CC24A-1259 Ocean Acidification and Climate Change as Determinants of Marine Phytoplankton Communities along the U.S. East Coast

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As climate change and carbon dioxide (CO_2) emissions continue to alter oceans, it is critical to understand how marine life will respond. Atmospheric CO_2 dissolves into ocean water, beginning a series of chemical reactions that lower pH and deplete free carbonate ions—this phenomenon is called ocean acidification (OA). Marine phytoplankton impact ocean chemistry by performing photosynthesis and cycling carbon. They also form the base of marine food webs and are thus implicated in fishery productivity and human food security. As part of the National Oceanic and Atmospheric Administration's Ocean Acidification Program, this research aimed to document the progression of OA and its effects on marine life. The project combined data analysis, remote sensing, and laboratory experiments to understand phytoplankton community change. Data from scientific cruises in 2018 and 2022 were compared to investigate inter-annual variability in phytoplankton distribution, size, and efficiency. These cruises measured chemical and biological indicators, including pH, temperature, and pigments associated with particular plankton taxa. Water samples collected at various depths were imaged to gather phytoplankton cell counts. The findings demonstrate a clear pH gradient along the East Coast, with northern waters being significantly more acidic than southern waters. This difference is primarily driven by increased precipitation, land characteristics, and ocean current dynamics. Biological community structure and the photosynthetic efficiency of the phytoplankton sampled along the coast varied with latitude and time, demonstrating that continued climate change and intensifying acidification will affect phytoplankton distribution and consumption of CO_2, with reverberations throughout the ocean and climate systems at large.