Geophysical Research Abstracts
Vol. 15, EGU2013-3853, 2013
EGU General Assembly 2013

Measurements of Stable Carbon Isotope Ratios in Atmospheric VOC on HALO during TACTS and ESMVal

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The assessment of the impact of VOC on the atmosphere can be significantly improved by measurements of stable carbon isotope ratios in VOC. Since this is a relatively new technique, data coverage is rare and more or less restricted to ground-based measurements. Nevertheless, measurements of stable carbon isotope ratios are a sensitive tool to study the atmospheric processing of VOC, to investigate the VOC distribution and to infer transport pathways. In addition, the isotopic information can help to differentiate between impacts of mixing and chemical processes and to estimate the residence times of the compounds in the atmosphere.
The automated high volume air sampling system (MIRAH) has been deployed during the atmospheric HALO aircraft campaign TACTS (Transport and Composition in the UTLS) in August and September 2012. The missions focused on transport processes determining the chemical composition in the upper troposphere and lowermost stratosphere (UTLS) during the transition from summer to fall. In addition, MIRAH was used to take whole air samples in a part of the ESMVal (Earth System Model Validation) missions. In total 212 samples were collected between 80°N – 65°S and 25°W – 73°E in a height region up to 15 km. The air samples were analysed for stable carbon isotope ratios in VOC with GC-C-IRMS in the laboratory later on. We determined the stable carbon isotope ratios and mixing ratios of several aldehydes, ketones, alcohols, and aromatics. The presentation will focus on the MIRAH system and first results of the valuable and unique data obtained during the HALO-missions.