

Iodine Speciation in the Marine Aerosol by Inductively Coupled Plasma Isotope Dilution Mass Spectrometry

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Iodine has a complex chemistry in aerosols in the marine boundary layer (MBL) and is involved in both ozone destruction and new aerosol particle formation processes. Much effort has been spent on analyzing iodine species in marine aerosol and on investigating the mechanism of iodine in MBL. However, many open questions remain. Sampling, identification and quantification of those iodine species have become necessary for the understanding of atmospheric iodine chemistry in MBL.

Inductively Coupled Plasma Isotope Dilution Mass Spectrometry (ICP-IDMS) was applied for iodine speciation in marine aerosol. Long-lived ^{129}I was used for isotope dilution in iodine quantification. Marine aerosol samples including $\text{PM}_{2.5}$ and size fractionated aerosol samples were collected during field campaigns at Mace Head in Ireland and on the open ocean over the North Atlantic during June-July 2006. After sampling, ultrasonic assisted water extraction was applied to collect soluble iodine species in marine aerosol. Total soluble iodine was measured with ICP-IDMS while a new online analytical technique of Gel Electrophoresis (GE) coupled with ICP-MS was also developed for iodide and iodate measurement. Furthermore, non-water soluble iodine was extracted by Tetra-methyl-ammonium Hydroxide (TMAH) extraction and analyzed by ICP-IDMS. Detection limits are both $0.1 \mu\text{g/L}$ for ICP-MS and GE-ICP-MS (expressed as iodine) iodine measurements. Water-soluble iodine was calculated by the difference of total soluble iodine and the sum of iodide and iodate. The concentrations of iodide, iodate, water-soluble organic iodine and non-water-soluble iodine will be shown in the contribution. Therein, water-soluble organic iodine and non-water-soluble iodine were the major iodine species in marine aerosol. These results indicate that more knowledge about the sources and formation pathways of the organic iodine fraction in the marine aerosol is urgently needed.

References

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