

## **Upper tropospheric CH<sub>4</sub> and CO affected by the Indian summer monsoon during OMO**

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The trace gas transport through the Indian summer monsoon convection was investigated as part of the aircraft campaign OMO (Oxidation Mechanism Observations) using the German research aircraft HALO (High Altitude and Long Range Research Aircraft) in July/August 2015. HALO was operated alternatively from Cyprus and the Maldives. Flights took place over the Mediterranean Sea, the Arabian Peninsula and the Arabian Sea. Here we investigate the distribution of carbon monoxide (CO) and methane (CH<sub>4</sub>) in the upper troposphere, measured in-situ with the IR-laser absorption spectrometer TRISTAR.

During OMO enhanced concentrations of CH<sub>4</sub> and CO were detected in the Asian Summer monsoon anticyclone at altitudes between 11 km and 15 km. Mixing ratios exceeded background levels for CO and CH<sub>4</sub> by 10-15 ppb and 30-40 ppb, respectively. The enhancement in the CO concentration appears to be within the range of tropospheric variability, while the methane enhancement is much higher than its natural variability. Therefore CH<sub>4</sub> is found to be a very good tracer for air masses influenced by the monsoon. This is confirmed by back trajectory calculations with FLEXPART, indicating convective transport from India approximately 10 days before the observations. A comparison of observations with EMAC atmospheric chemistry – climate model simulations generally agree within  $\pm 10\%$  and  $\pm 0.5\%$  for CO and CH<sub>4</sub>, respectively.