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Balloon-Borne Observations of BrO in the Tropical Upper Troposphere/Lower Stratosphere

L Kritten (1), A. Butz (2), M. Dorf (1), S Kreycy (1), C. Prados (1), and K. Pfeilsticker (1)
(1) Institut für Umweltphysik, University of Heidelberg, (2) SRON, Netherlands

Due to the ozone destroying capabilities of bromine bearing compounds, the stratospheric budget of inorganic bromine is of major interest for modelling ozone depletion and assessing the future evolution of the ozone layer. It has recently been shown that the contribution of very short-lived substances (VSLS) to the bromine budget enhances ozone depletion at mid-latitudes and polar regions.
Here we report for the first time on observations of the diurnal variation in stratospheric BrO by means of balloon-borne limb scanning observations. When combined with photochemical modelling, new insight into the photochemistry of stratospheric bromine and its budget is obtained.

In particular we report on observations made during three balloon soundings at tropical northeastern Brazil (5°S, 43°W) in June 2005 and June 2008 from deployments of the LPMA/DOAS (Limb Profile Monitor of the Atmosphere/Differential Optical Absorption Spectrometer), IASI (Infrared Atmospheric Sounding Interferometer) and MIPAS (Michelson Interferometer for Passive Atmospheric Sounding) payloads. Our measurements reveal that the diurnal cycle of BrO is primarily controlled by the reaction with NO2, and the photolysis of BrONO2 at daytime. Assimilation of our BrO measurements to photochemical modelling indicates that total stratospheric bromine is in agreement with the amount inferred by our direct sun observations, therefore providing further evidence for the importance of brominated very short-lived species (VSLS) for total stratospheric bromine.