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The "inorganic" iodine source in the marine environment: experimental and modelling studies

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Reactive iodine species in the marine boundary layer can have a significant effect on the lifetime of oxidising species in the lower atmosphere by causing ozone destruction and altering the HO_x and NO_x balance, and can also contribute to new particle production through the formation of iodine oxides. Over the remote oceans organo-iodine compounds contribute to the atmospheric iodine budget; however, these compounds do not fully account for the IO concentrations observed, where an additional source appears to be required. The deposition of O_3 to the sea surface and subsequent reaction with iodide in the interfacial layer has been proposed as the missing source of reactive iodine to the marine boundary layer. Experiments were conducted to quantify the flux of reactive iodine produced from this process, which releases both I_2 and HOI into the gas phase. The inorganic iodine flux was investigated as a function of temperature, iodide concentration, ozone concentration, salinity, turbulence and organic species. The results were modelled using a kinetic model of the interfacial layer of the sea surface, and a parameterised function of the iodine flux was then derived. Finally, a 1-D chemistry/transport model of the marine boundary layer, using this source function together with the measured organo-iodine flux, predicts IO concentrations over the tropical Atlantic ocean in good agreement with observations.