Development of an OCIO Slant Column Product for GOME-2

A. Richter, F. Wittrock, and J. P. Burrows
Email: Andreas.Richter@iup.physik.uni-bremen.de
Institute of Environmental Physics/Remote Sensing, University of Bremen, FB 1, P.O. Box 330440, D-28334 Bremen, Germany

1 Introduction

- stratospheric ozone loss is relatively well understood and expected to decrease in the coming years due to strong reductions in emissions of ozone depleting substances
- in cold stratospheric winters, light ozone depletion is also in the coming decade
- interaction between climate change, changes in circulation patterns, stratospheric temperatures, and chlorine activation has the potential to extend ozone depletion further into the future than expected
- measurements of OCIO by UV/visible nadir satellite spectrometers provide long-term data sets of chlorine activation at least as qualitative indicators
- the GOME2 instruments will provide at least 15 years of data so far. OCIO retrievals from GOME2 observations were noisy and had clear artefacts

2 The new OCIO product

- Figure 1: New OCIO product

3 Validation

Validation data
- zenith-sky DOAS observations in Ny-Alesund (79°N, 12°E) background spectrum from March 18 of each year data interpolated to mean time of satellite overpass
- SZA increases over time period leading to smaller slant columns (photolysis)

Satellite data
- all GOME2-B measurements within 200 km of station
- assumption: AMF is similar for satellite and ground-based measurement at these geometries

Results
- very good match of seasonal and inter-annual variability
- some differences expected from differences in volumes probed

Acknowledgements
- Funding by the University of Bremen and the O3M SAF visiting scientist project O3_A514_02 are acknowledged
- GOME2 t/l data were provided by EUMETSAT

4 Application to recent years

Northern hemisphere

winter 2010 / 2011
- relatively late onset of chlorine activation
- largest OCIO columns from mid February onwards until end of observations
- very low NO columns indicating denitrification

winter 2015 / 2016
- early activation from mid December
- rapid deactivation after major warming in February
- NO columns low early in season but then rapid increase and large spikes during the two warmings

Southern hemisphere

- much less variability in observations
- 2015 was year with largest OCIO columns
- NO was unusually low at end of season

5 Conclusions

- a new OCIO slant column product has been developed for the two GOME2 instruments
- empirical calibration functions need to be included in the DOAS fit to remove systematic biases
- the larger fitting window used results in much reduced noise compared to earlier products
- even with empirical calibration functions, normalisation is needed to remove long-term drifts in the OCIO values
- validation with ground-based measurements in Ny-Alesund shows good agreement
- the recent winter 2015 / 2016 was characterised by early and strong activation in the northern hemisphere but activation was less persistent than in 2010 / 2011

References


www.doas-bremen.de

EGU2016-11850
AS3.10
X3.22