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Airborne Observations of Greenhouse Gases during the Asian Summer Monsoon 2008

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The new CARIBIC system (Civil Aircraft for the Regular Investigation of the Atmosphere Based on an Instrument Container) is operational since December 2004. The fully automated instrument package is deployed monthly aboard a Lufthansa Airbus A340-600. The measurement results are representative for the extra-tropical UT/LS and for tropical free-troposphere air masses. Besides in-situ measurements, air is sampled into glass flasks for laboratory analyses (greenhouse gases, NMHCs, halocarbons, CO_2 and H_2 isotopes). The main greenhouse gas analysis comprises CO_2, CH_4, N_2O and SF_6, isotope analyses include $^{1}3C(CO_2)$, $^{1}8O(CO_2)$, $D(H_2)$ and $^{1}3C(CH_4)$.

In 2008 the emphasis was on flights between Germany and India in order to study the influence of the Asian summer monsoon on the upper troposphere. During the summer months a distinctive monsoon plume was observed.

Higher levels of CH_4, N_2O and SF_6 were found in air masses influenced by the monsoon. While the increase of the purely anthropogenic SF_6 is due to increased convective transport during the summer months, the enhancement of CH_4 and to a lesser extent also of N_2O is caused by increasing emissions from rice paddies, wetlands and landfills during the rainy season. In contrast, CO_2 is depleted in the monsoon plume due to an increase in photosynthesis in the regions affected by the monsoon rains.

The observations made in 2008 will be compared to data from the phase I of the CARIBIC project.