Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.19199

The role of phytoplankton in the marine biogeochemical cycle of Se

LENNY H.E. WINKEL[1,2], PAULINE BÉZIAT[1,3], ZOÉ LE BRAS[1,3], SYLVAIN BOUCHET[1,3], JULIE TOLU[4,5] AND URIA ALCOLOMBRI[6]

[1]Eawag, Swiss Federal Institute of Aquatic Science and Technology
[2]ETH, Swiss Federal Institute of Technology, Zurich
[3]ETH Zurich
[4]Eawag
[5]ETH Zürich, Institute of Biogeochemistry and Pollutant Dynamics
[6]ETH Zürich

Presenting Author: lenny.winkel@eawag.ch

The ocean plays a key role in the biogeochemical cycle of selenium (Se) as it was estimated that the marine biosphere accounts for the largest part of natural emissions of Se to the atmosphere [1]. The atmosphere constitutes an important source of this essential micronutrient to terrestrial environments. However, the processes leading to these biogenic emissions of Se are not well understood. Marine organisms are not only hypothesized to play an important role in atmospheric emissions of Se, but Se was also found to be an essential micronutrient for various marine phytoplankton in laboratory cultures [2]. While it has been assumed that this essentiality is due to the important redox capacities of selenoproteins in various biochemical processes, the reasons for its essentiality are still scarcely investigated. A useful approach to investigate the role of phytoplankton in Se cycling, and the role of Se as an essential element for phytoplankton, is to compare bio(geo)chemical and metabolic processes of Se to those of the chemically similar element sulfur (S). Biogeochemical cycles and metabolic routes of S are much better understood than those of Se, however, a marked difference between the two elements is that while Se is present at trace concentrations in marine waters, S is present in excess.

Here we will present how we investigate marine biogeochemical Se cycling in comparison to marine biogeochemical S cycling. E.g., we will show how we analyze concentrations of organic volatile Se and S compounds in marine waters and air, using a recently developed TD-GC-ICP-MS method [3] and how we relate these data to the activity of marine organisms. Furthermore, we will show how we study the selenometabolism of marine algae and how this is affected by interactions with bacteria. Finally, it will be discussed how lab and field data can be combined to achieve a more complete understanding of the role of phytoplankton in the marine Se cycle.

[1] Feinberg *et al*., (2020) Env. Sci. & Technol., 54, 12, 7146-7155

[2] Wake *et al*., (2012) J. of Phycology, 48, 3, 585-594

[3] Le Bras, *et al*. (2023) Anal. Chem., 95, 5, 2967-2974