Introduction

Tropospheric NO\textsubscript{2} has its main sources in emissions from the oil, fats, lighting, transport and industry. It plays an important role in the formation of tropospheric ozone and together with SO\textsubscript{2} it is the main cause of acid rain.

The Global Ozone Monitoring Experiment (GOME) is a UV/visible spectrometer on board of the European satellite ERS-2. GOME is a 4 channel double monochromator covering the wavelength range of 330 - 800 nm with a spectral resolution of 0.3 - 0.4 nm. ERS-2 was launched into a polar sun-synchronous orbit in April 1995. With a ground pixel size of 40 x 320 km\textsuperscript{2} (40 x 960 km\textsuperscript{2}) GOME reaches global coverage at the equator within 3 days. The main objective of GOME is the global measurement of ozone columns, but other trace gases such as NO\textsubscript{2}, SO\textsubscript{2}, HCHO, BrO and OCl\textsubscript{2} can be retrieved from the spectra as well.

The stratospheric amount of NO\textsubscript{2} is derived from the comparison between SLICCAT and GOME data for a sector at the longitude 180°-190° east.

Airmass Factors

For each day an individual global AMF map is approximated. A comparison between a full SCIATRAN calculation and the 2D AMF approximation for one day at the resolution of 4 km respectively 2 km is applied. Comparison between the retrieval based on the different 2D AMF and the Tropospheric Vertical columns of the MOZART model shows that the assumption of an urban aerosol with a visibility of 10 km leads to a retrieval which is in good agreement for most of the anthropogenic source regions.

The implementation of the aerosol leads to an increase of the NO\textsubscript{2} VC above Europe, China, Southeast Asia and biogenic source regions in South America and Africa and a decrease over the northeast of the USA.

The influence on the retrieval is small in comparison to that of the aerosol types.

Acknowledgements

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• Parts of this project have been funded by the University of Bremen and the European Community under contract EVK2-CT-1999-00011 (POET)

Selected References

- Chipperfield, M.P., 1999: Multiannual Simulations with a Three-Dimensional Chemical Transport Model, 104, 1781-1805
- J. Geophys. Res.
- Leue, C.; Wenig, M.; Wagner, T.; Klimm, O.; Platt, U.; Jähne, B., Quantitative analysis of NOx emissions from GOME satellite image sequences, 106, 4039-4053
- M. Kolle, M., Platt, U., et al., 1999: GOME tropospheric NO\textsubscript{2} and NO\textsubscript{3} distributions, 104, 2963-2982
- M. Kolle, M., Platt, U., et al., 1999: Tropospheric NO\textsubscript{2} and NO\textsubscript{3} distributions from GOME: a comparison of layers with different ozone concentrations.
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Model - Retrieval comparison

The standard GOME retrieval shows in general lower values than the MOZART model. Consideration of the individual aerosol, albedo, orography and NO\textsubscript{2} profile for each day and geolocation leads to a good agreement between retrieval and model data.

Influence of the Visibility

For the retrieval 2D AMF are used, which are based on different aerosol scenarios. For all regions above the oceans a maritime aerosol type, and for all other regions a rural aerosol with a visibility of 23 km is assumed. Additional for regions with high CO emissions (EDGAR3.2 pixel > 10 kg / yr 1995) an urbanly aerosol with a visibility of 10 km respectively 2 km is applied.

The altitude of 440 nm as a monthly mean is taken from maps which have been derived from GOME data (Keimelmeijer et al.).

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Only above china the urban aerosol scenario with the lower visibility of 2 km produces values that agree better with the MOZART VC.

Albedo Influence on the Retrieval

The albedo at 440 nm as a monthly mean is taken from maps which have been derived from GOME data (Keimelmeijer et al.).

The implementation of the aerosol leads to an increase of the NO\textsubscript{2} VC above Europe, China, Southeast Asia and biogenic source regions in South America and Africa and a decrease over the northeast of the USA.

The influence on the retrieval is small in comparison to that of the aerosol types.

Outlook

The next steps in the work are
• implementation of the cloud correction scheme
• precalculation of level AMF for an urban aerosol with a visibility of 5 km and a biomass burning aerosol
• analysis of SCIAMACHY data

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