



Simultaneous balloon-borne measurements of the key inorganic bromine species BrO and BrONO₂ in the stratosphere: DOAS and MIPAS-B evaluation

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Inorganic bromine contributes to a loss of stratospheric ozone of about 25 - 30%. Past studies have demonstrated several uncertainties in the photochemistry of stratospheric bromine, especially by considering the three body reaction (k_{BrONO_2}) $BrO + NO_2 + M \rightarrow BrONO_2 + M$, and the photolysis frequencies of BrONO₂ (j_{BrONO_2}). Hence, an improved knowledge of the ratio j_{BrONO_2}/k_{BrONO_2} is crucial to better assess the bromine-related loss of ozone as well as the total amount of bromine in the stratosphere.

Here, we report on the first simultaneous balloon-borne measurements of NO₂, BrO, and BrONO₂ in the stratosphere, performed over Timmins (Ontario, 49 °N, Canada) on Sept., 7th and 8th, 2014. During the flight the targeted species were monitored by remote sensing in the UV, visible and mid-IR spectral ranges by Differential Optical Absorption Spectroscopy (DOAS) and Michelson Interferometer for Passive Atmospheric Sounding (MIPAS-B), respectively. The analysis and interpretation of the measurements involves radiative transfer as well as photochemical modelling. Major features of the applied techniques are reported and first results of the DOAS as well as MIPAS-B evaluation are discussed. Further investigations address inter-comparisons of the retrieved NO₂, BrO, and O₃ concentrations and volume mixing ratios, to demonstrate validations of both evaluation methods.