An improved retrieval of tropospheric NO columns from the Ozone Monitoring Instrument


Published in:
Journal of Geophysical Research. A, Space Physics

Published: 01/01/2010

Document Version
Publisher’s PDF, also known as Version of Record (includes final page, issue and volume numbers)

Please check the document version of this publication:
• A submitted manuscript is the author’s version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher’s website.
• The final author version and the galley proof are versions of the publication after peer review.
• The final published version features the final layout of the paper including the volume, issue and page numbers.

Link to publication

Citation for published version (APA):

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.
• Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
• You may not further distribute the material or use it for any profit-making activity or commercial gain
• You may freely distribute the URL identifying the publication in the public portal?

Take down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.
An improved retrieval of tropospheric NO2 columns from the Ozone Monitoring Instrument

Folkert Boersma (1), Ruud Dirksen (1), Dominik Brunner (2), Yipin Zhou (2), Vincent Huijnen (1), Henk Eskes (1), Pepijn Veefkind (1), Quintus Kleipool (1), Marcel Dobber (1), and Piet Stammes (1)

(1) Royal Netherlands Meteorological Institute, Climate Observations Department, De Bilt, Netherlands (boersma@knmi.nl), (2) EMPA, Laboratory for Air Pollution/Environmental Technology, Duebendorf, Switzerland

Recent studies using Dutch OMI NO2 (DOMINO) retrievals have established the current data quality and provided information on how to improve future retrievals. OMI generally shows modest to good agreement with independent observations, but appears to be biased high by 0%-40%. We improve retrievals with more accurate radiative transfer calculations that better account for the sensitivity in the lowest atmosphere model layer, and use a more realistic set of atmospheric pressure and temperature profiles, surface albedos and surface pressure levels. The improved representation of radiative transfer alone leads to a reduction in tropospheric columns of 10%-20% in polluted regions. A better representation of terrain height in the retrieval (based on 3 x 3 km2 elevation data rather than the 3° x 2° model data) increases tropospheric columns (up to 10%) in valleys that were previously attributed too high a terrain height (such as the Po Valley, Beijing area), and reduces NO2 columns over elevated areas that previously had too low terrain height (Mexico City, Highveld Plateau). The implementation of a new surface reflectivity database from OMI shows that the frequently higher surface reflectivity in the OMI than in the TOMS/GOME dataset leads to lower cloud fractions and higher cloud pressures in the cloud-retrieval. We will show the direct impact of better surface albedos on retrievals (clear-sky scenes) as well as the impact via the cloud correction (partly clouded scenes). A better representation of vertical mixing of NO2 in the TM4 model results in a better match with observed NO2 profiles; the impact of this improvement but also the effect of a priori NO2 profiles with better spatial resolution (CHIMERE) on retrievals will be discussed. We conclude by proposing a simple method (vicarious calibration) to evaluate and correct for the stripes apparent in the OMI NO2 retrievals. The combined effect of all improvements is anticipated to lead to a significantly improved retrieval that will be evaluated against validation sets including DANDELIONS, CINDI, INTEX-B, and independent data from North America, the Po Valley, and China.