



Time dependent tomography by balloon-borne spectroscopy: Profiling of UV/vis absorbing radicals by balloon-borne spectroscopic Limb measurements and implications for stratospheric photochemistry

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Nitrogen bearing compounds play an important role in catalytic loss of stratospheric ozone and will become even more important in future. Here balloon-borne limb measurements of the time and altitude dependent variation of O₃, NO₂, BrO and HONO are presented, providing new insight into the NO_x and NO_y photochemistry of the tropical upper troposphere, lower and middle stratosphere. A new method is discussed aiming at the retrieval of the diurnal variation of UV/vis absorbing radicals. The method employs spectroscopic measurements in combination with radiative transfer modeling and a mathematical inversion on a regularized time and height grid. The retrieval is tested by comparing the results to in-situ ozone sonding, simultaneous O₃, NO₂ and BrO direct sun observations and to measurements of the ENVISAT/SCIAMACHY satellite instrument. The collected data are further explored to in-situ test photochemical parameters, critical for stratospheric ozone, exemplarily for the N₂O₅ photolysis rate. Finally, first detection of HONO in the tropical upper troposphere is reported, and discussed in the context of NO_x formation in thunderstorms.

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