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Global satellite validation of SCIAMACHY O_3 columns with GOME WFDOAS

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Abstract. Global stratospheric ozone columns derived from UV nadir spectra measured by SCIAMACHY (Scanning Imaging Spectrometer for Atmospheric Chartography; data ESA Versions 5.01 and 5.04) aboard the recently launched Environmental Satellite (ENVISAT) from January to June 2003 were compared to collocated total ozone data from GOME (Global Ozone Monitoring Experiment on ERS-2) retrieved using the weighting function DOAS algorithm (WFDOAS; Version 1.0) in order to assess the level-2 data (trace gas data) retrieval accuracy from SCIAMACHY. In addition, SCIAMACHY ozone columns retrieved with WFDOAS V1.0 were compared to GOME WFDOAS for some selected days in 2003 in order to separate data quality issues that either come from the optical performance of the instrument or algorithm implementation. Large numbers of collocated total ozone data from the two instruments, which are flying in the same orbit about 30 min apart, were spatially binned into regular 2.5° times 2.5° grids and then compared. Results of these satellite comparisons show that SCIAMACHY O_3 vertical columns (ESA Version 5.01/5.04) are on average 1% (±2%) lower than GOME WFDOAS and scatter increases at solar zenith angles above 85° and at very low total ozone values. Results show dependencies on the solar zenith angle, latitudes, and total ozone amounts which are explained by the implementation of an outdated GOME algorithm based on GOME Data Processor (GDP) version 2.4 algorithms for the SCIAMACHY operational product. The reprocessing with an algorithm equivalent to GOME WFDOAS V1.0 shows that the offset and dependencies on solar zenith angle, latitude, and total ozone disappear and that SCIAMACHY WFDOAS data are within 1% of GOME WFDOAS. Since GOME lost its global coverage in July 2003 due to data rate limitation, continuation of the total ozone time series with SCIAMACHY is of highest importance for long-term trend monitoring. Since the beginning of its operation in March 2002 the SCIAMACHY instrument has performed stable. With the application of proper algorithms to retrieve total ozone, SCIAMACHY will be able to contribute to the global long term satellite total ozone record and it has the potential to achieve the high accuracy of GOME total ozone.

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