**Seasonal Anomalies as Proxies for Phytoplankton Community Response to Climate Trends on a Temperate Continental Shelf**

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Phytoplankton community structure and dynamics have profound effects on the entire ecosystem, but insufficiently sustained and detailed observations have limited our ability to quantify their vulnerability and responses to on-going changes in coastal oceans. A multi-year time series at the Martha’s Vineyard Coastal Observatory (MVCO) is beginning to hint at trends and possible mechanisms of phytoplankton community response in New England Shelf waters. We are exploring whether these suggestive trends are robust and relevant for understanding responses to climate change. We use a combination of detailed in situ sampling including automated flow cytometry for phytoplankton characterization and regional remote sensing products. Our approach capitalizes on the “natural experiments” that occur in response to event-scale dynamics, large amplitude seasonal cycles, and interannual perturbations associated with forcing at the regional scale and larger (e.g., anomalous winters). Initial findings show that important aspects of phytoplankton community structure and its temporal dynamics exhibit patterns of variability associated with changes in water temperature at seasonal, interannual, and multiyear scales. Important examples include picocyanobacteria, which are more abundant during warmer winters and have been systematically increasing in abundance and biomass over the last decade, and a dominant species of diatom, which typically has larger amplitude blooms in colder years. In the former case, temperature dependence appears linked to a direct physiological impact on division rate, while in the latter case, temperature-dependent mortality from a lethal parasite is implicated. General patterns of seasonality can be retrieved from optical proxies and satellite products, but important details about interannual and multiyear trends remain challenging to detect.

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