



Observations of Stable Carbon Isotope Ratios in Atmospheric VOC on HALO during the EMeRGe-EU and ASIA campaigns

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The automated high volume air sampling system MIRAH (Measurement of Stable Carbon Isotope Ratios on HALO) has been deployed so far during several missions with the German High Altitude – Long-range research aircraft (HALO).

From July 10th to 28th, 2017, we operated the whole air sampler MIRAH during the European part of the EMeRGe (Effect of Megacities on the transport and transformation of pollutants on the Regional and Global scales) campaign. The objective was the investigation of the composition and transformation of pollution emitted and transported from the major population centres (MPCs) London, BeNeLux, Rhine-Ruhr, Rome and Po Valley. On seven flights, mostly below 6 km altitude, in total 141 air samples were collected with MIRAH and, in addition, 28 samples at specific ground sites in London, Milan and Rome.

In the second phase of EMeRGe from March 3rd to April 9th, 2018, with base station in Tainan (Taiwan) the outflow of Asian MPCs were investigated in a similar way. 143 air samples were collected on 10 flights, and 18 samples at ground sites in Taipei (Taiwan) and Manila (Philippines).

One key experiment during both phases was the identification of the source of the air masses by collecting whole air samples on ground sites in specific metropolitan regions. To further enable the aircraft instrumentation to unambiguously identify the source of the air masses inert tracers (perfluorinated hydrocarbons, PFC) were released at selected ground sites in London and Wuppertal (EU) and Manila (Asia).

The samples were analysed for stable carbon isotope ratios in volatile organic compounds (VOC) with GC-MSD-C-IRMS in the laboratory afterwards. For several aldehydes, ketones, alcohols, and aromatics stable carbon isotope ratios and mixing ratios have been determined. With HALO's special characteristics of long endurance and long-range flights an extended area could be investigated. This allowed investigating air masses of different origin, characteristic, and atmospheric processing. In this contribution we will give an overview of the data and show exemplary results.