

Inorganics in organics: Chemical and biological controls on micronutrient and carbon fluxes in the polar ocean



View from Rpthera Point, Western Antarctic Peninsula. Photo: S. Trimborn (Photo: Alfred-Wegener-Institut)

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In vast areas of the ocean, particularly in the Southern Ocean, marine primary production is limited by micronutrients such as iron. However, the bioavailability of iron to phytoplankton is predominantly controlled by organic compounds (ligands). These ligands are either actively produced by microorganisms or a result of microbial degradation of biomass. Despite the ubiquitous importance of marine ligands, their chemical structures and turnover pathways are essentially unknown. Ocean acidification, increased glacial melting and changes in aerosol deposition are likely to impact concentration and bioavailability of micronutrients in the future. Therefore, it is crucial to investigate the chemical composition and production of ligands, which effectively control primary production and ultimately carbon sequestration. In this project, we will study the chemical speciation of micronutrients in seawater and will focus on biological production and degradation of ligands in polar oceans, their molecular composition, chemical properties and responses to changing environmental conditions. A better mechanistic understanding of the coupled biogeochemical cycles of micronutrients and carbon will enable improved predictions on changes in species diversity, primary production and carbon sequestration.