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Bioregionalization of the coastal and open oceans of British Columbia and Southeast Alaska based on highly resolved chlorophyll-a satellite data and an objective classification approach

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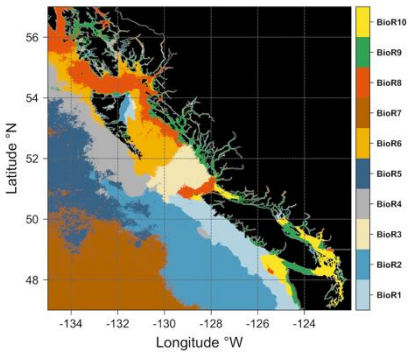

Short Abstract

Despite their highly dynamic nature, physical complexity, and rich biological activity, it is widely accepted that oceans can be partitioned into regions with observable boundaries and distinct properties. Regionalization is a valuable strategy for characterizing surface ocean variability, testing ecological hypotheses, and contextualizing observations. High-resolution satellite-derived products provide valuable data to address this task. This presentation will introduce the two-step classification procedure (i.e., a Self-Organizing Maps (SOM) analysis followed by a clustering method) to regionalize the coastal and open oceans of British Columbia (BC) and Southeast Alaska (SEA), which host essential habitats for several critical species. Across this heterogeneous marine domain, phytoplankton are subject to ocean circulation patterns and atmosphere-ocean-land interactions, and their variability, in turn, influences marine food web structure and function. Specifically, the method based on the seasonal climatology of high-resolution (300 m) Sentinel-3 surface Chlorophyll-a data for 2016-2020 allowed high precision to delineate the boundaries of ten bioregions, revealing the separation between off-shelf bioregions from those in neritic waters. Consistent with the high-nutrient, low-chlorophyll regime, relatively low values of biomass (< 1 mg/m^3) distinguished off-shelf bioregions, which also displayed, on average, more prominent autumn peaks. In sharp contrast, neritic (i.e., coastal shelf) bioregions were highly productive (>> 1 mg/m^3) and characterized by different phytoplankton dynamics, with the initiation of spring phytoplankton bloom varying spatially and inter-annually. Finally, preliminary results suggest that changes in phytoplankton biomass across BC's coastal and open oceans may be linked to the impacts of basin-scale climate modes.