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A new stratospheric BrO climatology based on dynamical and photochemical tracers

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Satellite UV-visible nadir instruments (such as GOME, SCIAMACHY, OMI and GOME-2) offer the unique capability to study and monitor total BrO columns at the global scale on a consolidated long-term basis. In this study, we establish a climatology of stratospheric BrO columns and profiles adequate for the retrieval of tropospheric BrO columns from satellite measurements based on a residual technique. In particular, the stratospheric BrO climatology is designed to be part of the operational processing of total and tropospheric BrO columns from GOME-2 (MetOp-1) observations within the UPAS environment at DLR. A new method is developed to treat the impact of the atmospheric dynamic on the stratospheric BrO distribution, using retrieved ozone columns. The effect of photochemistry on stratospheric BrO is taken into account using the stratospheric NO_2columns. The suitability of the adopted parameterization is evaluated based on one year of output data from the 3D chemistry transport model BASCOE. Model simulations include full gas phase chemistry and relevant heterogeneous reactions, while dynamics is driven by ECMWF wind fields. Particular attention is paid to the inorganic bromine budget, through implementation of an up-to-date inventory of organic bromine source gases. Modeled BrO columns and profiles are validated using ground-based and balloon-borne stratospheric BrO observations.