucidating variations in ocean chlorophyll-a concentrations through space and time and their impact on bathymetry estimation in Tubbataha Reef Natural Park (TRNP) and Apo Reef Natural Park (ARNP), both of which have recorded coral destruction due to ship groundings. The study employs the algorithm developed by Li et al. (2021), utilizing Google Earth Engine (GEE) and Sentinel-2 Multi-Spectral Instrument Level 2A dataset to estimate shallow-water bathymetry in the freely accessible Allen Coral Atlas. The objective is to generate mosaics spanning different time intervals (12-month, 6-month, 3-month, southwest, northeast, and intermonsoon season) to assess spatial chlorophyll patterns over time. The resulting satellite-derived chlorophyll will be used instead of the default 0.5 ug/L used by Li et al. (2021) and the newly derived bathymetry will be compared with field observations using four error metrics: Root Mean Square Error (RMSE), Bias/Mean Bias Error (MBE), Mean Normalized Bias (MNB), and R-squared (R^2). The derived bathymetry will also be compared with Li et al. (2021) to determine if significant improvement against observations ensue simply by accounting for the spatiotemporal variation of chlorophyll-a in the bathymetric derivation.