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“Aerosol Impacts on Marine Ecosystems”

ABSTRACT: Atmospheric deposition of trace elements and nutrients to the ocean can significantly modify seawater chemistry and influence oceanic productivity. However, mounting evidence suggests that the response of phytoplankton to atmospheric deposition depends on the chemical composition of the aerosols and varies across different phytoplankton species. Responses are also different depending on oceanographic setting and season. To determine if and how nutrients and metals from atmospheric deposition influence phytoplankton community structure in the Ocean we analyzed nutrient (nitrogen and phosphorous) and metal (Fe, Cu, Zn, Ni) concentrations in marine aerosols and tested how these constituents impact phytoplankton. This is done using incubation experiments with natural phytoplankton assemblages with different sources and amounts of aerosol or pure nutrients and metal additions. Laboratory-based culture experiments with phytoplankton from different taxonomic groups helped identify species that were most sensitive to aerosol additions. Variance in utilization of nutrients and susceptibility to metal toxicity was identified among different taxa, suggesting that aerosol deposition could potentially alter patterns of marine primary production and phytoplankton community structure. In addition, input of bioaerosols can also affect phytoplankton communities and should be considered. Changes in atmospheric deposition and aerosol composition that are impacted from natural and anthropogenic change could therefore have effects on ocean chemistry and productivity with potential feedbacks to the carbon cycle.