Analysis and improvement of SCIAMACHY limb data for tropospheric ozone retrieval

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1. Objective

- The work presented in this poster shows the improvement of one parameter — stratospheric ozone (retrieved from SCIAMACHY limb data) — for tropospheric ozone (hereafter trop.O3) retrieval, the accuracy of which is subsequently also improved.

2. SCIAMACHY limb data and trop.O3

SCIAMACHY

SCIAMACHY on-board ENVISAT was launched in a sun-synchronous polar orbit in March 2002. It uses three viewing modes: nadir, limb, and occultation to detect, among other things, both the total and stratospheric amounts of O3. More than 10 years of data are available, up through the year 2012.

Limb-Nadir Matching (LNM) method

Sierk, Richter et al. (2006)

3. Improvement of limb data

When switching from the old V2.9 to the new V3.0, the reference of retrieval changed from upper tangent height to extraterrestrial solar spectrum. Therefore retrieval method also changed from triplet to DOAS polynomial. Moreover, we added aerosol information retrieved from SCIAMACHY measurements (Emil et al., 2012) as well.

I. Vertical structure comparison

Follow images present comparison in vertical structure and partial columns* time series in station 'Eureka'. V3.0 demonstrates consistency in different altitude layers and partial columns, as well as the trop.O3 retrieval result.

II. Partial column comparison

Right figure shows times series of the differences of partial column

- Partial column criterion: 1) The altitude range from 15 km to 30 km was selected considering the uncertainty of both satellite and sondes, 2) The difference of partial column is SCIA minus sondes.

III. Retrieved trop.O3 comparison

As a preliminary test, 10 km was chosen as tropopause height. Retrieved trop.O3 was compared with ozone sonde data. Available data reduced as a result of limb-nadir data matching in cloud-free condition.

4. Summary and conclusions

- With excellent total ozone data (nadir data), stratospheric ozone (limb data) plays an important role in improving the retrieval accuracy of trop.O3.
- Trop.O3 limb data has been upgraded from V2.9 to V3.0 and sondes have been used to validate ozone limb data. The results agree in both: the vertical profile and partial columns.
- As follows a decline of differences of about 2 ~ 18 DU in the amount of stratospheric ozone can be determined. There are substantial value improvements in high latitude regions and slight improvement at low latitudes.
- Trop.O3 retrieval accuracy has been improved by 3 ~ 9 DU due to this work.

5. Selected references


6. Acknowledgements

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