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Laboratory studies of the uptake of reactive species onto sea salt particles and sea salt particle proxies

C. F. Braban, J. W. Adams and R. A. Cox

Centre for Atmospheric Science, Department of Chemistry, University of Cambridge, Lensfield Road, Cambridge, CB2 1EW, UK. (cfb32@cam.ac.uk)

HOBr and HOI are reservoir species for active halogens in the marine boundary layer and are formed via the reaction of BrO and IO with HO_2. Hypohalous acids, as well as other oxidising species including O_3 and OH, can interact with sea salt particles ultimately producing photochemically active gas phase dihalogens. This halogen activation process may significantly affect the partitioning of bromine and iodine species and hence the oxidation capacity and ozone levels in the marine atmosphere.

In order to study the uptake of gas phase species onto particles in the marine environment and the properties of the reaction products, two laboratory techniques have been used: a low pressure wetted wall flow tube coupled to an electron impact mass spectrometer (WWFT) and an atmospheric pressure aerosol flow tube coupled to a chemical ionisation mass spectrometer (AFT-CIMS). With the wetted wall flow tube, the uptake coefficients and product distributions of HOBr, HOI, O_3 and dihalogens onto seawater and seawater proxies were investigated. Gas phase products were observed; in particular Br_2 and BrCl upon HOBr uptake and IBr and ICl with HOI uptake. The effect of varying the Cl^-:Br^- ratio and the pH of the solution has been studied. It was observed that HOI and ICl are in rapid equilibrium, hence more detailed studies of ICl uptake were performed.

The AFT-CIMS has been developed using SF_6 as the reagent gas. The size distribution of the aerosol is measured using a differential mobility analyser (DMA). ICl uptake coefficients onto sodium bromide, sodium chloride and sea salt aerosol have been measured at 274 K and 298K. At 298 K, experiments have been performed in the RH range 0-30% and at 274 K up to 80% RH. The effect of aerosol composition and acidity on the uptake coefficient and the growth characteristics of the aerosols

have been determined. Implications for halogen processing on marine aerosol will be discussed.