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Atmospheric Deposition Impacts on Marine Biogeochemistry

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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, metals and other constituents from atmospheric deposition influence plankton activity and community structure in the ocean we analysed nutrient and metal concentrations in marine aerosols and tested how these constituents impact phytoplankton. This is done using incubation experiments with natural phytoplankton assemblages and different sources and amounts of aerosol or pure nutrients and metal 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. Importantly, up to 25% of airborne microbes are viable upon deposition and may compete for resources with marine organisms. Airborne viruses can also infect specific phytoplankton hosts and hence impact the ecosystem. Natural and anthropogenic change could impact the chemical and biological composition of aerosols with consequences to ocean chemistry and productivity with potential feedbacks to the carbon cycle.