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Operational O3M-SAF trace-gas column products: GOME-2 tropospheric NO2, SO2 and BrO

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This contribution focuses on the operational GOME-2 trace-gas column products developed at the German Aerospace Centre, in the framework of EUMETSAT's Satellite Application Facility on Ozone and Atmospheric Chemistry Monitoring (O3M-SAF). We present the algorithms and exemplary results of tropospheric NO2, total BrO and SO2. These trace-gas column products are retrieved from GOME-2 solar backscattered measurements in the UV/VIS wavelength region, using the Differential Optical Absorption Spectroscopy (DOAS) method.

Total NO2 is routinely retrieved with the GOME Data Processor (GDP) version 4.2 using the 425-450 nm wavelength region. An additional algorithm is applied to derive the tropospheric NO2 column for polluted conditions: after subtracting the estimated stratospheric component from the total column, the tropospheric NO2 column is determined using an air mass factor based on monthly climatological NO2 profiles from the MOZART-2 model. SO2 emissions from volcanic and anthropogenic sources can be measured by GOME-2 using the UV wavelength region around 320 nm. With GOME-2, it is possible to detect and track volcanic SO2 in near-real time and on a global scale, which is of particular importance for volcanic early warning services. For the GOME-2 retrieval of the total BrO column, current research focuses on the optimisation of the DOAS fitting window in the UV wavelength region. BrO columns retrieved from the baseline GOME fitting window (344.6-359 nm) show relatively large noise levels. Therefore, the use of an alternative fitting window has been analysed.

More than two years of tropospheric NO2, total BrO and SO2 measurements are now available from GOME-2. We present initial validation results using ground-based measurements, as well as comparisons with other satellite products, such as those from SCIAMACHY and OMI. The use of tropospheric NO2 columns for air quality applications will be presented. We will show examples of BrO from volcanic eruptions and under polar winter conditions. Finally, exemplary GOME-2 measurements of SO2 from volcanic eruptions and degassing will be shown, as well as SO2 from anthropogenic emissions.