Aura MLS Radiance Average Retrievals (RAR) BrO product guideline

Summary

Useful vertical range:	10–4.6 hPa
Latitude coverage:	50°S to 50°N (ascending − descending differences needed)
Vertical resolution:	∼5 km

Significant averaging (monthly means) is required to obtain scientifically useful data.

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Introduction

A description of the retrieval methodology is given by:

Millán et al. (2012), New Aura Microwave Limb Sounder observations of BrO and implications for Br_y, Atmos. Meas. Tech. 5, 1741-1751, doi:10.5194/amt-5-1741-2012.

In short, the retrieval algorithm produces a pair of zonal mean abundance fields for each day, one for the ascending part of the orbit (mostly daytime) and the other for the descending part (mostly nighttime) on a grid with 6 surfaces per decade change in pressure (∼3 km). These are obtained from a 10° latitude bin zonal mean of radiances interpolated onto 6 surface per decade pressure grid using the limb tangent pressure from the standard production data.

To minimize biases, ascending-minus-descending (i.e., mostly day-minus-night) differences must be used as a more accurate measure of daytime BrO. This restricts the usable data to 50°S and 50°N, avoiding the polar regions where in some seasons both ascending and descending orbits are either day (summer) or night (winter).

Due to the small spectral signature of BrO in the MLS radiances, significant averaging (such as monthly zonal means) is required to obtain scientifically useful results.

Precision, Accuracy, and Vertical Resolution

In the usable pressure range, the vertical resolution is about 5 km. The daily precision for a 10° latitude bin either ascending or descending is around 25 pptv, dropping to 5 pptv and ∼1.8 pptv for monthly and yearly averages, respectively. The precision in the ascending−descending difference is up to 40 pptv daily while the monthly and yearly precision drop to ∼7 and ∼2.5 pptv, respectively. The systematic errors when using the ascending−descending difference are always less than ∼3 pptv over the 10–4.6 hPa range.

Data Format

All the MLS BrO data described here can be found at the NASA Goddard Space Flight Center Earth Sciences (GES) Data and Information Services Center DISC website.

All the data described here are stored in netCDF files.

The data are stored in files named according to the convention

`MLS-Aura_L3ZMRAR-BrO_v05-<VV>-c<CC>_<yyyy>d<ddd>.nc4`

where `L3ZMRAR` stands for Level 3 Zonal Means Radiance Average Retrievals, `v05-<VV>-c<CC>` is the version and cycle number. The files are produced on a one-day granularity and named according to the observation date where `<yyyy>` is the four digit calendar year and `<ddd>` is the day number in that year (001 = 1 January).

Each file contains two swaths: Ascending and Descending. Each swath contains the following fields:

Average	retrieved BrO data	[vmr]
Error	precision	[vmr]
lat	latitude	[-80°,-70°,-60°, ... ,80°]
lev	pressure levels	[hPa]
Solar_Zenith_Angle	solar zenith angle	[deg]
Local_Solar_Time	local solar time	[hours]

Data Screening

Bad data were set to -999.99 and should be avoided.

Due to the small signal to noise ratio many negative values are found throughout this dataset. These values need to be included in any scientific study to avoid high biases in averages derived from these data.

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