Geophysical Research Abstracts
Vol. 18, EGU2016-16023-1, 2016
EGU General Assembly 2016

Volatile Organic Compounds (VOCs) onboard the HALO research aircraft during OMO-ASIA

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We report on first results of VOC measurements during the OMO-Asia campaign that took place in summer 2015 on Cyprus and on the island of Gan (Maldives) to study the free-radical chemistry at higher altitudes during the Asian summer monsoon. The deployed instrument (KMS = Karlsruhe Mass Spectrometer) is based on a commercial PTRMS from Ionicon and was strongly modified for the use onboard the research aircraft HALO (a modified Gulfstream GV-550 having a ceiling altitude of ∼15.5 km). By the construction of an aluminum vacuum system, the development of largely custom-made electronics and the use of light-weight pumps, the weight was reduced to ∼55 kg compared to 120-130 kg of the commercial instrument. The KMS is in addition very robust and field-compliant. Before OMO-Asia the HALO payload was tested first during a technical field campaign OMO-EU which took place in Oberpfaffenhofen (Germany) in winter 2015.
During OMO-Asia the instrument was calibrated before and after each flight by diluting an external gas standard (Apel-Riemer Environmental, Inc. Denver, Colorado) containing ∼1 ppm of 10 VOCs. The determined sensitivity for acetone was ∼380 cps/ppb showing a variation of ±5% over a period of 8 weeks. The detection limit amounted to ∼35 ppt for acetone at an integration time of 6 s.
The measurements during all together 17 flights took place over a wide range of Asia, including Saudi Arabia, Bahrain, Oman and Sri Lanka. Referring to the meteorological forecasts of carbon monoxide (CO), remnant of the Asia monsoon outflow was measured during some flights (e.g. over Oman). Acetone mixing ratios of up to ∼1500 ppt and up to ∼100 ppt of benzene were measured in the outflow of the plume. The gathered data shows a good correlation with the measurements taken with other instruments (e.g. CO measurements by Max Planck Institute for Chemistry).

The poster will describe the instrument and the main features derived.