Geophysical Research Abstracts
Vol. 21, EGU2019-9798, 2019
EGU General Assembly 2019

Description and drivers of the sea surface iodide distribution

Rosie Chance (1), Liselotte Tinel (1), Martin Wadley (2), Claire Hughes (3), Tomás Sherwen (1,4), Helmke Hepach (3), Eleanor Barton (3), Tim Jickells (5), David Stevens (2), Anoop Mahajan (6), Amit Sarkar (7), and Lucy Carpenter (1)

(1) Wolfson Atmospheric Chemistry Laboratories, Department of Chemistry, University of York, York, UK (rosie.chance@york.ac.uk), (2) Centre for Ocean and Atmospheric Sciences, School of Mathematics, University of East Anglia, Norwich Research Park, Norwich, UK, (3) Department of Environment and Geography, University of York, York, UK, (4) National Centre for Atmospheric Science (NCAS), Department of Chemistry, University of York, York, UK, (5) Centre for Ocean and Atmospheric Sciences, School of Environmental Sciences, University of East Anglia, Norwich Research Park, Norwich, UK, (6) Indian Institute of Tropical Meteorology (IITM), Ministry of Earth Sciences, India, (7) National Centre for Polar and Ocean Research, Goa, India

The reaction of ozone with iodide at the sea surface is an important sink for tropospheric ozone, and the dominant source of reactive iodine to the troposphere. Rates of both processes are dependent on iodide concentration, which varies by 1-2 orders of magnitude across the ocean surface. Observations of sea surface iodide are relatively scarce, and the drivers of this variation remain poorly understood.

We present an expanded, global dataset of 1342 sea surface (<20m) iodide observations, which is a 45% increase on an earlier compilation (Chance et al. 2014). Observations span 70˚S to 68˚N, and include measurements made in the Indian Ocean, a previously undersampled region. The expanded dataset confirms a strong latitudinal gradient, with highest iodide concentrations occurring at lower latitudes. The extended observational data set has been used to evaluate commonly used sea surface iodide parameterisations, and to develop a new parameterisation using a machine learning approach. We also present measurements of iodide in the sea surface microlayer, and discuss whether (or not) this crucial reaction zone may be enhanced in iodide.

The marine iodide distribution is thought to be controlled by biologically mediated production and loss processes, additional abiotic reactions, vertical mixing and advection. We summarise evidence for the microbiologically mediated interconversion of iodine species, including new results suggesting that iodide oxidation, the dominant iodide loss process, may be associated with bacterial nitrification, specifically the conversion of ammonium to nitrite.

A biogeochemical model of iodine cycling has been embedded in the OCCAM oceanographic framework, and calibrated using the observational dataset. In the model, iodide production is driven by primary production. Model-observation residuals were substantially reduced by linking iodide oxidation to biological nitrification, and increasing the ratio of iodide produced to carbon fixed (by primary production) with latitude. Using section data from the Indian Ocean, we explore how biological productivity, oxidation, mixing and advection drive the sea surface iodide distribution.

References

Chance, R., A. R. Baker, L. Carpenter, and T. D. Jickells. 2014. 'The distribution of iodide at the sea surface', *Environmental Science-Processes & Impacts*, 16: 1841-59.