

LIF instrument for airborne measurements of OH, HO₂ and RO₂ radicals in the upper troposphere deployed on HALO during the OMO 2015 campaign

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We present the first deployment of our instrument for the measurement of OH, HO₂ and RO₂ radical concentrations in the upper troposphere aboard the German research aircraft HALO during the OMO (Oxidation Mechanism Observation) campaigns in winter and summer 2015. Radicals are detected by laser induced fluorescence (LIF) in two separate measurement cells. One for the direct detection of OH (OH channel) and one for alternating measurements of HO₂ and RO₂ radicals after chemical conversion to OH by the reaction with NO (ROx channel). A special air inlet for the OH channel was developed and built at Forschungszentrum Jülich, based on the shrouded-inlet design by Eisele et al. It allows a controlled reduction of the air flow velocity prior to sampling as well as the performance of inflight calibrations via photolysis of ambient water vapor. The inflight calibrations show that the OH detection sensitivity increases substantially – roughly by a factor of 5 – over the altitude range from ground to 10 km. This is supported by the theoretical pressure dependence which is in good accordance with the measured data.

The ROx channel has no special inlet system and samples directly from the fast airflow along the aircraft. We will give an overview of the instrumental setup for the application on HALO and show first results from flights performed during the OMO-EU (winter 2015) and OMO-Asia campaign (summer 2015).