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In situ measurements of activated iodine compounds (ICl, HOI) and molecular iodine in the marine boundary layer by a coupled diffusion denuder system combined with GC-MS

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Recently the impact of iodine on atmospheric chemistry received increasing attention and became a growing active research field [1,2]. Numerous tropospheric filed measurements and modeling studies have been realized [1]; however, a number of uncertainties about the source, sinks, kinetic parameters and the recycling of iodine remain, and the identification and quantification of certain key species (e.g., interhalogens) are still a challenging analytical problem.

In this present work we report a coupled denuder system which consists of a 1,3,5-trimethoxybenzene (1,3,5-TMB)-coated cylindrical tube as front-denuder connected upstream of an α-cyclodextrin/$^{129}I^-$ (α-CD/$^{129}I^-$)-coated tube for the separation and quantitative collection gaseous activated iodine compounds (ICl, HOI) and molecular iodine (I_2) in combination with a gas chromatography–mass spectrometry (GC–MS) method. Detection limits were achieved at sub parts-per-trillion-by-volume (sub-pptv) level. In addition, the analytical system has been applied in field measurements at 3 sites at the west coast of Ireland, (1 sampling site at the Mace Head Atmospheric Research Station (MHARS, 53.25^o N, 9.80^o W) and 2 sampling sites at Mweenish bay (53.32^o N, 9.73^o W)), in August–September 2007. The concentrations of both AIC and I_2 were found in the pptv-range in most cases. I_2 data obtained by the present method were compared with that measured by differential optical absorption spectroscopy (DOAS) technique. Details about diurnal variation of the atmospheric concentrations of both AIC and I_2 linked to the meteorological profiles and to other trace gases will be presented.

References

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