Level-2 OMI Cloud Product (OMCLDO2) based on KNMI Cloud Algorithm

by Rashedul Chowdhury — last modified Jan 20, 2016 12:13 PM

OMCLDO2 README File

Pepijn Veefkind and Maarten Sneep

Last update 05 September 2011

Overview

This document provides a brief description of the OMCLDO2 data product. The OMCLDO2 Level 2 data product contains the cloud fraction and cloud pressure and ancillary information produced by the OMI Cloud O2-O2 algorithm. The main objective of the OMCLDO2 product is to support other OMI L2 algorithms by providing these with cloud information. Each OMCLDO2 file contains the sunlit part of an OMI orbit, from the South Pole to the North Pole. In the so-called global observation mode, the OMI swath is approximately 2600 wide, providing daily global coverage.

The OMCLDO2 is produced as a standard product as well as in near-real-time (within three hours of observation) and as a very fast delivery product (within 20 minutes of observation). Although it is expected that the differences will be very small, this document describes the standard data product. When the near-real-time data becomes operational, information on the near-real-time data will be posted on the KNMI OMI website. Information on the very fast delivery product will be posted on the FMI OMI website.

Release specific information about OMCLDO2 for the current collection 3 dataset can be found in the release details document. This includes information about software versions and known problems.

Algorithm Description

The OMI DOAS algorithm is described in the OMI Algorithm Theoretical Basis Document (ATBD). In addition, a paper describing the algorithm and applying it to the GOME data has been published in the Journal of Geophysical Research (J.R. Acarreta, J.F. de Haan and P. Stammes, *Cloud pressure retrieval using the O2-O2 absorption band at 477 nm*, J. Geophys. Res., 2004, **109**, D05204, doi:10.1029/2003JD003915).

The OMCLDO2 algorithm applies a DOAS type fit to the O2-O2 absorption band around 477 nm. From this fit the O2-O2 slant column density and the reflectance of the continuum

reflectance are used to derive the effective cloud fraction and the cloud pressure. The cloud model that is used represents a cloud by a Lambertian reflector with an albedo of 0.8, which roughly corresponds to a cloud optical thickness of 30.

As a consequence, thin clouds that fully cover an OMI pixel (e.g. cirrus clouds) are represented by a small effective cloud fraction. Therefore, direct comparison of the effective cloud fraction with a geometrical cloud fraction, or with a cloud fraction derived in the infrared (IR), should be performed with great caution, because these are different physical quantitues. This also holds for direct comparisons of the cloud pressure to cloud top heights derived using IR sensors. IR sensors tend to be sensitive to the top of thin clouds, whereas in the visible the sensitivity is more a few kilometers into moderately thick and thick clouds.

This algorithm is one of the two algorithms that derive cloud information from OMI data. The other algorithm uses Raman scattering determine the cloud pressure (OMCLDRR). A comparison of these two algorithms is published in the Journal of Geophysical Research (M. Sneep, J.F. de Haan, P. Stammes, P. Wang, C. Vanbauce, J. Joiner, A.P. Vasilkov en P.F. Levelt, *Three way comparison between OMI and PARASOL cloud pressure products*, J. Geophys. Res., 2008, **113**, doi:10.1029/2007JD008694).

Data Quality Assessment

The OMCLDO2 effective cloud fraction and cloud pressure have been compared to MODIS Aqua, which flies 15 minutes in front of OMI. This comparison is described in the for the ESA Atmos Conference (Frascati, 9-12 May 2006) and in the Journal of Geophysical Research (P. Stammes, M. Sneep, J.F. de Haan, J.P. Veefkind, P. Wang and P.F. Levelt, *Effective cloud fractions from the Ozone Monitoring Instrument: Theoretical framework and validation*, J. Geophys. Res., 2008, **113**, doi:10.1029/2007JD008820). The most important conclusions are:

1. The effective cloud fraction of OMI compares well to an effective cloud fraction derived from MODIS' cloud optical thickness. Large differences may occur of snow and ice surfaces. Also, the OMI cloud fractions are slightly higher at low effctive cloud fractions.
2. The cloud top pressure derived from MODIS is lower (higher clouds) than OMI. This is expected because MODIS uses the thermal infrared, which is more sensitive to higher clouds. The bias between OMI and MODIS is approximately 100 hPa, with a standard deviation of 200 hPa. It is noted that the comparison of the cloud pressure is difficult because of the different wavelength regions.

Further investigations on the accuracy of the OMCLDO2 product are published in the Journal of Geophysical Research (M. Sneep, J.F. de Haan, P. Stammes, P. Wang, C. Vanbauce, J. Joiner, A.P. Vasilkov and P.F. Levelt, *Three way comparison between OMI and PARASOL cloud pressure products*, J. Geophys. Res., 2008, **113**, doi:10.1029/2007JD008694, including a limited comparison with the CloudSat space bourne cloud radar.

Row Anomaly

There is a “Row Anomaly” present in OMI data, affecting some (but not *all*) viewing directions of OMI. This anomaly affects the quality of the Level 2 data products, including OMCLDO2. Details on the starting dates of the various stages of the development of this anomaly can be found on the web. Please note that rows that are *not* listed are unaffected, and of optimal quality.

Please be aware that the anomaly is known to the OMI team and are currently under investigation. The detailed technical information page describes the effect on the OMI spectra. The release details document descibes the effect of the anomaly and corrections that are implemented in OMCLDO2 itself in more detail.

The OMCLDO2 product includes an `XTrackQualityFlags` field. A non-zero value in this field indicates that the particular ground pixel is affected by the OMI row anomaly. Affected pixels should not be used for scientific purpose.

Product Description

A single OMCLDO2 product file contains all OMI measurements on the sunlit portion of the Earth, for one Aura orbit. During one orbit OMI performs approximately 1650 measurements, which take 2 seconds each. In the global observation mode, 60 across track ground pixels are measured simultaneously during a measurement. These 60 measurements cover a swath of approximately 2600 km wide. During so-called zoom-in measurements the swath width is reduced. The operational baseline includes zoom-in measurements for 1 day a month. In case of zoom-in measurements 30 of the 60 across track pixels contain data, the other 30 contain fill values.

The OMCLDO2 product is written as an HDF-EOS5 swath file. Some guidance specific for OMI level 2 files is given on the KNMI OMI website.

Product Availability

The OMCLDO2 product can be obtained from the Goddard Earth Sciences Data and Information Services Center (GES-DISC). OMCLDO2 files can be ordered through the Mirador website.

Full OMCLDO2 data, as well as subsets of these data over many ground stations and along Aura validation aircraft flights paths are also available through the Aura Validation Data Center (AVDC) website to those investigators who are associated with the various Aura science teams.

For users not interested in the detailed information provided on OMCLDO2 dataset we are developing several gridded products. In addition, OMCLDO2G data is made available in a geographically ordered (rather than time-ordered) format that can be more easily subsetted and manipulated on-line prior to ordering. Please check the Mirador website if you are interested in these products.

Contact Information

Questions related to the OMCLDO2 dataset should be directed to the GES DAAC. For questions and comments related to the OMCLDO2 algorithm and data quality please send mail to contact omcldo2@ltpmail.gsfc.nasa.gov.