Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07361, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07361
EGU General Assembly 2008

Determination of highly reactive halogen species in the remote marine boundary layer

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The reactive halogen species (RHS = X, X_2, XY, XO, HOX, OXO, $XONO_2$, XNO_2, where X, Y = Cl, Br, I) are present in various domains throughout the troposphere and play a key role in a wide variety of atmospheric processes [1, 2 and references therein]. In recent years selected RHS have been observed frequently at different locations (e.g. XO, X_2). However, data on the source strength of other RHS (e.g. ICl, IBr, HOCl, HOBr, HOI) are still not available and therefore their potential influences on the tropospheric processes are still not well understood. Therefore, the analytical methods for field measurements for these RHS, especially for the hypohalous acids, are becoming more and more important.

In this present work an analytical system capable for the quantitative collection of gaseous highly reactive halogen species (HRHS) based on in-situ derivatization in a diffusion denuder, followed by a gas chromatography-mass spectrometry (GC-MS) determination, was developed. Cl species (Cl_2, HOCl), Br species (Br_2, BrCl, IBr, HOBr) and I species (ICl, HOI) were measured in August-September 2007 at two sites at the west coast of Ireland, (Mace Head Atmospheric Research Station (MHARS, 53.25^o N, 9.80^o W) and Kilkieran Cove (MRI Carna, 53.32^o N, 9.73^o W)). The concentrations of the analytes were found in the pptv-range in most cases. Considering the high reactivity of these halogen species towards organic compounds, we suggest that the HRHS are probably responsible for the major fraction of organic halogens in the particle phase.

References

[1] U. Platt, G. Hönninger, Chemosphere 52 (2003) 325.

[2] A. Saiz-Lopez, J.M.C. Plane, J. Phys. IV 121 (2004) 223.