RADICALS AND AEROSOLS IN THE TROPOSPHERE AND LOWER STRATOSPHERE

RAINER VOLKAMER, THEODORE KOENIG, BARBARA DIX, *CIRES, University of Colorado, Boulder, CO, United States*.

The remote tropical free troposphere (FT) is one of the most relevant atmospheric environments on Earth. About 75% of the global tropospheric O3 and CH4 loss occurs at tropical latitudes. Tropospheric bromine and iodine catalytically destroy tropospheric O_3, oxidize atmospheric mercury, and modify oxidative capacity, and aerosols. Oxygenated VOCs (OVOC) modify HO_x (= OH + HO_2), NOx (= NO + NO_2), tropospheric O_3, aerosols, and are a sink for BrO_x (= Br + BrO). Until recently, atmospheric models were untested for lack of vertically resolved measurements of BrO and IO radicals in the tropical troposphere. BrO and IO are highly reactive trace gases. Even very low concentrations (parts per trillion; 1 pptv = 10^{-12} volume mixing ratio) can significantly modify the lifetime of climate active gases, and determine (bromine) the rate limiting step of mercury oxidation in air (that is washed out, and subsequently bio-accumulates in fish). Analytical challenges arise when these radicals modify in sampling lines. Sensitive yet robust, portable, and inherently calibrated measurements directly in the open atmosphere have recently been demonstrated by means of limb-measurements of scattered solar photons by the University of Colorado Airborne Multi-AXis DOAS instrument (CU AMAX-DOAS) from research aircraft. The CU AMAX-DOAS instrument is optimized to (1) locate BrO, IO and glyoxal (a short lived OVOC) in the troposphere, (2) decouple stratospheric absorbers, (3) maximize sensitivity at instrument altitude, (4) facilitate altitude control and (5) enable observations over a wide range of solar zenith angles. Further, (6) the filling-in of Fraunhofer lines (Ring-effect) by Raman Scattering offers interesting opportunities for radiative closure studies to assess the effects of aerosols on Climate.