



Improving 2D tomography for trace gas retrievals combining SCIAMACHY limb and nadir measurements

Jānis Puķīte (1), Sven Kühl (1), Tim Deutschmann (2), Steffen Beirle (1), Patrick Jöckel (3), Steffen Dörner (1), and Thomas Wagner (1)

(1) Max Plank Institute for Chemistry, Satellite Remote Sensing, Mainz, Germany (janis.pukite@mpic.de, +49 6131 305522),

(2) Institute of Environmental Physics, University of Heidelberg, Im Neuenheimer Feld 229, 69120 Heidelberg, Germany, (3)

Deutsches Zentrum für Luft- und Raumfahrt (DLR), Institut für Physik der Atmosphäre, Oberpfaffenhofen, 82234 Weßling, Germany

The Scanning Imaging Absorption spectroMeter for Atmospheric CHartographY (SCIAMACHY) on the ENVISAT satellite probes the atmosphere at the day side of Earth in alternating sequences of nadir and limb measurements, i.e., looking nearly perpendicularly and tangentially to the Earth's surface, respectively.

Limb measurements allow retrieving stratospheric profiles of various trace gases on a global scale. Combining measurements of the same air volume from different viewing positions along the orbit, a tomographic approach can be applied and 2D distribution fields of stratospheric trace gases can be acquired in one inversion.

With this approach, it is possible to improve the treatment for the effect of the horizontal gradients in the trace gas distribution on the profile retrieval. This was shown in previous studies (1) for the retrieval of NO₂ and OCIO profiles in the Arctic region near the polar vortex boundary in January and (2) globally for NO₂ on measurements during special "limb-only" orbits performed on 14 December 2008.

In this study, a possibility to include also the information from the nadir observations in the tomographic profile retrieval approach is shown. This has a potential to improve the retrieval for the first limb measurement sequence of a SCIAMACHY orbit where, due to no preceding limb scanning sequence, only the nadir measurements allow to estimate the gradient. An improvement can be obtained also along the remaining part of the nominal SCIAMACHY orbits for which, due to nadir measurements performed in between limb scanning sequences, the coarse spatial overlap of the limb measurements is limiting tomographic capabilities. The improvement is investigated for simulated scenarios and case studies on real measurements.