Geophysical Research Abstracts, Vol. 7, 06772, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06772

Sources of halogenated trace gases in the subtropical Atlantic

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Bromoform ($CHBr_3$), dibromomethane (CH_2Br_2), dibromochloromethane ($CHBr_2Cl$), bromodichloromethane ($CHBrCl_2$), methyl iodide (CH_3I) and chloroform ($CHCl_3$) were measured in the lower atmosphere, the surface water and the deep ocean of the subtropical Atlantic during Meteor-cruise 60 (Fort-de-France/Martinique/France, March 9^{th} to Lisbon/Portugal, April 15^{th} 2004), which crossed widely varying atmospheric and oceanic regimes.

Three dominating atmospheric regimes were encountered during our cruise. In the beginning, changeable winds of the west wind belt brought air with then high variable mixing ratios of the brominated compounds to the ship. Subsequently during an atypical depression in the Azores high area, air masses from the open North Atlantic showed stable and lower mixing ratios of most compounds. Finally the cruise entered the area of the North East Trades, where variable and higher mixing ratios of the compounds were also encountered.

Throughout the water column low concentrations of all halocarbons were measured. The subtropical ocean and atmosphere seemed to be in roughly equilibrium for most compounds, except for methyl iodide (CH_3I), which was highly supersaturated during most of the cruise. The surface water concentrations of CH_3I showed correlations with wind speed and saturation anomaly.

Bromform ($CHBr_3$) frequently showed two concentration maxima in the surface ocean. A shallow maximum at around 50 m and another maximum at around 200 m reveal a mixed signal of production and changes in mixed layer depth. $CHBr_3$ concentrations increased again between 1000 and 2000 m, suggesting a supply of $CHBr_3$to the deepocean by Labrador Sea Water (LSW). CH_2Br_2 showed a maximum at 200 m

depth and a steep concentration decrease towards the deep ocean, suggesting different production and degradation pathways as for $CHBr_3$. Concentrations of $CHBr_2Cl$ and $CHBrCl_2$ increased towards the deep ocean with different gradients, supporting the theory of their production by halogen exchange and their usefulness as oceanic tracer.