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The budget of bromine and iodine and the aerosol extinction in the tropical UT/LS as derived from spectroscopic balloon observations

M. Dorf(1), A. Butz(1,2), C. Camy-Peyret(2), M. P. Chipperfield(3), W. Feng(3), K. Grunow(4), L. Kritten(1), B. Simmes(1), F. Weidner(1), and K. Pfeilsticker(1)

(1) Institut für Umweltphysik, Universität Heidelberg, Heidelberg, Germany, (2) Laboratoire Physique Moléculaire pour l'Atmosphère et l'Astrophysique, (LPMAA), Université Pierre et Marie Curie, Paris, France, (3) Institute for Atmospheric Science, School of Earth and Environment, University of Leeds, Leeds, UK, (4) Meteorologisches Institut, Freie Universität Berlin, Berlin, Germany (marcel.dorf@iup.uni-heidelberg.de / Fax: -49-6221-546405)

Since 1996, solar occultation observations have been performed by the LPMA / DOAS (Limb Profile Monitor of the Atmosphere / Differential Optical Absorption Spectroscopy) balloon payload in the high, mid, and low-latitude upper troposphere and stratosphere during different seasons. Vertical profiles of O_3, NO, NO_2, HNO_3, BrO, $ClONO_2$, OClO, HCl, IO, OIO and of some source gases (e.g., N_2O and CH_4) as well as the extinction by aerosols can be inferred simultaneously from the UV/vis/near-IR solar occultation measurements. This study highlights the most important results obtained by the LPMA/DOAS payload during the Envisat Stratospheric Aircraft and Balloon Campaign (ESABC) in northeastern Brazil in June 2005.

The present understanding of bromine and iodine photochemistry in the upper troposphere / lower stratosphere (UT/LS) is tested by comparing measured with photochemically modelled slant column amounts and profiles. For bromine, the comparison with the model indicates that in addition to the known trend of organic bromine source gases (CH_3Br and halons) in the troposphere, short lived bromo-organic source gases, with a lifetime < 0.5 years, contribute to total reactive bromine (3.5 to 5 pptv) in the UT/LS (Dorf et al., 2006). Inorganic gaseous iodine species could not be unambiguously detected in the tropical UT/LS. Given the current knowledge about iodine photochemistry, the inferred upper limits of IO and OIO constrain total reactive iodine ($<$ 0.3 ppt) to a minor important chemical agent in the tropical UT/LS. Furthermore, the

spectral analysis in the UV/vis wavelength range reveals extinction by aerosols peaking with 1.5x10^{-3} km^{-1} (at 540 nm) in the tropical lower stratosphere. This aerosol layer extends over several kilometers up to 6 to 7 km above the tropopause.