Temporal and Spatial Variability of Nutrients in Clayoquot Sound, BC Canada from 2003-2019

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Abstract:

Nutrients in salt water play a key role in determining primary productivity in the ocean. The availability of dissolved nutrients in sea water is affected by sources and sinks such as rivers and sediments, and vertical mixing processes. This study examines the distribution of dissolved nutrients (Nitrate, Phosphate, Silicate, and Ammonia) in Clayoquot Sound, BC Canada in the fall season from 2003-2019, and explores nutrient distribution shifts pre and post marine heat wave intrusions. Clayoquot Sound is located off the West Coast of Vancouver Island and consists of five fjord inlets. The distribution of nutrients in these inlets is a function of the physical configuration, season, stratification, and local and coastal circulation. Here, we compare different stations in Clayoquot Sound for the levels of nitrate, silicate, and phosphate as well as ammonia. Inlets that have a shallow sill with a deep inner bay tend to have anoxic bottom waters in the fall, resulting in high bottom phosphate and ammonia levels. Nutrient distributions were mapped using Geographic Information System (GIS), and quartile plots were prepared to compare nutrient levels between years with and without marine heat waves. Results showed that surface nutrient averages decreased over the 16-year sampling period. Overall, the spatial patterns between the years showed no difference due to the marine heat wave, but a consistent pattern of nutrient distribution was evident across all years. The northern inlets, Sydney, Shelter, and Herbert, showed high nutrient deep waters compared to the two southern inlets; Bedwell Inlet which had low nutrients overall, and Tofino Inlet which had a gradual increase in nutrients from the mouth to the head of the inlet. A follow-on study examining the difference in physical configuration and forcing conditions between these two sets of inlets is recommended.