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Local Ecological Marine Units for 3D Ocean Mapping and Analysis

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In 2015, a public/private partnership of ecologists, oceanographers and technologists created an open-source 3D dataset and map of the global ocean known as the Ecological Marine Units (EMUs) (Sayer, Wright, et al., 2017). These distinct marine physical and chemical volumetric regions were generated from an environmental stratification of the global ocean. The stratification produced 37 ecological marine units (EMUs) at a base resolution of one quarter degree (approximately 27 kilometers at the equator). The EMUs were objectively derived from non-supervised statistical clustering of over 52 million points from NOAA's World Ocean Atlas 2013 (WOA) database, an authoritative 57-year archive of global water column data. The WOA data were organized into a 3D ocean point mesh which represents a standardized geospatial framework for structuring physical, chemical, and biological data that characterize ocean composition and processes. The EMUs are an open access resource, and are intended to be useful for disturbance assessments, ecosystem accounting exercises, conservation priority setting, marine protected area network design, and other research and management applications.
While the EMUs have proven useful for meso and global scale analyses, they do not have sufficient granularity for local scale analyses along the coast, in smaller bays or estuaries, or protected areas. To overcome this limitation and to incorporate additional data from recent collection activities, a workflow has been developed to create local EMUs. This workflow provides opportunities to supplement the original EMU framework with additional and recent data for these smaller areas, offering additional analytical scenarios such as creating seasonal versions of the EMUs. This paper will discuss workflows and examples of the methodology as well as offer insights into constraints and best practices.