

Selenium volatilization in the marine biosphere

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Marine selenium (Se) speciation is complex, with coexisting inorganic selenite and selenate and a large pool of operationally defined organic selenide. A small fraction of this organic pool is in the form of dimethylselenide (DMSe) and dimethyldiselenide (DMDSe), volatile selenium species that can escape to the atmosphere. These mobile species are crucial for global biogeochemical cycling, with an estimated 60 percent of natural atmospheric selenium derived from the marine biosphere [1].

Although marine-derived selenium is presumed to be a key source of this essential micronutrient to land, the formation of these volatile compounds in the ocean is poorly understood. It has been suggested that the species are formed by mechanisms analogous to those responsible for the production of volatile sulfur species [2] [3] or by degradation of selenoamino acids with light [4]. Mechanistic evidence for these hypotheses under environmentally relevant conditions remains lacking.

We are using laboratory microcosm experiments with two marine algae, *Emiliana huxleyi* and *Thalassiosira oceanica*, to test possible mechanisms for the production of volatile selenium species in the oceans. Our preliminary results hint that algae are less important than previously assumed, and that sorption to organic matter is an important constraint on the mobility of the volatile species. Planned experiments will investigate the impact of bacteria and abiotic degradation on the production of volatile species. Altogether, these results will shed light on the mechanisms responsible for the creation of highly mobile selenium species in the marine biosphere.

[1] Wen & Carignan (2007), *Atmospheric Environment* **41**, 7151-7165. [2] Amouroux *et al.* (2001), *Earth Plan Sci Lett* **189**, 277-283. [3] Ansedé & Yoch (1997), *FEMS Microbio. Ecol.* **23**, 315-324. [4] Amouroux, Pécheyran & Donard (2000), *Appl. Organometal. Chem.* **14**, 236-244.