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Using airborne in-situ measurements of brominated hydrocarbons in the Western Pacific to improve the understanding of atmospheric halogen loading.

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In this work, we present measurement data from the field campaign "SHIVA - Stratospheric Halogens in a Varying Atmosphere". One part of this campaign was the deployment of the German research aircraft "Falcon" in the Western Pacific at Miri/Malaysia, performing research flights from the boundary layer up to 11km altitude. The dataset we present was obtained by a total amount of sixteen local flights in the area of Borneo in November and December 2011. Onboard the aircraft we used a sophisticated in-situ GC/MS system operated in negative chemical ionization mode for the fast analysis of halogenated hydrocarbons in ambient air.

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 (TTL). 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 by deep convective systems.

Our main goal during SHIVA was to improve the understanding of emissions, atmospheric transport and the chemical degradation of halogenated VSLS. Detailed measurements in the boundary layer as well as data from survey flights in the free upper troposphere are used to deflect a local budget bromine species in this tropical region. Measurements in areas of convective outflow can be used to gather information about the vertical transport of VSLS-emissions by shallow and deep convection over the rainforest and over coastal regions. Furthermore we will investigate the emission ratios of different substances like CHBr3, CH2Br2 and CHBr2Cl.