

OMUFPSLV and OMVFPSLV README File

1. Summary of the OMI Ancillary Data Files

The OMI ancillary data products were developed to provide supplementary information for use with the OMI Collection 4 L1b datasets. This latest version of the OMI L1b data was released in OMI Collection 4 with an improved L0 to L1b processor and included an updated instrumental calibration to account for changes that occurred through the duration of the mission. The ancillary data provide information that have been omitted from the L1b files themselves for Collection 4 such as the snow/ice classification, as well as co-located meteorological fields and instrument monitoring data for the benefit of algorithm developers.

There are two types of ancillary products provided with the Collection 4 data. The first type provides meteorological fields from the Goddard Modeling and Assimilation Office (GMAO) which are co-located to the OMI Field of View (FoV). These are the OMUFPMET, OMVFPMET, OMUFPSLV, and OMVFPSLV products. The second class of OMI ancillary product provides information about the instrument data quality and surface information that are not derived from the GMAO products. These files, the OMUANC and OMVANC products, provide snow/ice classification, land type classification, terrain height data, row anomaly flags, pixel corner information, and spectral correlation flags.

The ancillary information provided in these products are collocated with the OMI measurements differently depending on whether the source product is reported at higher or lower resolution than the OMI FoV. GMAO meteorological fields and NISE snow/ice data used for southern Hemisphere are interpolated to the center of the OMI FoV since these sources of information are reported at a coarser resolution than the area of the OMI FoV. Products with higher spatial resolution than OMI, for example the IMS snow/ice data used in northern Hemisphere and the land type classification, are averaged over the OMI FoV. A list of all the ancillary fields and their associated products can be found at the end of this README document.

2. Overview

This document provides a summary of the OMUFPSLV and OMVFPSLV data products. These products supply 2-d meteorological (met) fields at OMI overpass positions from the Forward Processing for Instrument Teams (FP-IT) product produced by the Global Modeling and Assimilation Office (GMAO). FP-IT analysis products are produced in near real-time (NRT) by assimilating high quality observations available at the time into the Goddard Earth Observing System Model, Version 5 (GEOS-5). There is approximately a 6-hour latency in the production of the OMUFPMET and OMVFPMET products as the temporal interpolation requires FP-IT files after the overpass time. For OMUFPSLV and OMVFPSLV, the OMI Team has selected a subset of the FP-IT met fields from the time-averaged hourly GEOS-5 FP-IT 2d single level diagnostics (DFPITT1NXSLV) product. The subsets were selected for use in OMI retrieval

algorithms as ancillary data, and for later data analysis. Separate products are provided for the OMI UV2 (Band 2) and VIS (Band 3) channels since they have slightly different geolocation. A corresponding product is not provided for the OMI UV1 channel.

2.1 Data

GEOS-5 FP-IT is a forward processing data assimilation system that produces analyses in near real time for use by NASA instruments teams. A fixed version of the GEOS-5 model (Lucchesi, 2013) is used to maintain consistent results for use in climate quality satellite retrievals. The spatial resolution of the GEOS-5 model in the FP-IT product is 0.5° latitude by 0.625° . The OMI instrument collects measurements in a swath of 60 across-track pixels dimensioned $13\text{ km} \times 24\text{ km}$ at nadir with larger FOV observations off nadir. Figure 1 shows a comparison of the resolution of GEOS-5 FP-IT data grid cell centers compared to the center points of OMI measurements.

The co-located OMI/FP-IT product provides linearly interpolated data from FP-IT for the overpass time and locations of all usable pixels in the OMI swaths. The interpolated FP-IT data are processed only for orbits taken in OMI's global measurement mode. OMI zoom mode data were not processed. The products discussed here are reported on the native vertical resolution of the GEOS-5. Table 1 lists of the variables from FP-IT interpolated to the OMI measurement locations.

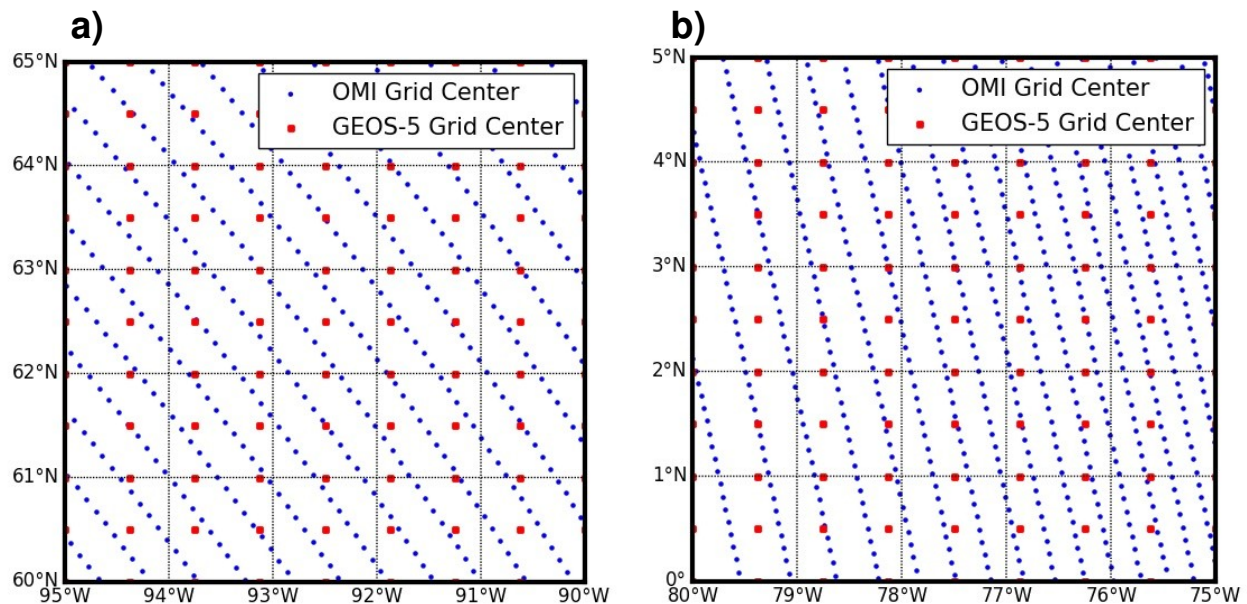


Figure 1. Comparison of the spacing of the FP-IT model grid center points with the FOV center points for OMI measurements. The FP-IT grid cells are lower

spatial resolution (0.5° lat x 0.625° lon) than OMI FOVs (13 x 24 km at nadir). The spatial density of the OMI and FP-IT data varies differently with latitude. Examples shown here for (a) 60-65° N and (b) 0-5°N.

| Variable Name | Description | Dimensions | Units |
|----------------------|--|---------------------------|--------------|
| latitude | Latitude (deg. north) | (1,scanline,ground_pixel) | deg North |
| longitude | Longitude (deg. east) | (1,scanline,ground_pixel) | deg East |
| PBLTOP | PBL Top Pressure | (1,scanline,ground_pixel) | Pa |
| TROPPB | Blended Based Tropopause Pressure | (1,scanline,ground_pixel) | Pa |
| TROPPT | T-Based Tropopause Pressure | (1,scanline,ground_pixel) | Pa |
| TROPPV | PV-Based Tropopause Pressure | (1,scanline,ground_pixel) | Pa |
| PS | Surface Pressure | (1,scanline,ground_pixel) | Pa |
| TS | Surface Skin Temperature | (1,scanline,ground_pixel) | K |
| U10M | 10-m Eastward Wind | (1,scanline,ground_pixel) | m·s-1 |
| V10M | 10-m Northward Wind | (1,scanline,ground_pixel) | m·s-1 |
| time_TAI93 | Seconds Since 1993-01-01-00 UTC | (1,scanline,ground_pixel) | s |
| delta_time | Offset of the observation from reference start time of measurement | (1,scanline) | m·s-1 |

Table 1. List of FP-IT meteorological fields interpolated to the OMI grid in the OMUFPSLV and OMVFPSLV products. Abbreviations for the dimensions of the data fields are ground_pixel for cross-track and scanline for along-track.

2.2 File Format

| Variable Name | Description | Ancillary Product |
|-------------------------------|--|-----------------------|
| latitude | Latitude (deg. north) | OMxFPSLV |
| longitude | Longitude (deg. east) | OMxFPSLV |
| PBLTOP | PBL Top Pressure | OMxFPSLV |
| TROPPB | Blended Based Tropopause Pressure | OMxFPSLV |
| TROPPT | T-Based Tropopause Pressure | OMxFPSLV |
| TROPPV | PV-Based Tropopause Pressure | OMxFPSLV |
| PS | Surface Pressure | OMxFPSLV, OMxFPMET |
| TS | Surface Skin Temperature | OMxFPSLV |
| U10M | 10-m Eastward Wind | OMxFPSLV |
| V10M | 10-m Northward Wind | OMxFPSLV |
| time_TAI93 | Seconds Since 1993-01-01-00 UTC | OMxFPSLV, OMxFPMET |
| delta_time | Offset of the observation from reference start time of measurement | OMxFPSLV |
| DELP | Layer Pressure Thickness | OMxFPMET |
| T | Air Temperature | OMxFPMET |
| PHIS | Surface Potential | OMxFPMET |
| PL | Mid-layer pressure | OMxFPMET |
| snow_area_fraction | Percent snow cover in OMI FoV | OMxANC |
| sea_ice_area_fraction | Percent sea ice cover in OMI FoV | OMxANC |
| snow_ice | Majority classification, definitions shown in Table 2 | OMxANC |
| snow_ice_source | The source of the snow-ice flag (0-IMS, 1-NISE) | OMxANC |
| land_cover | Percent of each IGBP land cover type in OMI FoV | OMxANC |
| land_cover_mode | Top 3 land cover types in OMI FoV by area | OMxANC |
| row_anomaly | UV Residual Row-Anomaly Flags | OMxANC |
| decorrelation_index | Decorrelation index associated with the observation | OMxANC |
| terrain_height | Pixel-averaged terrain height (in m) | OMxANC |
| area_fov75 | Mean area (in km) of the 75% field of view | OMxANC |
| latitude_bounds_fov75 | Latitudes (in degrees) of corner coordinated of 75% field of view | OMxANC |
| longitude_bounds_fov75 | Longitudes (in degrees) of corner coordinated of 75% field of view | OMxANC |

Table 2. List of OMI ancillary datasets along with the description and specific product where the data can be found. Note the x indicates U or V for UV or VIS, respectively.

More details on the file format can be found in the file specification documents:

<https://docserver.gesdisc.eosdis.nasa.gov/public/project/OMI/OMVFPSLV.fs>

<https://docserver.gesdisc.eosdis.nasa.gov/public/project/OMI/OMUFPSLV.fs>

The data files are in netCDF4/HDF5 as recommended by NASA for Earth Science data (<https://earthdata.nasa.gov/user-resources/standards-and-references/netcdf-4hdf5-file-format>). The files can be read with netCDF4 readers as well as any HDF5 reader because of the general interoperability of netCDF4 and HDF5 low level file formats. The following documentation provides information about software to read netCDF4/HDF5 files.

Fortran netCDF4:

<https://www.unidata.ucar.edu/software/netcdf/netcdf-4/newdocs/netcdf-f90.html>

Fortran HDF5:

<https://support.hdfgroup.org/HDF5/examples/f-src.html>

Python netCDF4:

<http://unidata.github.io/netcdf4-python/>

Python HDF5:

<http://docs.h5py.org/en/stable/>

For questions related to the OMxFPSLV algorithm and data quality please contact [Zachary Fasnacht](#).

GEOS-5 FP-IT products:

<https://gmao.gsfc.nasa.gov/>

References:

Bosilovich, M. G., R. Lucchesi, and M. Suarez, 2016: MERRA-2: File Specification. GMAO Office Note No. 9 (Version 1.1), 73 pp, available from http://gmao.gsfc.nasa.gov/pubs/office_notes.

Lucchesi, R., 2015: File Specification for GEOS-5 FP-IT. GMAO Office Note No. 2 (Version 1.4), 64 pp, available at <https://gmao.gsfc.nasa.gov/pubs/docs/Lucchesi865.pdf>