Geophysical Research Abstracts
Vol. 15, EGU2013-10605, 2013
EGU General Assembly 2013

Deriving an atmospheric budget of total organic bromine using airborne in-situ measurements of brominated hydrocarbons in the Western Pacific during SHIVA.

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Halogenated hydrocarbons play a major role as precursors for stratospheric ozone depletion. Released from the surface in the troposphere, the halocarbons reach the stratosphere via transport through the tropical tropopause layer. Measurements of stratospheric BrO indicate an existing gap between the abundance of long lived brominated halocarbons, such as Halons and methyl bromide (CH3Br), and the abundance of inorganic bromine in the stratosphere. Recently, it has been realized that in addition to these long-lived substances so called very short-lived substances (VSLS) can also contribute significantly to the stratospheric halogen loading. The VSLS have lifetimes less than half a year and are predominantly emitted from climate-sensitive natural sources, e.g. marine macro-algae. A main source region for those emissions is the Western Pacific where sea surface temperatures are high and air masses from the surface can be transported rapidly into the TTL (Tropical Tropopause Layer) by deep convective systems.

In this work, we present results derived by our measurement data from the field campaign which was part of the SHIVA (Stratospheric Halogens in a Varying Atmosphere) Project.

One aspect of this campaign, which took place in November and December 2011, was the deployment of the German research aircraft “Falcon” in the Western Pacific at Miri in Malaysia. From there we performed sixteen local flights in total; these flights covered a spatial range from the boundary layer up to 11km altitude around the area of Borneo. Our contribution to the campaign was the deployment of a newly developed GC/MS system operated in negative chemical ionization mode for the fast analysis of halogenated hydrocarbons in ambient air onboard the aircraft. The long lived halocarbons H1301, H1211, H1202, H2402 as well as CH3Br and the very short lived substances CHBr3, CH2Br2, CHBr2Cl, CHBrCl2 and CHBrCl were be analyzed with the instrument.

We derive a detailed budget of total organic bromine in this tropical region from more than 500 measurements of ambient air. Observations in the boundary layer as well as data from survey flights in the free upper troposphere are discussed. Furthermore, the results are compared and discussed with other studies from this region.