Geophysical Research Abstracts
Vol. 14, EGU2012-8874, 2012
EGU General Assembly 2012

Trace analysis of short-lived iodine-containing volatiles emitted by different types of algae

U. R. Thorenz, M. Kundel, R.-J. Huang, and T. Hoffmann

Institute of Inorganic and Analytical Chemistry, Johannes Gutenberg University, Duesbergweg 10-14, 55128 Mainz, Germany (ute.thorenz@uni-mainz.de)

Atmospheric iodine chemistry in the lower troposphere gained more attention in the last decade, because of its role in depleting tropospheric ozone and accelerating the ozone destroying capacity of other halogen species [1]. The iodine oxides formed during this reaction may also undergo further oxidation and form polyoxides which then can act as cloud condensation nuclei [2]. Precursors of both reactions are gaseous molecular iodine (I_2) and volatile iodocarbons. Both I_2 and iodocarbons are emitted by different kinds of macroalgae, whereby the emission of I_2 dominates [3]. Iodocarbons are also released by different kinds of microalgaeand itis assumed that also I_2 is released by these algae.

Here we present the results of the measurement of iodine containing volatiles emitted by eight different macroalgae found in the intertidal zone and microalgae, two pure cultures and two net samples. To measure I_2 emissionfrom macroalgae an on-line time-of-flight aerosol mass spectrometric method was used[4] to determine the emission rates and to investigate temporally resolved emission profiles. The molecular iodine emissions from microalgae were measured using a recently developed denuder sampling technique and GC-MS method [5]. Iodocarbons were preconcentrated on solid adsorbent tubes and measured using thermodesorption-GC-MS.

The results of the macroalgae experiments showed that Laminariales were found to be the strongest I_2 emitters. Time series of the iodine release of *L. digitata* and *L. hyperborea* showed a strong I_2 emission when first exposed to air followed by an exponential decline of the release rate. For both species I_2 emission bursts were observed. For *L. saccharina* und *F. serratus* a more continuous I_2 release profile was detected, however, *F. serratus* released much less I_2. For *A. nodosum* and *F. vesiculosus* the I_2 emission rates were slowly increasing with time (1h-2h) until a more or less stable I_2 emission rate was reached. The lowest I_2 emission rates were detected for the red algae *C. Crispus* and *D. sanguienea*. Total iodocarbon emission rates showed almost the same general trend, however, the total iodocarbon emission rates were about one to two orders of magnitude lower than those of molecular iodine, demonstrating that I_2 is the major iodine containing volatile released by the investigated seaweed species. The dependency of I_2 and iodocarbon emission on the ozone level was investigated, the interplant variability in I_2 emission was to high to see a trend for this compound, but a clear dependency of iodocarbon emission from the ozone level (0-150 ppb O_3) was found for *L. digitata*.

The results of the microalgae experiments showed that the pure cultures of *mediopyxis helysia* and *coscinodiscus wailesii* and the net samples of microalgae emitted iodocarbons (iodomethane, iodochloromethane, iodobromomethane and diiodomethane). Although no ozone dependency was found for the halocarbons, the ozone measurements showed that the depletion of ozone was quite different for the different algae species.

References

[1] Read et al. (2008) Nature 453, 1232–1235. [2] O'Dowed C. et al. (2002) Nature 417, 632–636. [3] Carpenter L. et al. (2005) Environ. Sci. Technol. 39, 8812–8816. [4] Kundel M. et al. (2011) Anal. Chem. DOI: 10.1021/ac202527a. [5] Huang R.-J. et al.(2009) Anal. Chem. 81, 1777–1783