

# MOPITT V6 Level 3 Data Quality Summary

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**The following information applies to MOPITT Level 3 (L3) data, Version 6 (V6; L3V4.2.x and L3V94.2.x)  
August, 2013**

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Further details on MOPITT Data Quality and recommended analysis methods may be found in the updated V6 User's Guide, which is available at the [MOPITT Publications page](#). Users may also need to consult the V5 and/or V4 User's Guide.

Several significant retrieval algorithm and product format changes have been introduced in the V6 product. Details can be found in the V6 User's Guide. A bias in the geolocation data (latitude and longitude values) contained in previous MOPITT products has been corrected in V6. Meteorological data required for Level 2 processing (specifically, water vapor and temperature profiles, and surface skin temperature) is now based on the [MERRA reanalysis](#) product instead of NCEP. A priori profiles for CO for V6 are based on a new climatology based on the [CAM-Chem](#) chemical transport model for the years 2000-2009. The a priori CO total column has been added to the V6 Level 3 files; otherwise the content of the V6 files is the same as V5. **However, the format of the V6 Level 3 files is now [HDF-EOS5](#), which is fundamentally different than the format of previous MOPITT products. This format change will require users of previous MOPITT products to adapt the code they use for reading the contents of MOPITT Level 3 data files.**

## Gridded CO Retrieval Products

MOPITT Level 3 data files are produced in HDF-EOS5 format for both individual days and individual months, providing daily-mean and monthly-mean CO distributions at a resolution of 1 degree (latitude and longitude) respectively. Daytime and nighttime MOPITT observations are processed separately in the Level 3 processing (based on solar zenith angle), and lead to separate daytime and nighttime products within each Level 3 HDF file. Retrieval sensitivity is generally greater for daytime overpasses than for nighttime overpasses, particularly over land. Generally, there exists a corresponding L3 product for each data field in the Level 2 Product. In addition, the number of Level 2 retrievals (or 'Number of Pixels') used as the basis of each Level 3 gridded value is also provided. Moreover, for each retrieved parameter, additional fields provide (1) the mean uncertainty of the Level 2 values and (2) the variability of the Level 2 values as represented by the standard deviation.

Three different types of Level 3 products are available based on different subsets of the MOPITT calibrated radiances. Each type of Level 3 product is based on the corresponding Level 2 product. The format and variables contained in the three types of Level 3 files are identical.

The V6 Level 3 products include:

- Daily and monthly **TIR-only** products. *Example filenames: MOP03T-20010101-L3V4.2.1.he5 (daily) and MOP03TM-200101-L3V94.2.1.he5 (monthly).*



- Daily and monthly **NIR-only** products. *Example filenames: MOP03N-20010101-L3V4.2.2.he5 (daily) and MOP03NM-200101-L3V94.2.2.he5 (monthly).*
- Daily and monthly **TIR/NIR** products. *Example filenames: MOP03J-20010101-L3V4.2.3.he5 (daily) and MOP03JM-200101-L3V94.2.3.he5 (monthly).*

## Data Filtering

For optimum quality, filtering is applied to the Level 2 data in the process of producing Level 3 gridded values. For example, for grid cells overlapping coastline, Level 2 data within that grid cell will often include more than one surface type. Averaging Level 2 data characterized by significantly different averaging kernels, as would occur in this case, should generally be avoided. Other special cases are listed below, together with descriptions of the methods by which such data are processed. If any single surface type constitutes at least 75% of the Level 2 retrievals in a particular grid cell, only retrievals with that surface type are used as the basis of the Level 3 gridded value. If no single surface type constitutes 75% of the available Level 2 retrievals, all of the Level 2 data are retained in the L3 gridded value, and the surface index is set to 2 ('Mixed'). If the L2 retrievals in a particular L3 grid cell contain varying numbers of valid levels (usually because of varying topography), it is determined which case (i.e., number of valid levels) occurs most frequently. Only this subset of L2 retrievals are retained as the basis of the L3 gridded value.

Also, for V6 Level 3 processing, a new type of filter has been applied to the Level 2 data on the basis of the particular detector element used for each observation. The MOPITT instrument employs a linear array of four detector elements which are scanned continuously across the track to form the MOPITT swath. A review of the performance of these four detector elements for Channel 7 over the full MOPITT mission has revealed that two of the detector elements (specifically Pixels 3 and 4) exhibit significant variations in instrumental noise. Although we believe that the effects of such noise variations are properly represented in the MOPITT retrieval algorithm, Level 2 retrievals for these two particular pixels may exhibit time-dependent variability with respect to the weighting of a priori information. This effect could degrade the quality of Level 3 products, particularly for climate analysis. **Therefore, V6 Level 3 products are based exclusively on Pixels 1 and 2; these pixels consistently exhibit lower instrumental noise for Channel 7 compared to Pixels 3 and 4.** Users of the Level 2 product can effectively reproduce (or adapt) this type of filter using the 'SwathIndex' diagnostic which includes the pixel, stare, and track index for each retrieval.

## Gridded Methane Retrieval Products

Gridded methane (CH<sub>4</sub>) products are not available in this data version.

