Geophysical Research Abstracts
Vol. 19, EGU2017-3755, 2017
EGU General Assembly 2017

How well does cloud correction of satellite observations of tropospheric NO_2 work?

Saqr Munassar, Andreas Richter, Andreas Hilboll, Lisa K. Behrens, and John P. Burrows

University of Bremen, Institute of Environmental Physics (IUP), Bremen, Germany
(andreas.richter@iup.physik.uni-bremen.de)

Satellite observations of tropospheric trace gases are limited by the presence of clouds which block part of the troposphere from the satellite view (shielding effect). They also enhance the sensitivity of satellite observations to absorbers located above clouds (albedo effect). In order to correct for these effects, most satellite data products use cloud correction schemes which apply cloud fraction and cloud height retrieved from measurements of columns of O_2 or the O_2-O_2 dimer in combination with radiative transfer calculations. If the vertical profile of the trace gas of interest is known, such correction approaches can in theory remove most of the cloud dependence from the retrieved tropospheric columns.

In practice however, neither the cloud parameters nor the vertical distribution of reactive gases such as NO_2 are well known, and it is therefore useful to investigate how well the current approaches used for cloud correction work on real data. In this study, several versions of the FRESCO+ and O_2-O_2 cloud retrievals are applied to GOME2a and OMI data. The retrieved cloud parameters as well as the resulting tropospheric NO_2 columns are compared between algorithm versions and between instruments for a number of selected regions in polluted, background and biomass burning regions. In addition, different sources are used for the a priori NO_2 profiles used in the retrieval.

The results show that differences in cloud parameters between algorithm versions and instruments can be quite large, but effects on tropospheric NO_2 columns are limited. Comparison of model predicted and observed cloud fraction dependency of tropospheric NO_2 slant columns disagrees in many regions in particular over China, where the largest NO_2 columns are not observed at smallest cloud fractions as expected. As a result, tropospheric NO_2 vertical columns have a significant cloud fraction dependency, indicating that improvements are needed to further reduce cloud related uncertainties.