



## **Measurements of nitrogen oxides in the UTLS: Results from the TACTS and ESMVal mission using the new German research aircraft HALO**

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In summer 2012 the new German research aircraft HALO (High Altitude and LOng range research aircraft) took off for its first missions to study atmospheric chemistry and transport. During the TACTS (Transport and Composition in the UTLS) mission the main focus laid on transport processes in the UTLS determining the chemical composition at midlatitudes. The ESMVal (Earth System Model validation) mission aimed at the study of the large scale composition of trace species along a north-south transect between the North and South Polar Region (about 80°N to 65°S). Both missions have been carried out with the same scientific payload.

Here we report on measurements of nitrogen oxide (NO) and the sum of all atmospheric reactive nitrogen species (NO<sub>y</sub>). Nitrogen oxides have a decisive influence on the chemistry of the upper troposphere and lower stratosphere. They are key constituents of several reaction chains influencing the production of ozone. They also play an essential role in the cycling of hydroxyl radicals and therefore influence the lifetime of methane. Due to their short lifetimes and their variety of sources there is still a high uncertainty about the abundance of nitrogen oxides in the UTLS.

During both missions the large scale distribution of NO and NO<sub>y</sub> was observed in the UTLS covering regions with different source characteristics. Among others, signatures of biomass burning events and lightning activity were detected. Also North and South Polar regions were probed. The acquired data are compared to other aircraft observations (e.g. CARIBIC) and to the results of simulations with the atmospheric chemistry model EMAC.