

NASA CO Products for Air Quality Applications

NASA Remote Sensing Training
Webinar 6, February 2014

ARSET

Applied Remote SEnsing Training

A project of NASA Applied Sciences



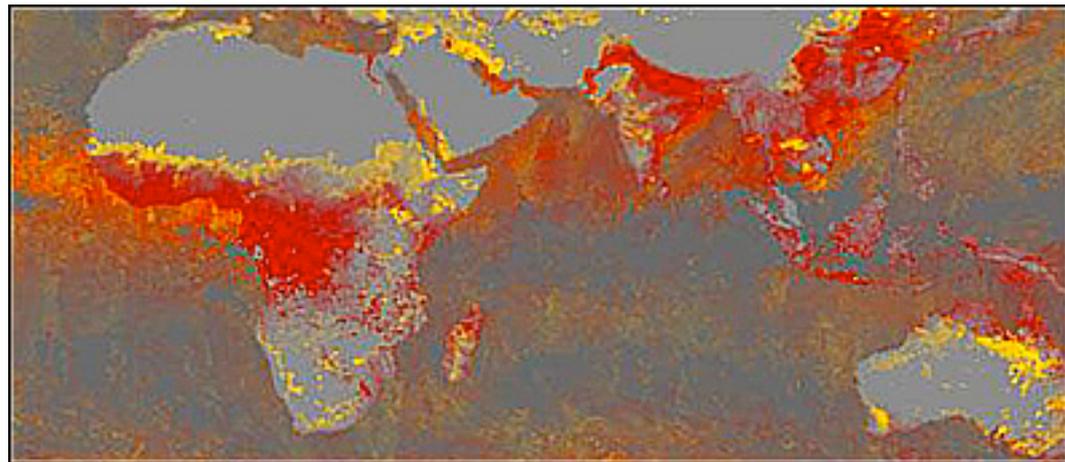
Satellite Observations of CO

- ✓ CO is
 - ✗ major component of air pollution, produced by fossil fuels, biomass burning, CH₄ oxidation ...
 - ✗ an ideal 'tracer'

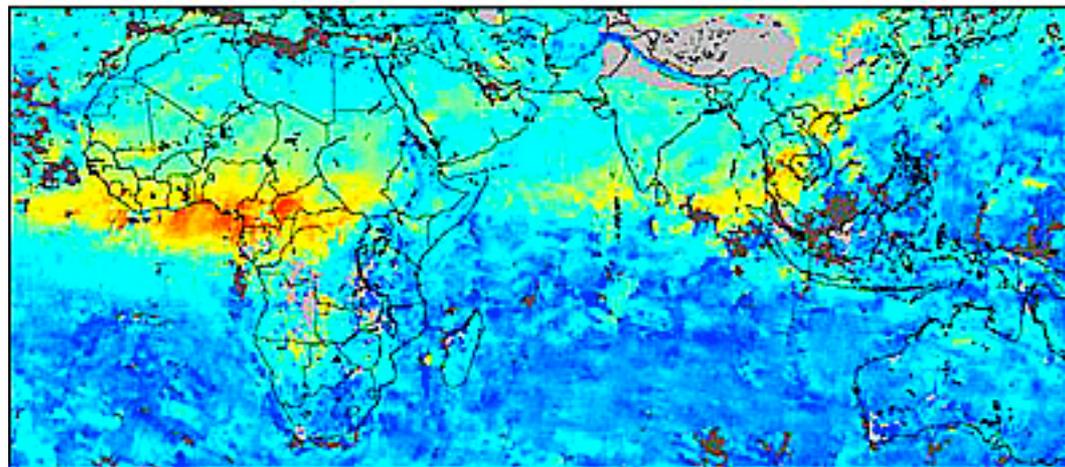
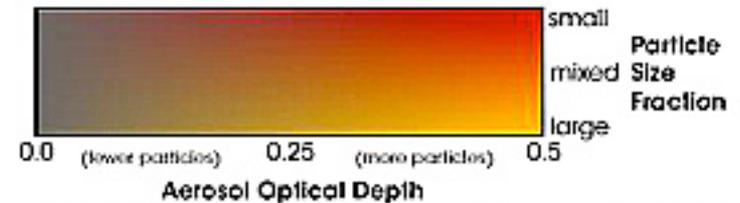
- ✓ Satellite observations of CO increasingly used for
 - ✗ evaluation of chemical transport models
 - ✗ quantifying CO emissions (inverse modeling)
 - ✗ forecasting air quality and 'Chemical Weather'



There is a close correlation between aerosol distribution and increases in CO, as seen in this pair of Terra images.

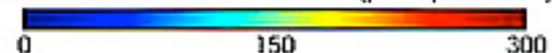


December 8 -12, 2004



December 2 - 12, 2004

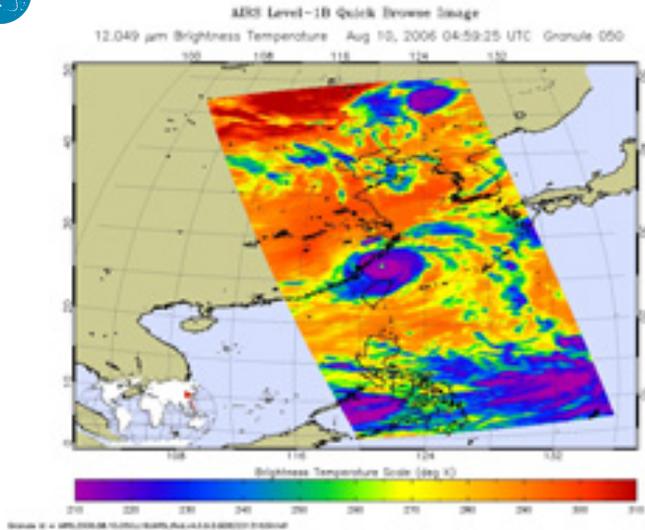
Carbon Monoxide Concentration (parts per billion)



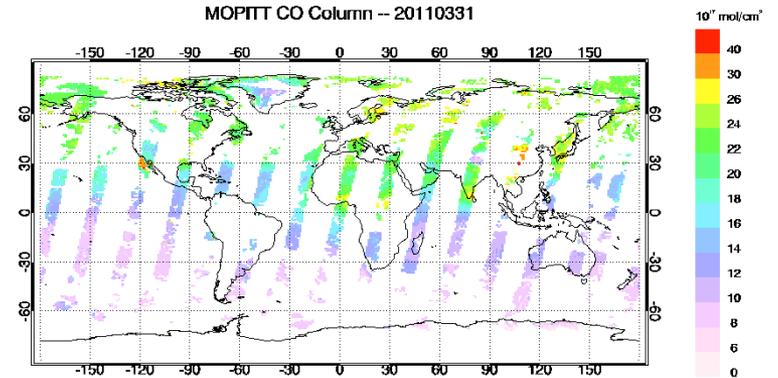


Current CO Sensors

AIRS – Atmospheric Infrared Sounder

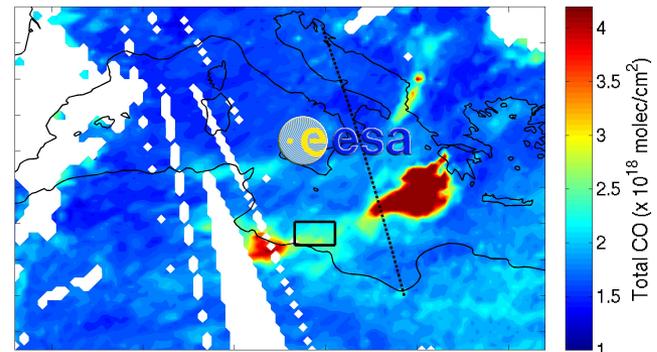


MOPITT – Measurements of Pollution in The Troposphere



IASI – Infrared Atmospheric Sounding Interferometer

20070825 (night)





Level 2 pixel (footprint) size at nadir and comparison chart

- AIRS** 

14 x 14 km

- MOPITT** 

22 x 22 km

- TES** 

8.3 km
5.3 km

- SCIAMACHY** 

30 km
60 km

- IASI** 

12 x 12 km

	MOPITT	AIRS	TES	IASI	SCIAMACHY
Product/pixel size	22 x 22 Km	14 x 14 km	5.3 x 8.3 KM 100 M between pixels	50 KM 12 x 12 KM	30 x 60KM
Swath width	650 KM	1650 KM	N/A	2200 KM	1000 KM
Global Coverage/ Repeat Cycle	3 Days Composite for global coverage	2X per day (day and night)	16 days Repeat Cycle	2X per day (day and night)	6 Days
Overpass time	10:30 AM	13:30	2:30 AM / PM	9:30 AM/PM	10:00 AM
Product Resolution	L3 1 Degree grid	L3 1 Degree grid	L3 5x8km	NO L3 Product	L3 0.5 Degree grid
Products available	L2 L3 Daily, Monthly	Level 2 (granule) Level 3	L2 granule	L2 NOAA and ESA	2B - swath 3 - global
Vertical sensitivity	Mid and lower troposphere	Mid-Troposphere	mid and lower troposphere	mid troposphere	Total column only
Product accuracy	TIR - 10% Near Surface 30%	10 - 20%	20%	< 10%	10 - 20%
Other notes	TIR and NIR Channels	QA flags in L2 and L3	Report data for clouds 0 -25% Simultaneous trace gas	250 KM sampling ESA Should avg. to 4x5 deg.	

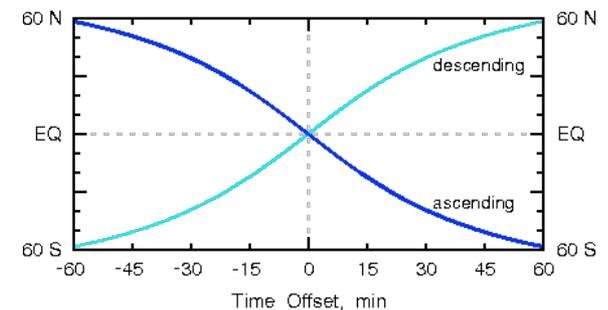
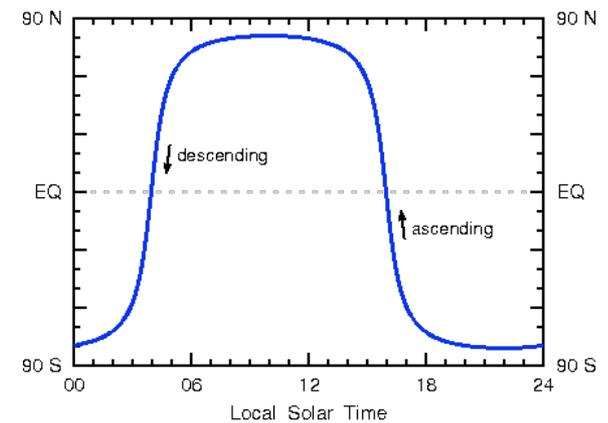
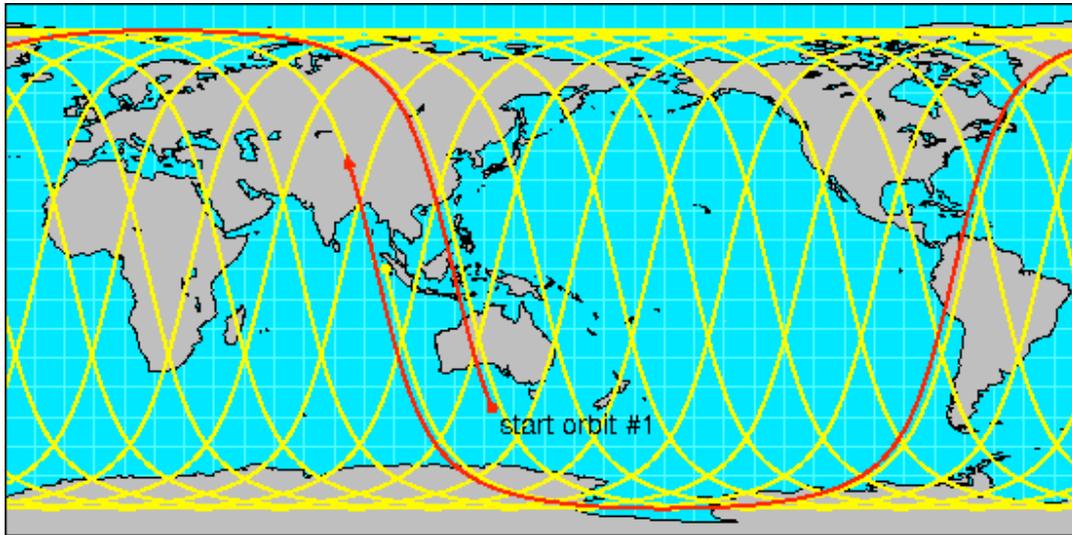
MOPITT- Measurements of Pollution In The Troposphere

- Operational since March 2000
- A nadir sounding instrument
- Pixel resolution = 22km × 22km
- Swath width = 640 km
- Equator crossing times = 10:00 AM (local mean solar time)
- Vertical profiles of CO are obtained at 4.7 μm (thermal infrared – TIR – band)
 - Profile Units = Parts per Billion Volume mixing ratio (ppbv)
- Column CO are obtained at 2.2-2.4 μm (Near-infrared – NIR - band)
 - Column Units = molecules/cm²
- Latest Version 6
- 9 vertical layers 900hPa – 100hPa
- Final products are the Level 3 gridded data



HOME PAGE = <http://www.acd.ucar.edu/mopitt/>

Sun-synchronous tracks: Polar orbiting satellites (A-Train satellites)



- Sun-synchronous orbits are typically described by their equatorial crossing times.
 - When one says that a sun-synchronous orbit goes over a spot on the earth at the same **local time** each time, this refers to [mean solar time](#), not to [apparent solar time](#).
- Orbit combines altitude and inclination in such a way that the instrument ascends or descends over any given Earth latitude at the same local mean solar time, i.e. the surface illumination angle will be nearly the same every time.
- This consistent precession ensures that the equatorial crossing times of the satellites, in terms of the local solar time, remain nearly constant throughout the year. This means that a satellite can make repeated global observations from a single set of sensors with similar illumination from pass to pass.



MOPITT V6 Level 2 products include:

Homepage: <http://www2.acd.ucar.edu/mopitt>

A **TIR-only** product, similar to the MOPITT V4 product and V5 TIR-only product. *Example filename: MOP02T-20010101-L2V16.2.1.he5.*

A **NIR-only** product, similar to the MOPITT V5 NIR-only product and qualitatively similar to the ENVISAT SCIAMACHY CO product. This dataset is produced only for daytime observations over land. This product exhibits relatively large random errors and may require significant spatial and/or temporal averaging. *Example filename: MOP02N-20010101-L2V16.2.2.he5.*

A **TIR/NIR** product, featuring the maximum sensitivity to near-surface CO. In this product, information from the NIR channels is exploited only in daytime observations over land. This product exhibits relatively large random errors and may require significant spatial and/or temporal averaging. *Example filename: MOP02J-20010101-L2V16.2.3.he5.*

MOPITT Data Options x Measurements Of Pollution In T... x

Back Forward Print New Tab Home Reload Stop

www2.acd.ucar.edu/mopitt

MOPITT

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MOPITT PRODUCT AVAILABILITY

MOPITT Version 6 Level 2 and Level 3 products are now available for the entire MOPITT mission. Generally, V6 Level 2 and Level 3 products should become available between three weeks and two months after the actual observations; this data latency is the result of the dependency on the MERRA reanalysis. Version 4 and Version 5 Level 2 and Level 3 products are also available. See [Data Products](#) for descriptions of the different products. User's Guides available on the [Publications](#) page should be consulted before attempting to analyze the MOPITT products.

- [NASA Data Archives via Reverb](#)
- [ASDC Data Pool](#)
- [ASDC MOPITT Subsetter \(V5 Level 2 Products only\)](#)

MOPITT PRODUCT VISUALIZATION

Global plots of MOPITT CO products at 1 degree horizontal resolution can be viewed for each day and month of the MOPITT mission.

V6 Plots

- V6 TIR-only [Daily Plots](#) / [Monthly Plots](#)
- V6 NIR-only [Daily Plots](#) / [Monthly Plots](#)
- V6 TIR/NIR [Daily Plots](#) / [Monthly Plots](#)

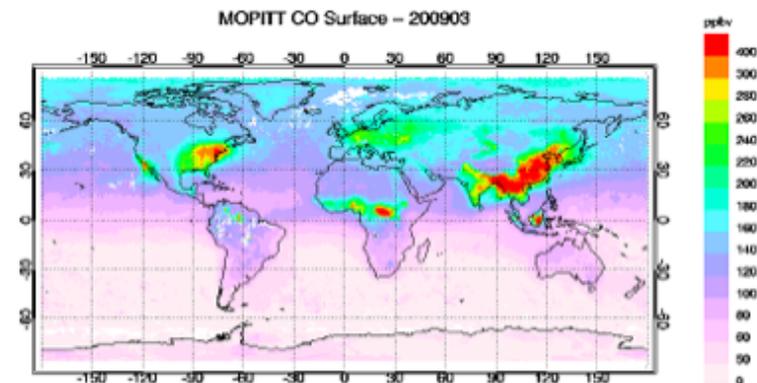
V5 Plots

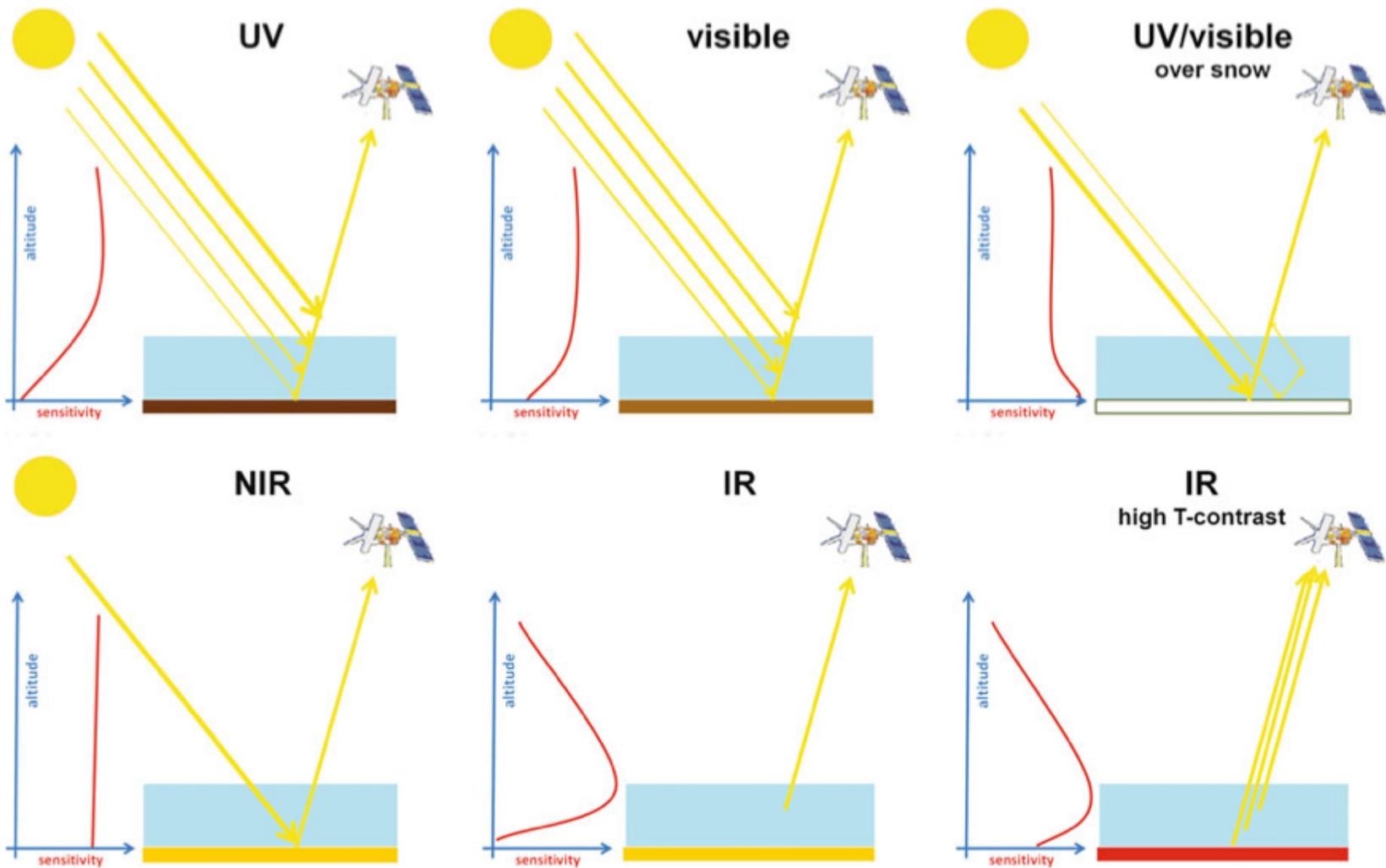
- V5 TIR-only [Daily Plots](#) / [Monthly Plots](#)
- V5 NIR-only [Daily Plots](#) / [Monthly Plots](#)
- V5 TIR/NIR [Daily Plots](#) / [Monthly Plots](#)

V4 Plots

- V4 TIR-only [Daily Plots](#) / [Monthly Plots](#)

- [Interactive Data Viewers for V4, V5, and V6 MOPITT products](#)

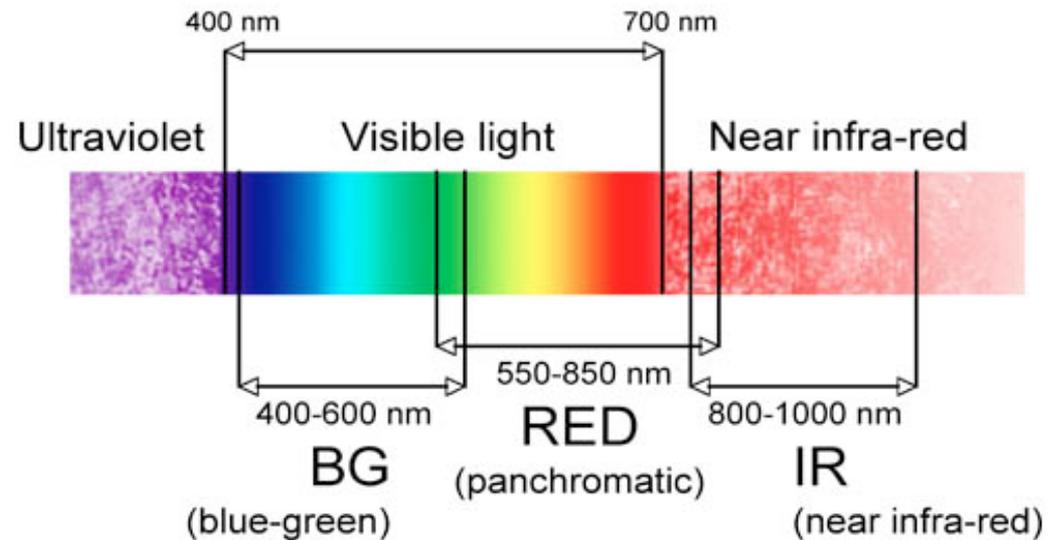




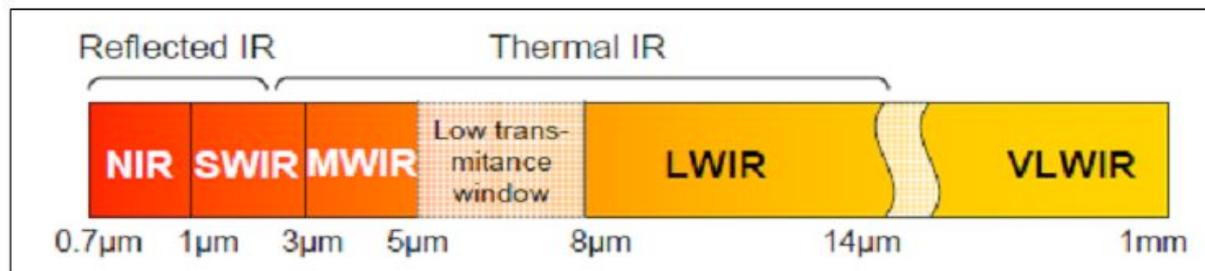
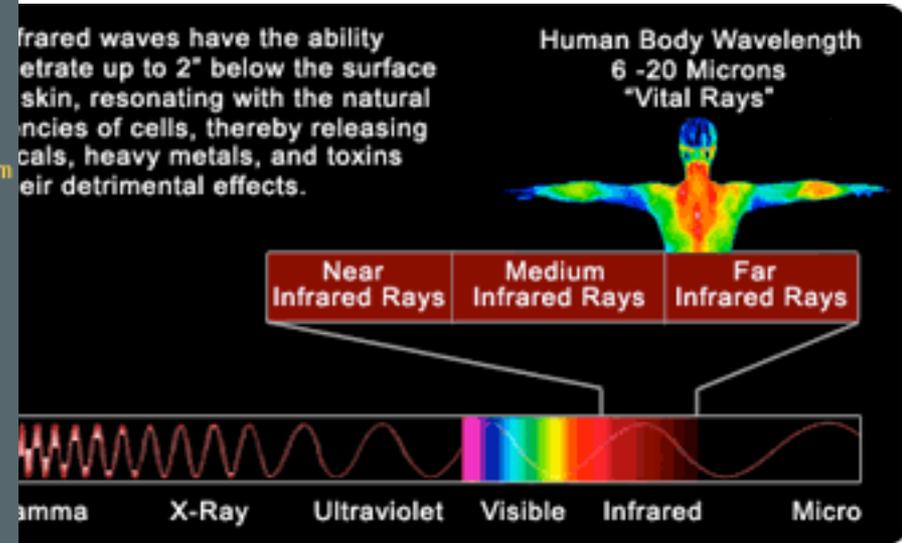
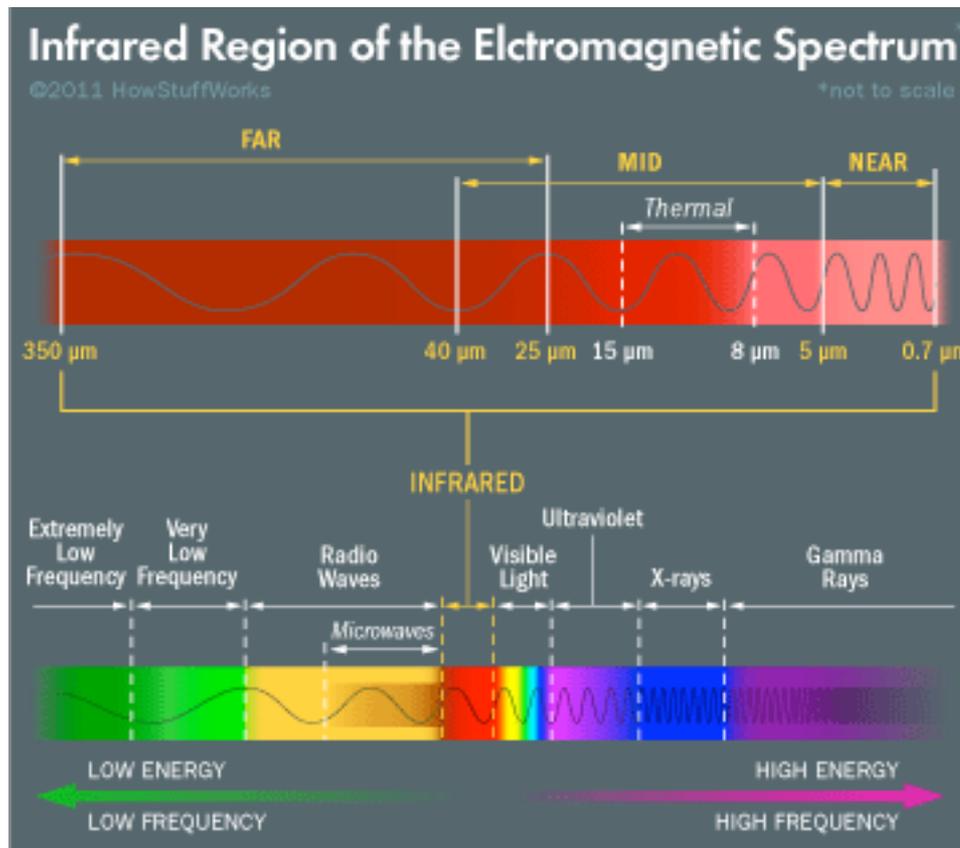
Sketch of measurement geometry and vertical sensitivity for satellite observations of the troposphere in different wavelength ranges.

Near Infrared (NIR): A small portion of the infrared region, located between the visible and microwave portions of the electromagnetic spectrum. NIR makes up the part of IR closest in wavelength to visible light. NIR is not to be confused with thermal infrared, which is on the extreme other end of the infrared spectrum and measures radiant (emitted) heat.

MOPITT takes advantage of the NIR and TIR measurements to infer CO estimates.

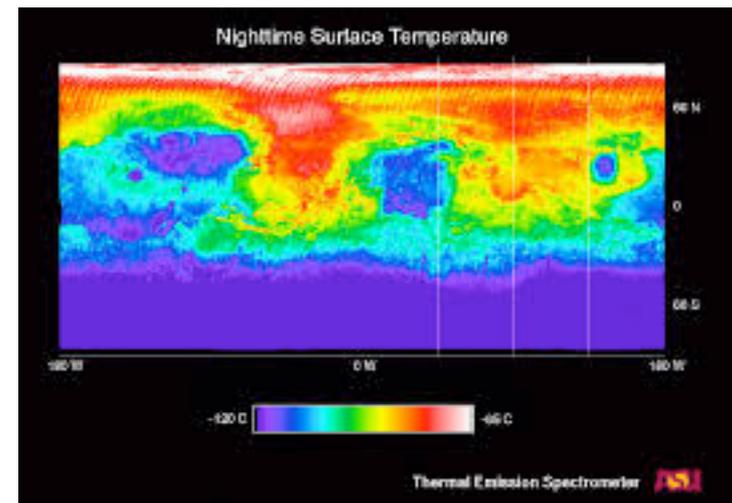
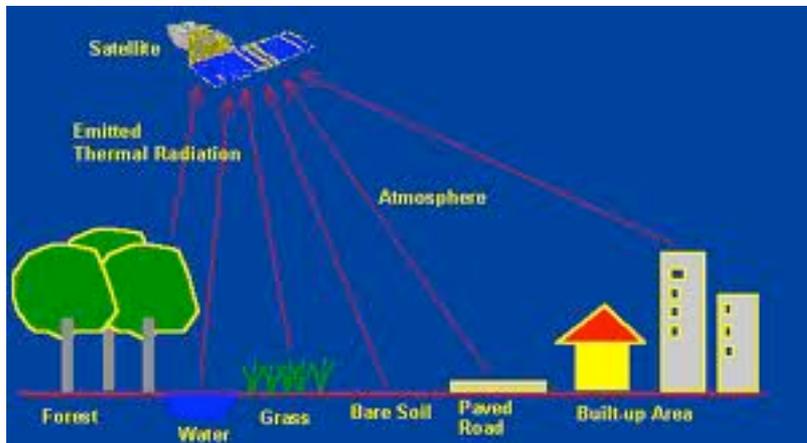


Thermal infrared: uses emitted radiation instead of reflected, for imaging of geological structures, thermal differences in water currents, fires, and for night studies.



Limitations of TIR usage

- Thermal IR imagery is difficult to interpret and process because there is absorption by moisture in the atmosphere.
- Thermal infrared imaging systems are notoriously difficult to calibrate because temperature differences can be subtle.
- The data collected is computationally expensive due to the iterative nature of filtering software



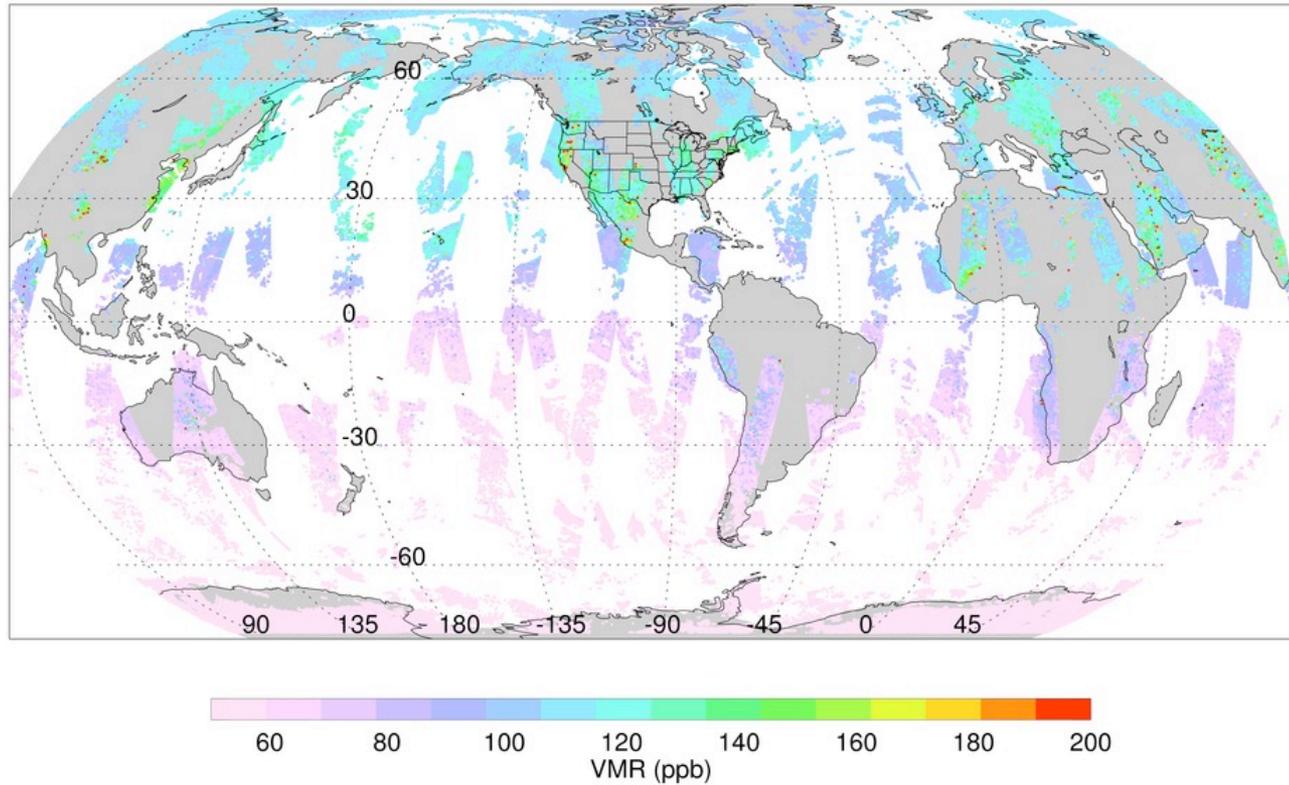


One day of MOPITT

NCAR/ACD

MOPITT CO Total Column Effective VMR

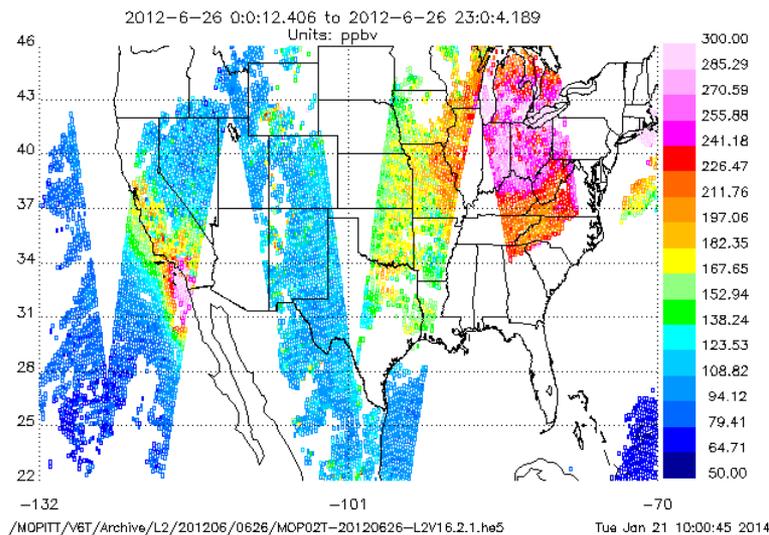
22 Apr 2013



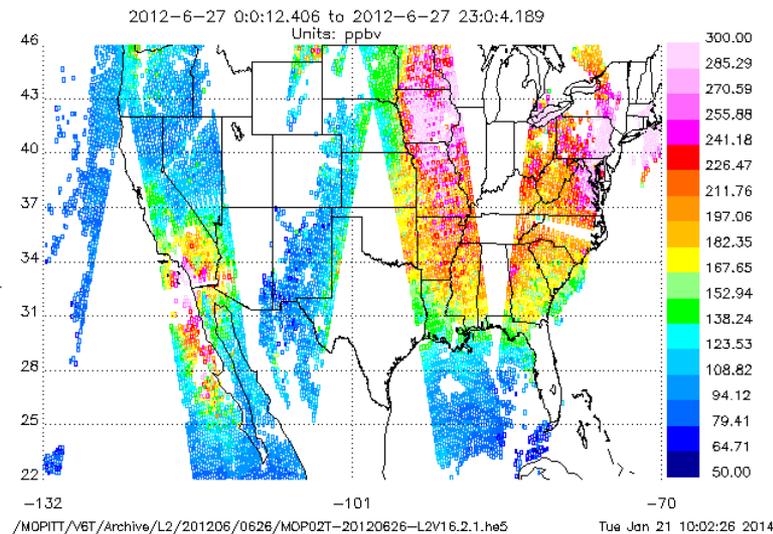
Homepage: <http://www.acd.ucar.edu/mopitt/>

Data and documentation: <http://www.acd.ucar.edu/mopitt/products.shtml>

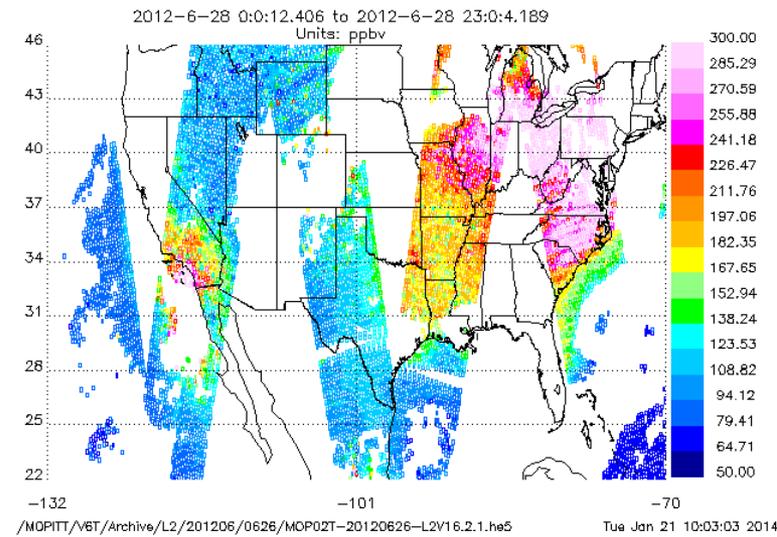
RetrievedCOSurfaceMixingRatio



RetrievedCOSurfaceMixingRatio



RetrievedCOSurfaceMixingRatio



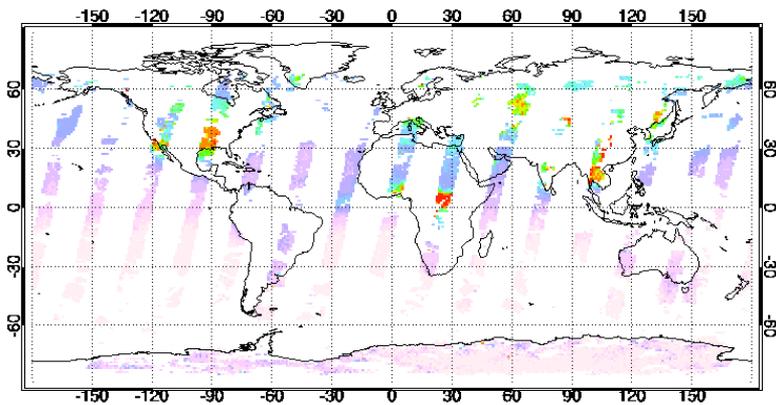
Big MOPITT Limitation!! – COVERAGE

Due to large data gaps, do not expect to get daily coverage in your domain of interest!!

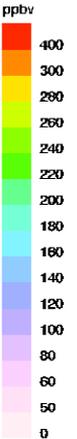
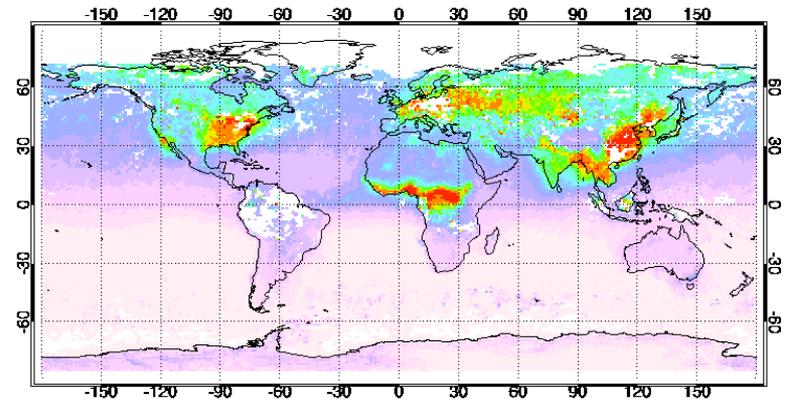


MOPITT: Measurements Of Pollution In The Troposphere

MOPITT CO Surface -- 20130216



MOPITT CO Surface -- 201302



One day coverage

vs

One month coverage

<http://www.acd.ucar.edu/mopitt/MOPITT/data/plots6t/maps.html>

MOPITT V6 TIR-only Daytime and Nighttime CO Retrievals

Quick look images



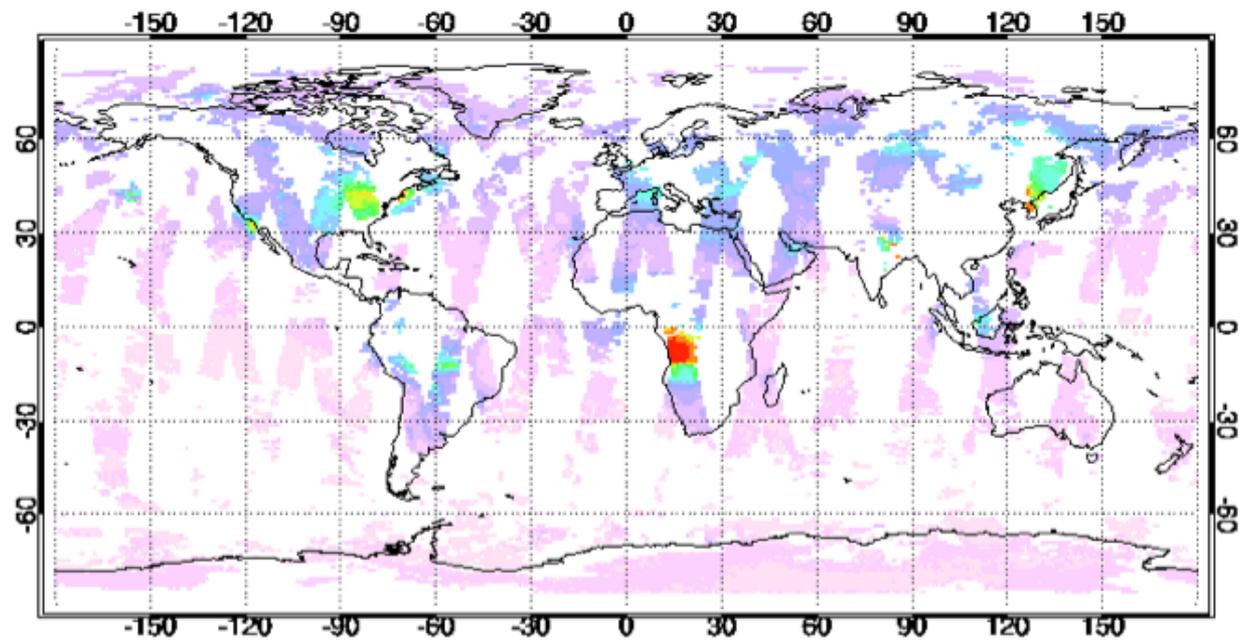
[MOPITT Data page](#)
[Monthly Average Plots](#)

YEAR MONTH DAY LEVEL

2012 6 26 Surface

[PLOT](#)
[PREVIOUS](#)
[NEXT](#)

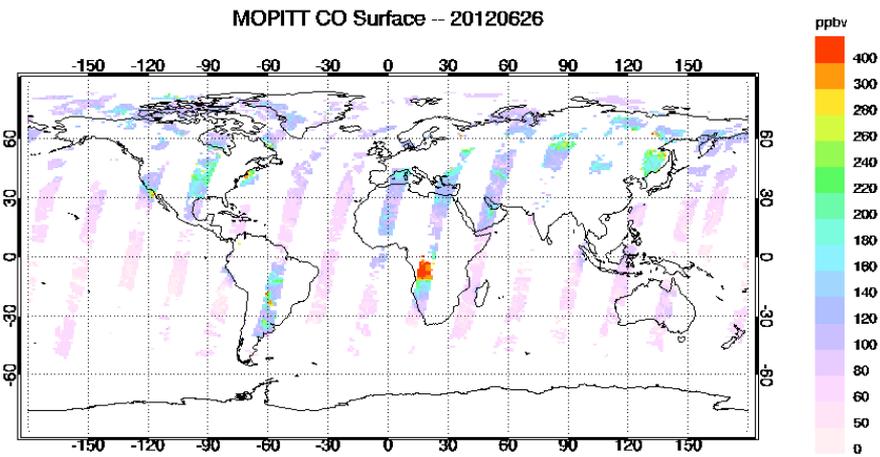
MOPITT CO Surface -- 20120626



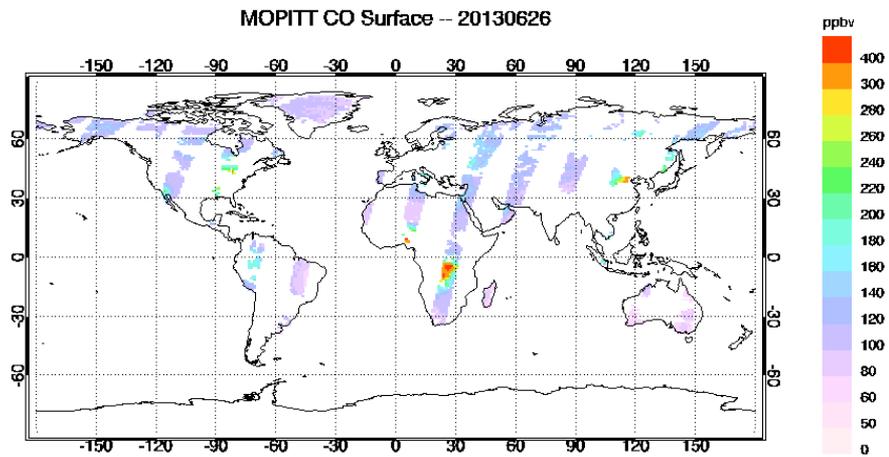
[MOPITT Google Earth File](#)

MOPITT Version 6 Level 2 Product Images

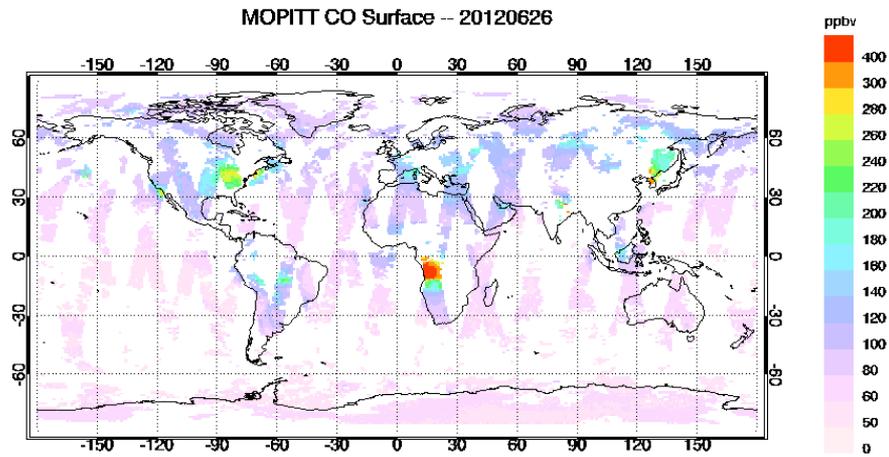
TIR/NIR
Daytime only

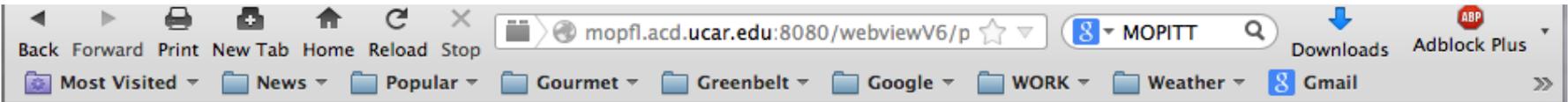


NIR-only
Daytime only

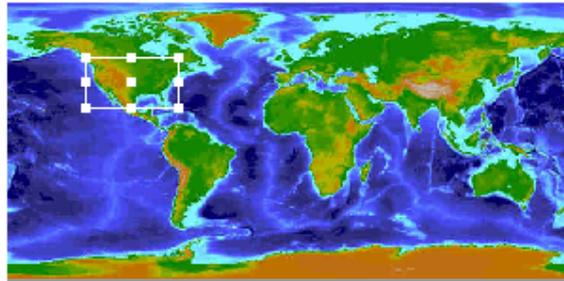


TIR-only
Daytime/Nighttime





[Help](#)



55.0 N
130.0 W 72.0 W
22.0 N

Zoom In

Zoom Out

Current Files:

1. /MOPITT/V6T/Archive/L2/200006/0605/MOP02T-20000605-L2V16.2.1.he5
2. /MOPITT/V6T/Archive/L2/201306/0626/MOP02T-20130626-L2V16.2.1.he5

Select Level 2 variable to plot: RetrievedCOSurfaceMixingRatio

Projection

Cylindrical Equidistance

Colorbar

Data Max to Min

High - Low

User Defined

Min: 50.00000 ppbv

Max: 300.000 ppbv

Plot Options

Filled Pixels

Black Background

Political Boundaries

Size: Medium

Time

Year Month Day Hour Minute Second Millisecond

Start 2013 6 26 0 0 16 897

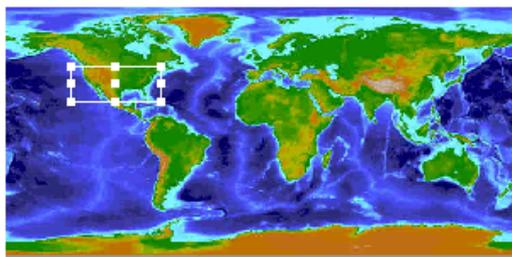
End 2012 6 26 23 59 59 672

Return to File Selection

Reset Form

Export ASCII File

Plot



47.0 N
 134.0 W 70.0 W
 22.0 N

Zoom In Zoom Out

Help

/MOPITT/V6T/Archive/L2/201206/0626/MOP02T-20120626-L2V16.2.1.he5

RetrievedCOTotalColumn

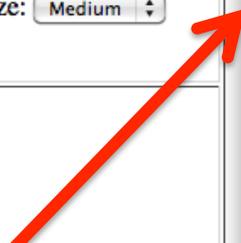
```

mol/cm2
6.1483491e+08
9488 Rows
0.000000 22.6490 -78.7385 1.44293e+18
195.31700 34.5912 -83.1742 2.58548e+18
195.76700 34.5378 -83.7002 2.28244e+18
196.21700 34.4792 -84.2514 1.94735e+18
196.66700 34.4138 -84.8349 2.17334e+18
196.66700 34.1943 -84.7786 2.28690e+18
197.11700 34.4876 -84.5516 1.97743e+18
197.56700 34.6041 -83.9959 2.23721e+18
198.01700 34.7149 -83.4690 1.99838e+18
198.46700 34.8209 -82.9639 2.08610e+18
198.91700 34.9236 -82.4747 2.10626e+18
199.36700 35.0227 -81.9960 2.44906e+18
205.20100 35.6803 -79.9632 3.26988e+18
205.65100 35.6385 -80.4600 2.07351e+18
206.10100 35.5972 -80.9485 1.85808e+18
206.10100 35.3995 -80.9062 4.84476e+18
206.55100 35.5552 -81.4328 1.87937e+18
206.55100 35.3580 -81.3895 1.35081e+18
207.00100 35.5135 -81.9178 2.52359e+18
207.00100 35.3160 -81.8733 2.04869e+18
207.00100 35.1184 -81.8294 2.25329e+18
207.45100 35.4680 -82.4066 1.78810e+18
207.45100 35.2692 -82.3607 1.97663e+18
207.45100 35.0705 -82.3156 2.01648e+18
207.90100 35.4209 -82.9047 2.04342e+18
207.90100 35.2200 -82.8571 1.94698e+18
207.90100 35.0191 -82.8104 1.94628e+18
    
```

Current File: /MOPITT/V6T/Archive/L2/201206/0626/MOP02T-20120626-L2V16.2.1.he5

Select Level 2 variable to plot: RetrievedCOTotalColumn

<p>Projection</p> <p>Cylindrical Equidistance</p>	<p>Colorbar</p> <p><input type="radio"/> Data Max to Min</p> <p><input type="radio"/> High - Low</p> <p><input checked="" type="radio"/> User Defined</p> <p>Min: 1.00000e+18 mol/cm2</p> <p>Max: 3.00000e+18 mol/cm2</p>	<p>Plot Options</p> <p><input type="checkbox"/> Filled Pixels</p> <p><input type="checkbox"/> Black Background</p> <p><input checked="" type="checkbox"/> Political Boundaries</p> <p>Size: Medium</p>
<p>Time</p> <p>Year Month Day Hour Minute Second Millisecond</p> <p>Start 2012 6 26 0 0 12 407</p> <p>End 2012 6 26 23 59 44 19</p>		
<p>Return to File Selection Reset Form Export ASCII File Plot</p>		



MOPITT (+ all NASA EOS satellite) data are available at EOSDIS – NASA's Earth Observing System Data and Information System

The screenshot displays the Reverb | ECHO website interface. The browser address bar shows the URL: `reverb.echo.nasa.gov/reverb/#utf8=✓&spatial_map=satellite&spatial_type=rectangle`. The page header includes the NASA logo, "National Aeronautics and Space Administration", "EOSDIS NASA's Earth Observing System Data and Information System", and "Reverb | ECHO The Next Generation Earth Science Discovery Tool".

The main content area is divided into two sections: "Step 1: Select Search Criteria" and "Step 2: Select Datasets".

Step 1: Select Search Criteria

- Spatial Search:** A map interface with a bounding box set to "e.g. -50.736, 163.477, -11.144, 105.680 (S,E,N,W)". A "Satellite" dropdown menu is visible.
- Search Terms:** A text input field containing "e.g. MODIS Fire AST_L1A".
- Temporal Search:** Fields for "START" and "END" with a format of "YYYY-MM-DD HH:MM:SS".

Step 2: Select Datasets

Found 2869 datasets. Total Query Time: 0.11s

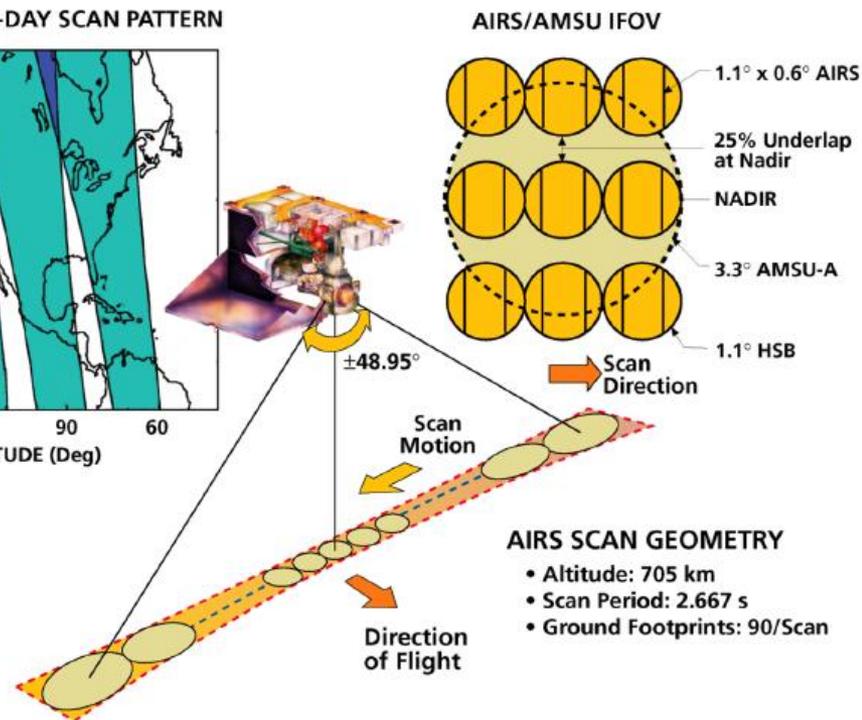
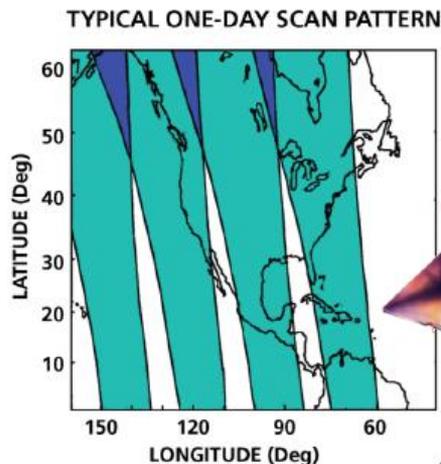
Dataset Name	Archive Center	Short Name	Version	Actions
15 MINUTE STREAM FLOW DATA: USGS (FIFE)	ORNL DAAC	15 MINUTE STREAM FLOW DATA: USGS (FIFE)	Version: 0	+ -
2000 Pilot Environmental Sustainability Index (ESI)	SEDAC	CIESIN_SEDAC_ESI_2000	Version: 1.0	+ -
2001 Environmental Sustainability Index (ESI)	SEDAC	CIESIN_SEDAC_ESI_2001	Version: 2.0	+ -
2002 Environmental Sustainability Index (ESI)	SEDAC	CIESIN_SEDAC_ESI_2002	Version: 3.0	+ -

The left sidebar contains "Search Options" (Spatial, Search Terms, Temporal, Platforms & Instruments, Campaigns, Processing Levels, Science Keywords) and "Availability" (ECHO Outage, ASTER GDEM V2 Tutorial, Notices).



AIRS

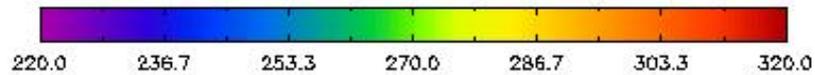
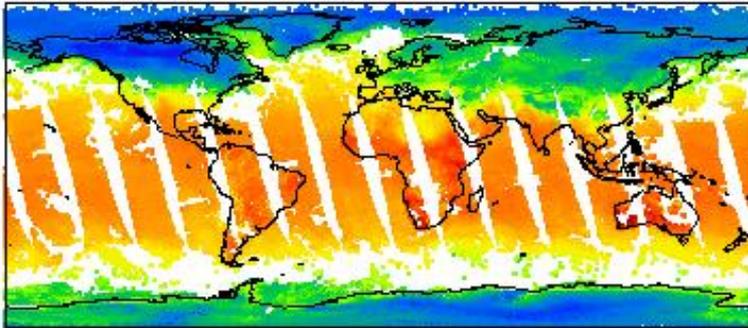
- Operational since Sept. 2002
- A nadir sounding instrument.
- Pixel size = 14 km at nadir
41 x 21 km edges
- Swath width = 1650 km
- Equator Crossing times
 - 13:30 AM (Ascending orbit)
 - 13:30 PM (Descending orbit)
- Column measurements
 - Units = molecules/cm²
- Profile measurements
 - 9 vertical layers (904.866 hPa – 0.016 hPa)
 - Profile Units = Volume mixing ratio
- Total Column CO measurements provided in units = molecules/cm²
- Data Source: Level 2 pixel and Level 3 gridded 1°×1° resolution
- Current Version 6



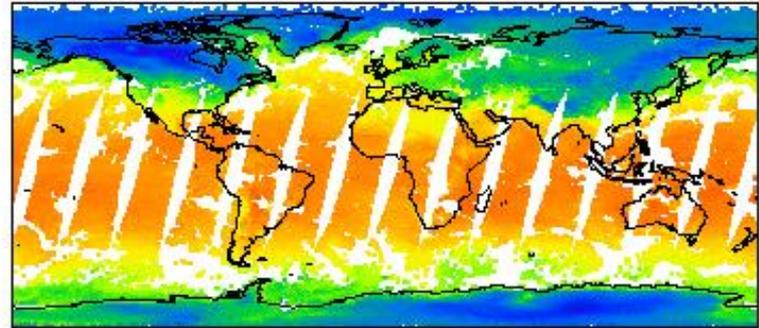
HOME PAGE: <http://airs.jpl.nasa.gov>

One day of AIRS data

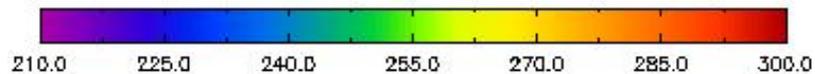
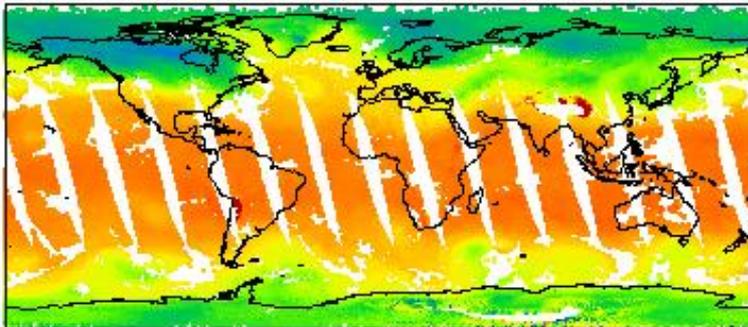
Surface Temperature (deg K: ascending)



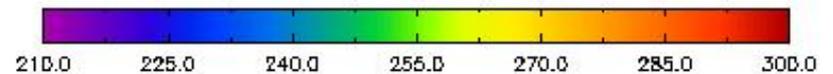
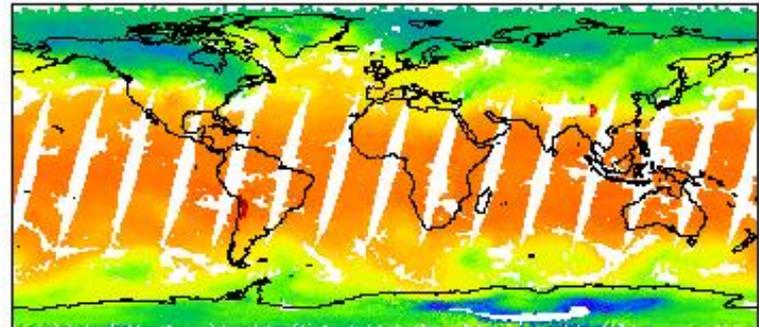
Surface Temperature (deg K: descending)



Temperature at 700 mb(deg K: ascending)



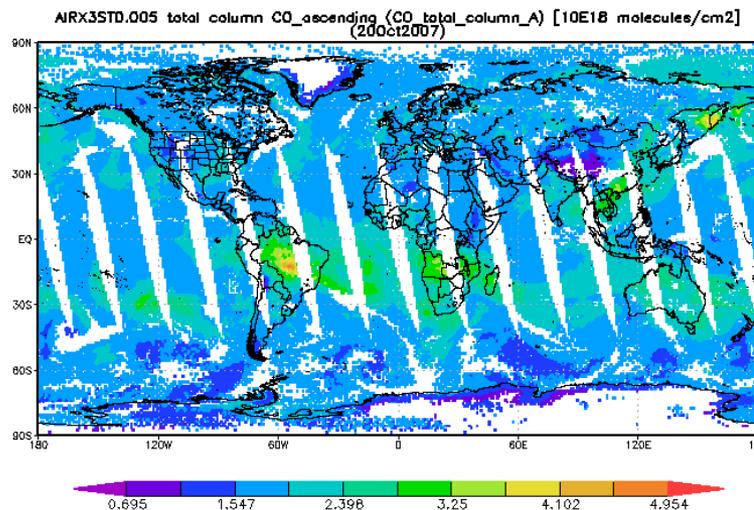
Temperature at 700 mb(deg K: descending)



AIRS vs MOPITT CO

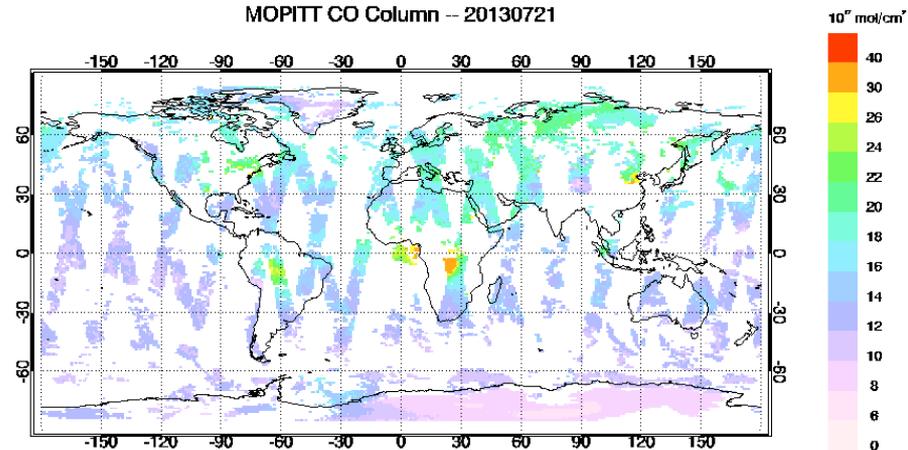


AIRS Level 2
From NRT Website



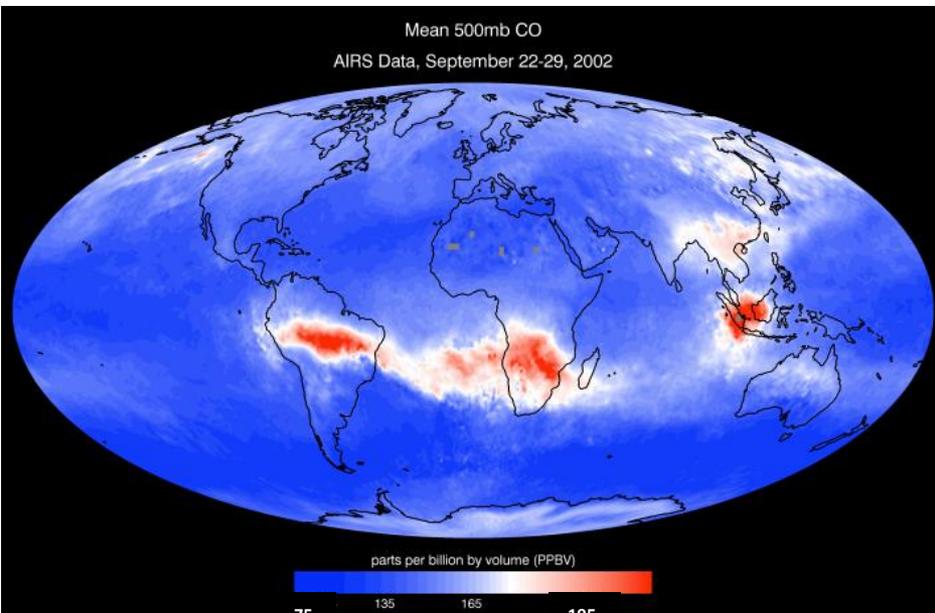
AIRS Level 3 1x1deg
from GIOVANNI

MOPITT CO Column -- 20130721

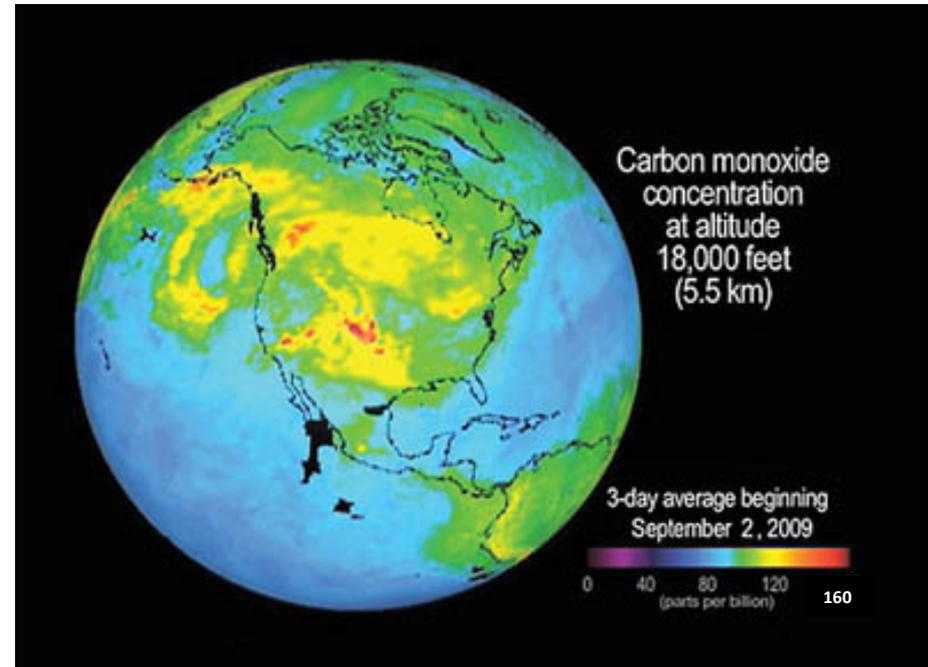


MOPITT
Level 3 1x1deg

Perspective: What's a lot of CO?



ppbv



Data Formats

Aura data (OMI and TES) are stored in HDF5 format

Airs and MOPITT data are stored in HDF4 format



HDF Zoo – provides examples on how to read and visualize various NASA HDF/HDF-EOS files using IDL and MATLAB

<http://hdfeos.org/zoo/>



HDF - EOS Tools and Information Center



[HOME](#)
[EXAMPLES](#)
[SOFTWARE](#)
[WORKSHOPS](#)
[FORUM](#)
[HELP](#)

COMPREHENSIVE EXAMPLES

This page provides comprehensive examples on how to access and visualize various NASA HDF/HDF-EOS files using [IDL](#)[®], [MATLAB](#)[®] and [NCL](#). Other tools and programming languages examples can be found [here](#).

Please read this [special note](#) first before you proceed further.

You can find examples quickly using the search box below. **Please add keyword 'zoo'** first to limit the search within this *Comprehensive Examples* page. Then, type the **first few characters** from the NASA HDF/HDF-EOS file name such as **MOD06**. Finally, you can limit the search by providing one of programming language keywords: **NCL, IDL, or MATLAB**.

Search Examples by Product Name

For a list of examples for the different data centers, click on the product name in the table below.

NASA Data Centers	Product Examples using different tools
GESDISC	AIRS TRMM MERRA TOMS OMI MLS HIRDLS BUV SWDB GSSTF GOSAT/ACOS
LAADS	MOD MYD NPP VIIRS
LP DAAC	MCD MOD MYD VIP WELD
LaRC	CERES MISR MOPITT TES
NSIDC	AMSR E MODIS NISE ICESat/GLAS
PO.DAAC	AVHRR SeaWinds QuikSCAT Aquarius
Ocean Biology Processing Group	OCTS SeaWiFS CZCS MODISA MODIST
GHRC	LIS
ICESat-2	MABEL

Table 1: Sample Data Files and Code Examples

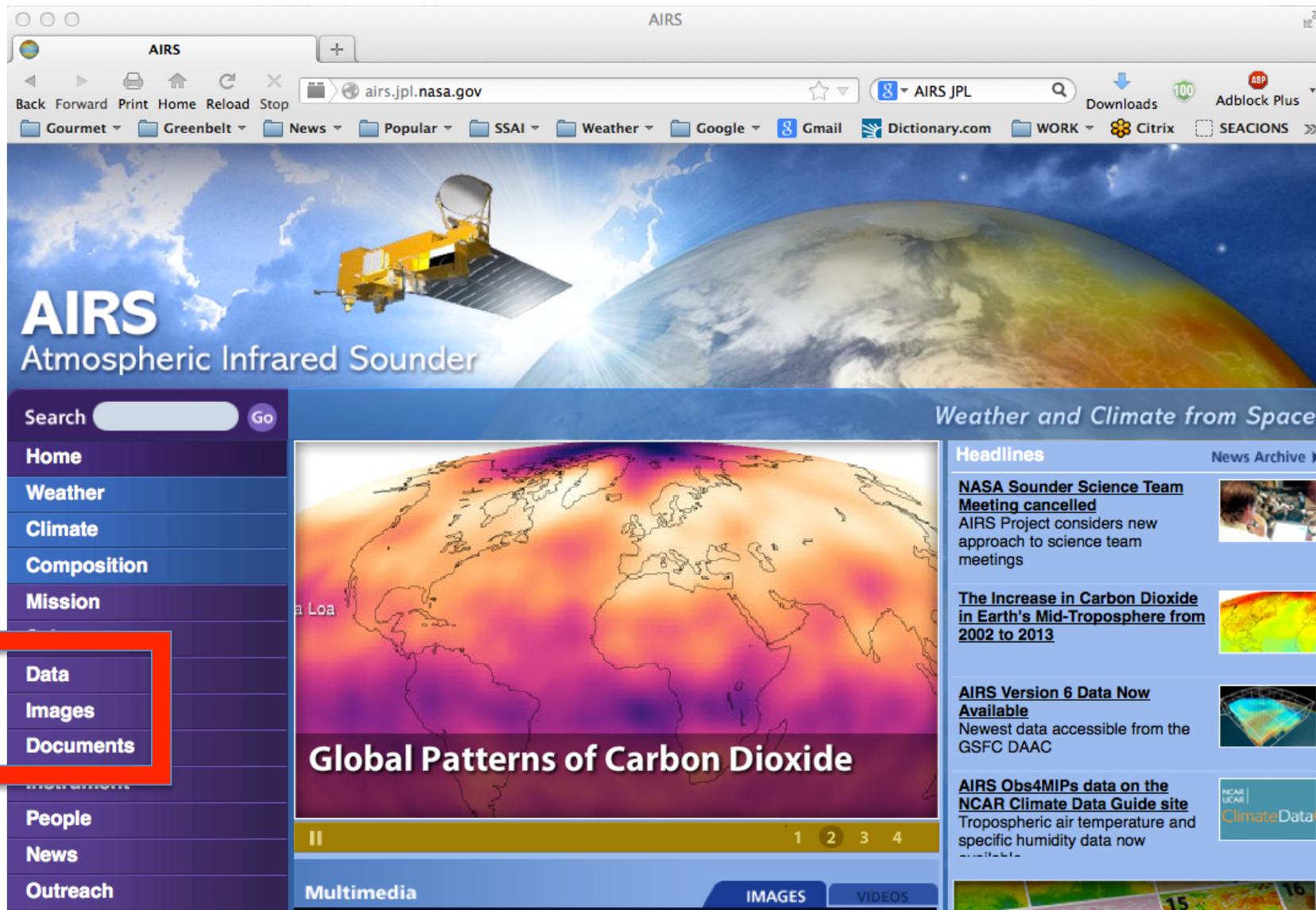
We also provide examples for other data centers that produce HDF4 files.

Other Data Centers	Product Examples using different tools
CloudSAT Data Processing Center	CloudSAT
Ocean Productivity	Net Primary Production

Table 2: Sample Data Files and Code Examples from Other Data Centers

We also extracted and documented information for sample HDF-EOS2/HDF4 and HDF-EOS5 files that are useful to determine the EOS contents stored in the sample files. Please click [here](#) for HDF-EOS2/HDF4 and [here](#) for HDF-EOS5 to read comprehensive description and retrieve sample files.

Access to AIRS data, documentation, and Imagery can be found in the AIRS homepage: <http://airs.jpl.nasa.gov/>



The image shows a screenshot of the AIRS website homepage in a browser window. The browser's address bar displays airs.jpl.nasa.gov. The website features a large banner at the top with the text "AIRS Atmospheric Infrared Sounder" and an image of the satellite orbiting Earth. Below the banner is a navigation menu with the following items: Home, Weather, Climate, Composition, Mission, Data, Images, Documents, Instrument, People, News, and Outreach. The "Data" menu item is highlighted with a red box. The main content area includes a search bar, a "Weather and Climate from Space" header, a large map titled "Global Patterns of Carbon Dioxide" showing a color-coded globe, and a "Headlines" section with three news items: "NASA Sounder Science Team Meeting cancelled", "The Increase in Carbon Dioxide in Earth's Mid-Troposphere from 2002 to 2013", and "AIRS Version 6 Data Now Available".

http://airs.jpl.nasa.gov/data/get_AIRS_data/



AIRS

Weather and Climate from Space

Search [Go](#)

- Home
- Weather
- Climate
- Composition
- Mission
- Science
- Data**
 - Get AIRS Data**
 - Data Product Descriptions
 - Geophysical Data Products
 - Product Accuracies
 - Validation
 - Data Readers
 - Algorithms
 - Direct Broadcast
 - Skew_T Plotting Tool
 - Data Documents
 - Data Users News
 - FAQ
- Images

DATA

Get AIRS Data

AIRS data products are free and are available to the science community and general public

AIRS data is distributed by the NASA Goddard Earth Sciences Data Information and Services Center (DISC). At the DISC you will find information and tools designed to help you find the AIRS data you need.

Get AIRS Version 6 Data

[What's new about AIRS version 6 data >](#)
[Get AIRS version 6 data >](#)
[AIRS version 6 documentation >](#)

Get AIRS Carbon Dioxide Data

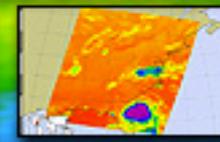
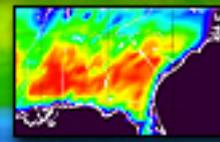
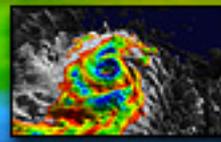
Two pages have been created specifically for the AIRS carbon dioxide data product:

[Get AIRS carbon dioxide data >](#)
[About AIRS carbon dioxide data >](#)



AIRS

Atmospheric InfraRed Sounder



Product Information and access to AIRS data can be found here:

http://disc.sci.gsfc.nasa.gov/AIRS/data-holdings/by-data-product/data_products.shtml

Take you to the **Mirador** search engine. There is the option to convert to Net CDF format

AIRS Level-2 Products (Version 5): without-HSB // AIRS IR Only // with-HSB

Data Product	Description	Spatial Resolution	Temporal Coverage	Average Item Size (Mb)	GES DISC Data Access
AIRX2RET	L2 standard retrieval product using AIRS IR and AMSU, without-HSB	45 km @ nadir; 28 atm pressure levels; 14 pressure layers for H2O related variables...	2002-08-30 - present	2.3	Search
AIRS2RET	L2 standard retrieval product using AIRS IR-only	45 km @ nadir; 28 atm pressure levels; 14 pressure layers for H2O related variables...	2007-05-31 - present	2.3	Search
AIRH2RET	L2 standard retrieval using AIRS IR and AMSU, with-HSB	45 km @ nadir; 28 atm pressure levels; 14 pressure layers for H2O related variables...	2002-08-30 - 2003-02-05	2.3	Search

Goes to a product summary page with links to the Instrument and product documentation

Level 2 AIRS2RET and Level 3 AIRS3STD are the standards daily products

HSB is a humidity sensor that failed in 2003

AMSU is a temperature sounder

AIRS Level-3 Products (Version 5): without-HSB // AIRS IR Only // with-HSB

Data Product	Description	Spatial Resolution	Temporal Coverage	Average Item Size (Mb)	GES DISC Data Access
AIRX3STD	L3 daily gridded standard retrieval product using AIRS IR and AMSU, without-HSB	1°x1°; 24 atm pressure levels; 12 pressure levels for H2O related variables.	2002-08-30 - present	71	Search
AIRS3STD	L3 daily gridded standard retrieval product using AIRS IR-only	1°x1°; 24 atm pressure levels; 12 pressure levels for H2O related variables.	2007-06-01 - present	54	Search
AIRH3STD	L3 daily gridded standard retrieval product using AIRS IR and AMSU, with-HSB	1°x1°; 24 atm pressure levels; 12 pressure levels for H2O related variables.	2002-08-30 - 2003-02-05	75	Search

You are here: [Keyword Search](#)

Keyword Projects Science Areas

Keyword: AIRS2RET Time Span: 2012-07-04 To: 2012-07-04
 Location: (24.89,-126.04),(51.94,-73.6) [Update Map](#) [Search GES-DISC](#)

POWERED BY Google
 Imagery ©2012, Map data ©2012, Terms of Use

[Advanced Search](#)

Data Sets Results 1 - 1 of 1 for AIRS2RET (1 seconds)

-More Services (e.g. http download, format conversion, subsets etc) are available for the data set(s). Whenever you add files to the shopping cart, you will be presented with options for selecting a service and service parameters for any data set which has these services.

AIRS Aqua Level 2 Standard physical retrieval (AIRS-only) (AIRS2RET)

[View Files](#) | [Info](#) | [Data Calendar](#)

Approx. 16 files found (Avg Size: 2.075 MB)
 Parameters: SKIN TEMPERATURE, SURFACE AIR TEMPERATURE, AIR TEMPERATURE, TROPOPAUSE, PRECIPITABLE WATER, WATER VAPOR, OXYGEN COMPOU...
 Spatial Resolution: 50 km x 50 km
 Temporal Resolution: 6 Minutes

[Select All](#) [Reset](#) [List Selected Files By Time](#) [See Timeline View](#) [Add Selected Files To Cart](#)

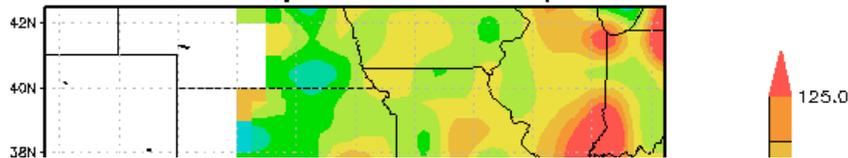
NASA Search Results
 (Number of files found may not be entirely accurate)
 Page: 1

<input type="checkbox"/> Select All in Page	Start Time
<input type="checkbox"/> AIRS.2012.07.04.214.L2.RetStd_IR.v5.0.14.0.G12187114451.hdf (2.06 MB) One Click Download: HDF (Quality Screened) HDF (FTP) HDF (HTTP) NetCDF OPeNDAP	2012-07-04 21:23:23 (Day) Metadata
<input type="checkbox"/> AIRS.2012.07.04.213.L2.RetStd_IR.v5.0.14.0.G12187114451.hdf (2.05 MB) One Click Download: HDF (Quality Screened) HDF (FTP) HDF (HTTP) NetCDF OPeNDAP	2012-07-04 21:17:23 (Day) Metadata
<input type="checkbox"/> AIRS.2012.07.04.212.L2.RetStd_IR.v5.0.14.0.G12187114454.hdf (2.05 MB) One Click Download: HDF (Quality Screened) HDF (FTP) HDF (HTTP) NetCDF OPeNDAP	2012-07-04 21:11:23 (Day) Metadata
<input type="checkbox"/> AIRS.2012.07.04.197.L2.RetStd_IR.v5.0.14.0.G12187114418.hdf (2.07 MB) One Click Download: HDF (Quality Screened) HDF (FTP) HDF (HTTP) NetCDF OPeNDAP	2012-07-04 19:41:23 (Day) Metadata
<input type="checkbox"/> AIRS.2012.07.04.196.L2.RetStd_IR.v5.0.14.0.G12187114402.hdf (2.12 MB) One Click Download: HDF (Quality Screened) HDF (FTP) HDF (HTTP) NetCDF OPeNDAP	2012-07-04 19:35:23 (Day) Metadata
<input type="checkbox"/> AIRS.2012.07.04.181.L2.RetStd_IR.v5.0.14.0.G12187114340.hdf (2.13 MB) One Click Download: HDF (Quality Screened) HDF (FTP) HDF (HTTP) NetCDF OPeNDAP	2012-07-04 18:05:23 (Day) Metadata
<input type="checkbox"/> AIRS.2012.07.04.180.L2.RetStd_IR.v5.0.14.0.G12187114355.hdf (2.10 MB) One Click Download: HDF (Quality Screened) HDF (FTP) HDF (HTTP) NetCDF OPeNDAP	2012-07-04 17:59:23 (Day) Metadata
<input type="checkbox"/> AIRS.2012.07.04.179.L2.RetStd_IR.v5.0.14.0.G12187114334.hdf (2.15 MB) One Click Download: HDF (Quality Screened) HDF (FTP) HDF (HTTP) NetCDF OPeNDAP	2012-07-04 17:53:23 (Day) Metadata
<input type="checkbox"/> AIRS.2012.07.04.164.L2.RetStd_IR.v5.0.14.0.G12187113502.hdf (2.06 MB) One Click Download: HDF (Quality Screened) HDF (FTP) HDF (HTTP) NetCDF OPeNDAP	2012-07-04 16:23:23 (Day) Metadata
<input type="checkbox"/> AIRS.2012.07.04.118.L2.RetStd_IR.v5.0.14.0.G12187103555.hdf (1.95 MB) One Click Download: HDF (Quality Screened) HDF (FTP) HDF (HTTP) NetCDF OPeNDAP	2012-07-04 11:47:23 (Both) Metadata
<input type="checkbox"/> AIRS.2012.07.04.103.L2.RetStd_IR.v5.0.14.0.G12187113355.hdf (2.06 MB) One Click Download: HDF (Quality Screened) HDF (FTP) HDF (HTTP) NetCDF OPeNDAP	2012-07-04 10:17:23 (Night) Metadata
<input type="checkbox"/> AIRS.2012.07.04.102.L2.RetStd_IR.v5.0.14.0.G12187113353.hdf (2.04 MB) One Click Download: HDF (Quality Screened) HDF (FTP) HDF (HTTP) NetCDF OPeNDAP	2012-07-04 10:11:23 (Night) Metadata

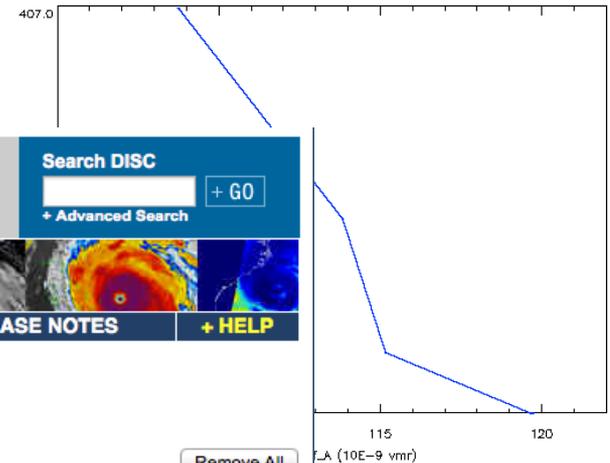
Quality Screened = Filters all data variables based on the science team recommendations.
 Available ONLY for Level 2 data!

GIOVANNI quick-view images: Level 3 1x1 deg images and data access: http://gdata1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=AIRS_Level3Daily

AIRX3STD.005 CO volume mixing ratio ascending (CO_VMR_eff_A) [10E-9 vmr]
@905.0hPa (25Jun2012 - 02Jul2012)



CO volume mixing ratio ascending (CO_VMR_eff_A)
Averaged over Longitude: 97W-95W, Latitude: 29N-31N and Time: 28Jun2012



NASA National Aeronautics and Space Administration

Search DISC + GO
+ Advanced Search

Giovanni - The Bridge Between Data and Science

+ ABOUT GIOVANNI + NEWS + INSTANCES + FEEDBACK + RELEASE NOTES + HELP

AIRS Online Visualization and Analysis

AIRS Global 1.0° x 1.0° Daily Level-3 Products

Home | Result #2 | Results #3 | Remove All

Visualization Results | **Download Data** | Product Lineage | Acknowledgment Policy

Download source data products and data products derived from Giovanni processing stages. For simplicity purposes, only the initial retrieval and final rendering phases are currently accessible for downloading. Supported download formats are HDF, NetCDF(NCD), ASCII, and KMZ (ASCII is available only when the array size is within about half-million points). To **download multiple files** at once, select the desired files (from any section) by clicking on their associated checkboxes, and then click 'Download in Batch'. **Note:** that 'n/a' means that a file size or other column value is not available; 'saa' means that a file is exactly the same as the previous one in the list. Also, not all services and data products support all download file formats.

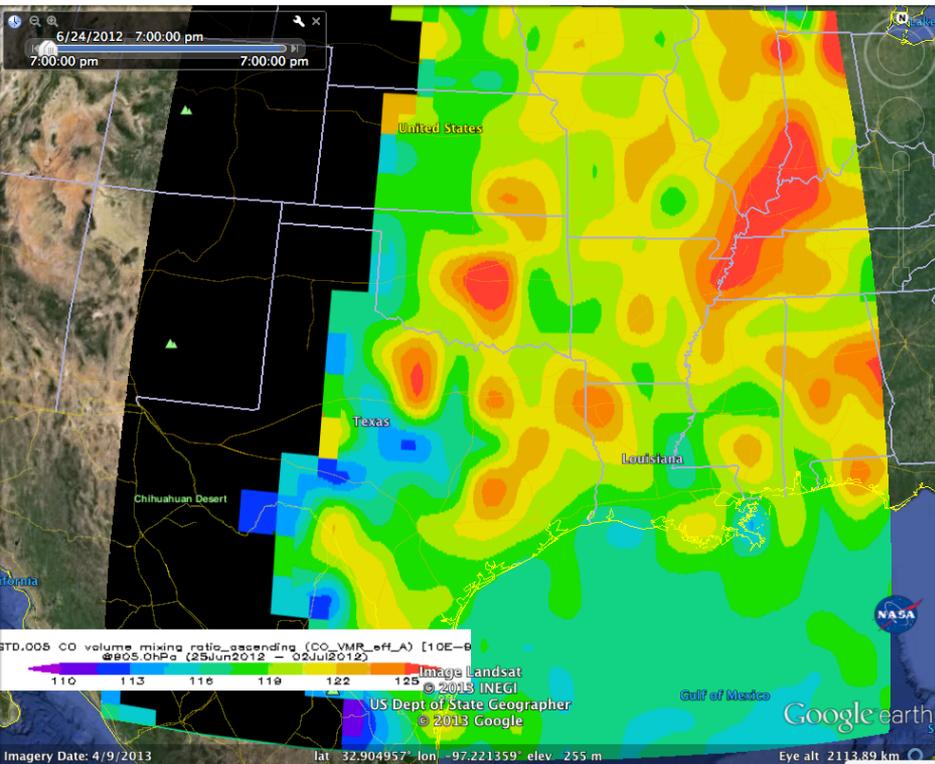
Initial Data Retrieval			
Data Product	Start Time	File Size (b)	Download Files
AIRX3STD.005 (CO_VMR_eff_A)	2011-07-30T00:00:00Z	31834468	<input type="checkbox"/> HDF <input type="checkbox"/> NCD <input type="checkbox"/> RSC
Two Dimensional Map Plot			
Input Files	Start Time	File Size (b)	Download Files
AIRX3STD.005 (CO_VMR_eff_A)	2011-07-30T00:00:00Z	9667	<input type="checkbox"/> HDF <input type="checkbox"/> NCD <input type="checkbox"/> RSC
Output Files	Start Time	File Size (b)	Download Files
CO_VMR_eff_A.AIRX3STD.005.AreaMap.2011-07-30.gif		31878	<input type="checkbox"/> KMZ

Download Data file that create the image

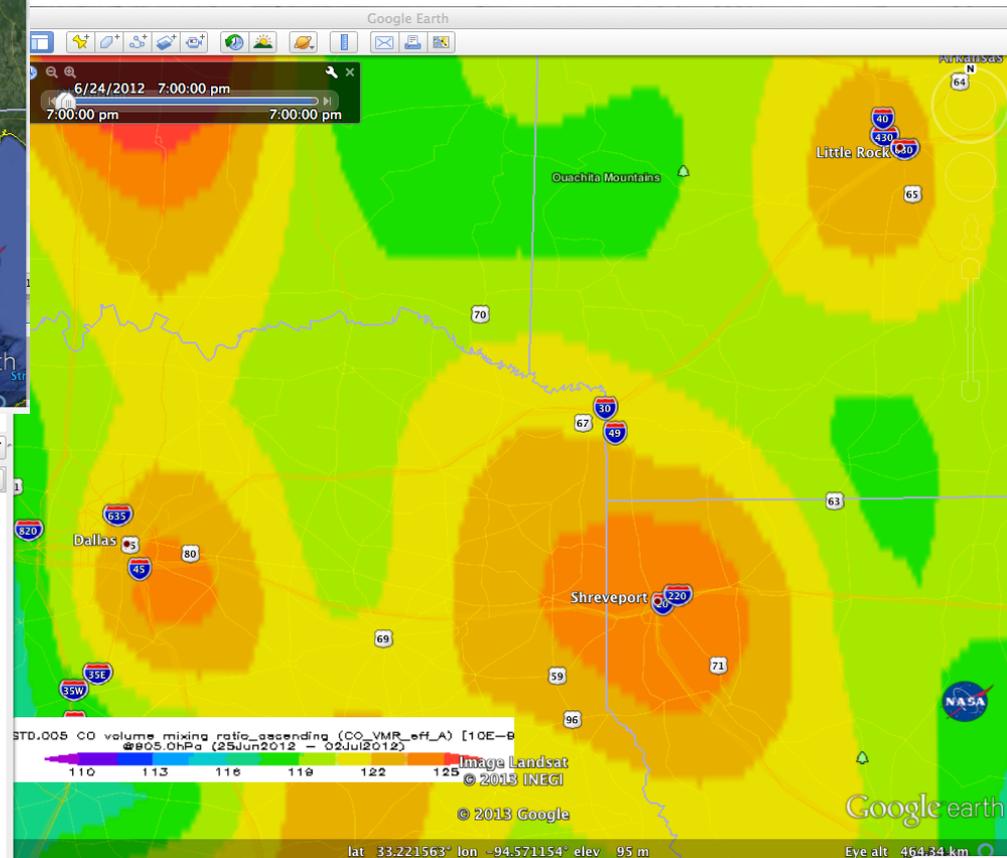
Download Image

http://gdata1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=AIRS_Level3Daily

IF AIRS Level 3 1x1 degree resolution is too coarse then another option is to use Level 2 data – either NRT or downloaded from the Goddard DISC.



Google Earth Example:
June 25 – July 3, 2012



Access to AIRS NRT Trace Gas Products

AIRS NRT Products and Images Website:

<http://disc.sci.gsfc.nasa.gov/nrt/data-holdings/airs-nrt-products/>

There is a **Near-Real Time (NRT)** product that exports KMZ files but is available for data going back 9 days only. This product is great for capturing events **as they happen!**

NRT Level 2 data, PNG, GeoTIFF, and KMZ files are available at this site. **BUT historic data is not available.**

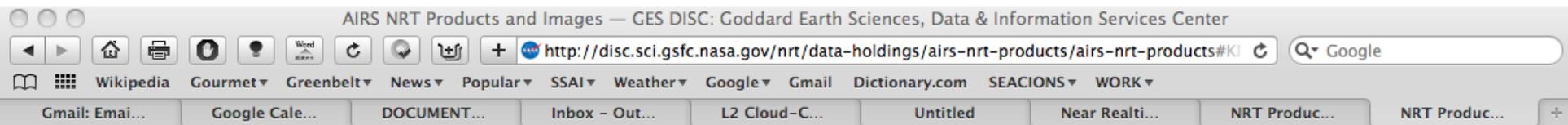
The screenshot shows a web browser window displaying the AIRS NRT Products and Images website. The browser's address bar shows the URL: <http://disc.sci.gsfc.nasa.gov/nrt/data-holdings/airs-nrt-products/airs-nrt-products#D>. The website header includes the NASA logo, the text "GES DISC Goddard Earth Sciences Data and Information Services Center", and a search bar. Below the header, there are navigation tabs for "GES DISC Home", "Data Services", "Science Portals", and "Mission Portals". Under "Data Services", there are links for "Analyze Data with Giovanni", "Search for Data with Mirador", "Simple Subset Wizard", and "More...". A prominent banner for "Near Realtime Data" features three thumbnail images labeled "CO", "SO₂", and "Visible". On the left side, there is a sidebar with a "DATA HOLDINGS" section containing links for "AIRS NRT Products" and "MLS NRT Products", and a "DOCUMENTATION" section. Below this is an "Additional Features" section with links for "News", "FAQ", and "Links". The main content area shows a breadcrumb trail: "You are here: GES DISC Home » Near Real Time Data » Data Holdings » AIRS NRT Products". The title of the page is "AIRS NRT Products and Images". A yellow warning box contains an "IMPORTANT MESSAGE Aug 09, 2012 LANCE-AIRS Near-Real Time" stating: "Due to a Aqua maneuver, There is gaps in the AIRS NRT data starting from 2012-08-09 14:53:22 - 16:53:23." Below the warning, there is a list of three items: "1. AIRS Near-Real-Time (NRT) Data Products", "2. AIRS NRT Images", and "3. AIRS NRT MapViewer".

AIRS NRT Products and Images Website:

<http://disc.sci.gsfc.nasa.gov/nrt/data-holdings/airs-nrt-products/>

To get KMZ files for Google Earth:

1. click on “2. AIRS NRT Images”
2. Click on where it says ‘KMZ’



2.3. KMZ, the compressed Keyhole Markup Language (KML)

KML is an XML-based language schema for expressing geographic annotation and visualization on existing or future Internet-based, two-dimensional maps and three-dimensional Earth browsers, like GoogleEarth. We link here to the **KMZ** - the compressed version of KML - because browsers can attempt to open KML as plain XML file, whereas our goal is to view global imagery, through [GoogleEarth](#) or other relevant browser. An important distinction in this approach is that one file can contain multiple images ("Places") that can be overlaid for simultaneous three-dimensional views. The KMZ below can be easily combined and overlaid in various ways, using for instance GoggleEarth's "Places" and "Layers" folders.

You must have [GoogleEarth](#) (or other appropriate tool) installed on your computer to view the **KMZ** as images.

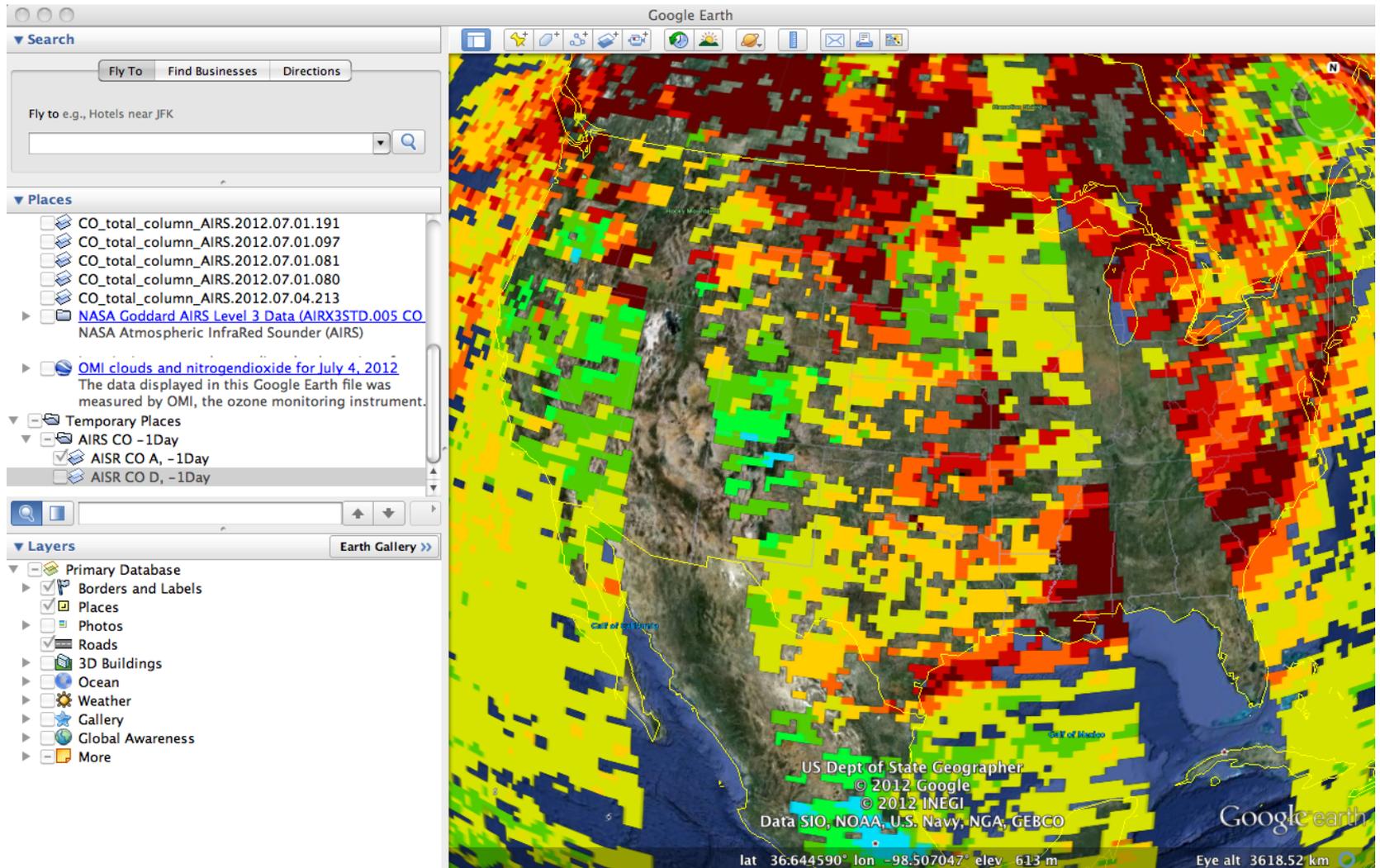
KMZ Format

RGB* (Visible 3-km)	Today	Yesterday	-2 Days	-3 Days	-4 Days	-5 Days	-6 Days	-7 Days	-8 Days	-9 Days
IR_Precip_Est	Today	Yesterday	-2 Days	-3 Days	-4 Days	-5 Days	-6 Days	-7 Days	-8 Days	-9 Days
BT_diff_SO2	Today	Yesterday	-2 Days	-3 Days	-4 Days	-5 Days	-6 Days	-7 Days	-8 Days	-9 Days
Prata_SO2	Today	Yesterday	-2 Days	-3 Days	-4 Days	-5 Days	-6 Days	-7 Days	-8 Days	-9 Days
CO	Today	Yesterday	-2 Days	-3 Days	-4 Days	-5 Days	-6 Days	-7 Days	-8 Days	-9 Days
Dust Score	Today	Yesterday	-2 Days	-3 Days	-4 Days	-5 Days	-6 Days	-7 Days	-8 Days	-9 Days

*Note:

- AIRS NRT imagery is broken into tiles that are seamlessly served as one image, to speed up regional viewing. Even though the Visible false color RGB are broken into tiles too, their global coverage at 3-km resolution still makes the tiles very big. Please, allow more time the RGB image to refresh in your application.
- The **Prata_SO2** images are generated by an algorithm authored by [Fred Prata](#), Norwegian Institute for Air Research.

Note: These NRT data are in parts per billion
A = Ascending (daytime) and D = Descending (nighttime) are included.



Summary of AIRS and MOPITT Websites

GIOVANNI

<http://disc.sci.gsfc.nasa.gov/giovanni>

AIRS Near-Real Time (NRT) Products and Images (PNG, GeoTIFF, KMZ)

<http://disc.sci.gsfc.nasa.gov/nrt/data-holdings/airs-nrt-products/>

AIRS Level 2 Data Products

[http://disc.sci.gsfc.nasa.gov/AIRS/data-holdings/by-data product/data_products.shtml](http://disc.sci.gsfc.nasa.gov/AIRS/data-holdings/by-data-product/data_products.shtml)

EOSDISC Reverb global search tool: <http://reverb.echo.nasa.gov>

Mirador Search/Get date: <http://mirador.gsfc.nasa.gov>

AIRS Homepage: <http://airs.jpl.nasa.gov/>

MOPITT Homepage: <http://www.acd.ucar.edu/mopitt/>

MOPITT Daily/Monthly images:

<http://www.acd.ucar.edu/mopitt/visualize.shtml>

<http://mopfl.acd.ucar.edu:8080/webviewV4/selectmopittfile>