
The following information applies to MOPITT level 2 (L2) data, Version 4 (V4; L2V8.0 or higher)
April 3, 2009

Further details on MOPITT Data Quality (and recommended analysis methods) can be found in the V4 User's Guide available at the [MOPITT Publications page](#).

CO Products

Carbon monoxide (CO) mixing ratio profiles are retrieved on the 9 standard MOPITT pressure levels: 900, 800, 700, 600, 500, 400, 300, 200, and 100 hPa, and at the surface, for global clear sky measurements. CO total columns are calculated by integrating the retrieved mixing ratio profile and are not retrieved independently. The horizontal footprint of each MOPITT retrieval is 22 km by 22 km (at nadir). The contents of Level 2 (MOP02) files are given in the MOPITT File Spec available on the [NCAR MOPITT Data Products page](#).

Estimated errors

For CO vertical profiles, estimated errors are available in the error field (2nd element) of the "Retrieved CO Mixing Ratio Profile" and "Retrieved CO Surface Mixing Ratio" variables of the MOP02-files. These values represent the cumulative error from smoothing error, model parameter error, forward model error, and error due to instrument noise.

Missing data when surface pressure < 900 mb

For the 'standard' case ($p_{\text{sfc}} > 900$ mb), there are 10 valid levels in the retrieved profile (including the surface-level retrieval), and the Retrieval Averaging Kernel Matrix A (provided in the Level 2 product) is a 10 by 10 matrix.

For the case where $800 \text{ mb} < p_{\text{sfc}} < 900$ mb, the surface level moves to the second row and column of A. In this case, the first row and column of A is populated by the value 0. For cases where there are even more missing levels (e.g., $p_{\text{sfc}} < 800$ mb), the surface level always skips down to replace the missing level closest to p_{sfc} .

For the vertical profile mixing ratios, the values at the standard retrieval levels that are greater than the surface pressure will be reported as "nodata" (-9999).

Cloud detection

MOPITT retrievals are only performed for clear-sky observations. The presence or absence of clouds in a particular MOPITT observation is determined using a combination of information from MOPITT radiances and the MODIS Cloud Mask. A "Cloud Description" flag is provided in MOPITT level-2 products for each pixel. When both MOPITT radiances and MODIS cloud mask are used and agree the Cloud Description is 2. When MODIS cloud mask states clear for a pixel and MOPITT radiances indicate cloudy the pixel is treated as clear and the Cloud Description is 3. In the case that MODIS cloud mask is not available, only MOPITT radiances are used. Cloud Description is 0 if both MOPITT thermal and solar channels are used for cloud detection, and 1 if only thermal radiances are used. Poleward of 65N/S only MODIS cloud mask is used and the Cloud Description is 5.

Further details on MOPITT Cloud Detection can be found in the V4 User's Guide available at the [MOPITT Publications page](#).

Data Interpretation

Averaging Kernels: Averaging kernels indicate the sensitivity of the retrievals to different levels of the atmosphere, and must be examined in order to properly interpret the retrieved data. For V4, the "Retrieval Averaging Kernel Matrix" is provided for each retrieval.

High latitude data: Retrievals south of 65S and north of 65N should be used with caution, because of potential problems with cloud detection and due to difficulties in performing retrievals over icy surfaces. Moreover, such retrievals tend to have low information content as quantified by the "Degrees of Freedom for Signal" diagnostic because of poor thermal contrast.

Day-Night and Land-Ocean differences: Due to the sensitivity of the MOPITT radiances to surface temperature, differences between day and night may appear in retrievals over land. This effect can be identified through analysis of the retrieval averaging kernels. At land-ocean boundaries, similar differences may be seen. These differences should not be interpreted as changes in the atmospheric concentration of CO, but are due solely to the change in sensitivity of the measurement over different surfaces.

Validation

MOPITT CO mixing ratios have been validated with numerous aircraft profiles measured by NOAA/ESRL, as well as with datasets from many



field campaigns. V4 results will be posted to the [NCAR MOPITT Data Products page](#).

CH4 Products

Methane (CH₄) retrievals are not available in this data version.

