1.162 Airborne measurement of peroxy radicals during EMeRGe .

Early Career Scientist

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Abstract:

The amount, distribution and role of peroxy radicals, HO_2 and RO_2 (where R is an organic group) in tropospheric air masses are of key importance for the assessment and interpretation of the transformation and processing of polluted outflows from major population centres (MPC). This issue has been investigated within the EMeRGe project (Effect of Megacities on the Transport and Transformation of Pollutants on the Regional to Global Scales) for selected MPCs. The reactions of these radicals play a key role in the catalytic oxidation of hydrocarbons. Thereby they determine the O_3 budget and the oxidation capacity of the atmosphere (OCA).
Airborne measurements of the total sum of peroxy radicals, $RO_2^* = (HO_2 + \sum RO_2)$, have been conducted within EMeRGe by using PeRCEAS (Peroxy Radical Chemical Enhancement and Absorption Spectrometer), which is part of the EMeRGe payload in the HALO research aircraft (www.halo.dlr.de). PeRCEAS combines the PeRCA (Peroxy Radical Chemical Amplification) measurement technique for the amplified conversion of radicals entering the reactor into NO_2 by a chain reaction, with the sensitive detection of NO_2 by a novel cavity ring down instrument. The instrument shares a common inlet for two identical measurement lines (reactor-detector) to improve time resolution and sensitivity. The amplification factor (chain length) and detection limit are determined by calibrations under controlled representative flight conditions.
PeRCEAS successfully participated in the EMeRGe HALO campaigns in Europe in summer 2017 and in Asia in spring 2018. Air masses of different photochemical activity and significant RO_2^* mixing ratios up to 100 pptv were measured.
This presentation will describe the preliminary findings of the RO_2^* mixing ratios observed upwind and downwind of the selected MPCs.