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Evaluating the potential of GOME-2 ozone column retrievals in the Chappuis bands

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Atmospheric ozone columns are dominated by the stratospheric ozone layer which comprises roughly 90% of the total ozone column. The stratospheric ozone acts as a UV shield for life on Earth's surface, determines the stratospheric temperature profile and stratospheric chemistry. The much smaller tropospheric ozone part is of similar importance as it is a key species in tropospheric chemistry, is an important secondary pollutant and, depending on altitude, acts as a greenhouse gas.

Monitoring of atmospheric ozone columns is often performed using UV and visible absorption spectroscopy on direct or scattered sunlight. Measurements from satellite have the advantage of providing global coverage, and from the TOMS, GOME, SCIAMACHY, and OMI instruments, a long and accurate time series of ozone column observations exists.

Up to now, nadir observations of total ozone are based on the Hartley and Huggins ozone bands in the UV. They have the advantage of providing a large absolute and differential signal, much larger than from the Chappuis bands in the visible part of the spectrum which has been applied for limb and occultation measurements and also in zenith-sky observations from the ground. As result of reduced Rayleigh scattering, ozone measurements in the Chappuis bands would provide larger sensitivity to the lower atmosphere, and in combination with UV observations, could add profile information to the retrievals. However, so far no successful global ozone column retrieval in the Chappuis bands has been reported for nadir observations.

Here, we report on an evaluation of the potential for ozone retrievals in the Chappuis bands using GOME-2 data. The theoretical precision is discussed and the results from retrievals using different settings are presented. It is shown that good agreement with UV retrievals can be achieved in many situations but that problems remain with interference from other absorbers, surface spectral reflectance properties, and also instrument calibration issues. The reasons for the problems are discussed and possible solutions suggested.