Geophysical Research Abstracts
Vol. 17, EGU2015-11836-1, 2015
EGU General Assembly 2015

The physiological and ecological roles of volatile halogen production by marine diatoms

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Sea-to-air halogen flux is known to have a major impact on catalytic ozone cycling and aerosol formation in the troposphere. The biological production of volatile organic (e.g. bromoform, diiodomethane) and reactive inorganic halogens (e.g. molecular iodine) is believed to play an important role in mediating halogen emissions from the marine environment. Marine diatoms in particular are known to produce the organic and inorganic volatile halogens at high rates in pelagic waters and sea-ice systems. The climate-induced changes in diatom communities that have already been observed and are expected to occur throughout the world's oceans as warming progresses are likely to alter sea-to-air halogen flux. However, we currently have insufficient understanding of the physiological and ecological functions of volatile halogen production to develop modelling tools that can predict the nature and magnitude of the impact.

The results of a series of laboratory studies aimed at establishing the physiological and ecological role of volatile halogen production in two marine polar diatoms (*Thalassiosira antarctica* and *Porosira glacialis*) will be described in this presentation. We will focus on our work investigating how the activity of the haloperoxidases, a group of enzymes known to be involved in halogenation reactions in marine organisms, is altered by environmental conditions. This will involve exploring the antioxidative defence role proposed for marine haloperoxidases by showing specifically how halogenating activity varies with photosynthetic rate and changes in the ambient light conditions in the two model marine diatoms. We will also present results from our experiments designed to investigate how volatile halogen production is impacted by and influences diatom-bacterial interactions. We will discuss how improved mechanistic understanding like this could pave the way for future volatile halogen-ecosystem model development.