TRMM Data Service Update

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NASA Goddard Earth Sciences Data and Information Center (GES DISC)
Outline

- Overview of TRMM data services
- Mirador (Data access made simple)
- TOVAS (Data access without downloading data and software)
- Other tools and examples (YOTC, HDAT, Giovanni)
- Other data services (OPeNDAP, WMS, etc.)
- Future plans
What is TRMM?

The Tropical Rainfall Measuring Mission (TRMM) is a joint U.S.-Japan satellite mission to monitor tropical and subtropical (40° S - 40° N) precipitation and to estimate its associated latent heating.
X, Y, Z: Spacecraft coordinate system (right handed)

*Nominally coincident with spacecraft flight direction with velocity, v: 7.3 km/sec

+Y: VIRS cooler side
+X: TMI side
W: TMI spin speed 31.6 rpm
Z: nadir

Range resolution: 250 m

TMI swath: 759 km
VIRS swath: 720 km
PR swath: 215 km

Incident angle: 52.8°

TRMM ground track: 6.9 km/sec
Mirador (Data Access Made Simple)

- An earth science data search tool developed at the GES DISC
- Simplified, clean interface
- Google mini appliance for metadata keyword searches.
- Spatial and parameter subsetting, format conversion
- Gazetteer (geographic search by feature name capability)
Mirador Data Access Made Simple

Keyword: [Required] Location: [ ]

Time Span:
From: [ ] To: [ ]

Search OBS-DISC

Advanced Search

Available:
APRS, CML, MLE, MPECS, TCMOD, FLAP, TRMM, GLDAS, SORCE, SIC, Troposphere (modis, ICAO), AMSR, ERA and NCEP

What's New:
Quality Screening for APRS Level 2 Products, TRMM DB42 available with netCDF conversion and compression

Acknowledgements:
Locations Gazetteer data from: National GeoSpatial Information Agency
Events Gazetteer data from: University of California, Berkeley and Smithsonian Global Volcanism Program

LATEST NEWS

2011-01-11T22:01:17Z - APRS Near Real-Time Data and the Dry Season in AFRICAN savanna
APRS Near Real-Time Data shows dust and smoke in African savanna
+ Read More

2011-01-11T21:36:52Z - Caspian Sea temperatures set in motion, set to music
Russian scientist creates simulation of daily sea surface temperatures in the Caspian Sea
+ Read More

2011-01-11T16:42:58Z - GES DISC provides rapid analysis of factors contributing to record Australian floods
Rainfall and temperature data and analyses demonstrate dramatic departures from normal conditions
+ Read More

Total Solar Irradiance (TSI) data update is now available at the GES DISC
+ Read More
<table>
<thead>
<tr>
<th>Data Sets</th>
<th>Results 1 - 10 of 10 for daily rainfall (2 seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily TRMM and Others Rainfall Estimate (3B-42 V6 derived) (TRMM_3B42_daily)</td>
<td>Approx. 1097 files found (Avg Size: 2.197 MB)</td>
</tr>
<tr>
<td>TRMM and Other Sources Rainfall Product (TRMM Product 3B-43) (TRMM_3B43)</td>
<td>Approx. 36 files found (Avg Size: 4.415 MB)</td>
</tr>
<tr>
<td>Half-Hourly Radar Site 3-D Reflectivity (TRMM_2A50UW)</td>
<td>Approx. 13824 files found (Avg Size: 6.441 MB)</td>
</tr>
<tr>
<td>2A53: Half-Hourly 2 km Radar Site Rain Map (TRMM_2A53_CSI)</td>
<td>Approx. 220 files found (Avg Size: 6.007 MB)</td>
</tr>
</tbody>
</table>

- More Services (e.g., ftp 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.
## Daily TRMM and Others Rainfall Estimate (3B42 V6 derived)

The following services are available for the data set(s). Whenever you add files to the shopping cart, you will be presented with options for selecting these services.

- **Download via HTTP**
- **Convert to NetCDF**
- **Convert to groped NetCDF**

### Results 1 - 15 for daily rainfall (3 seconds)

**Sort by time: Descending**

<table>
<thead>
<tr>
<th>File Name</th>
<th>Size (MB)</th>
<th>Start Time</th>
<th>Metadata Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>3B42_daily.2009.01.01.bin (226 MB)</td>
<td>2.26 MB</td>
<td>2000-12-31 22:30:00</td>
<td>Metadata</td>
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<tr>
<td>3B42_daily.2009.12.31.bin (226 MB)</td>
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<td>Metadata</td>
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<td>3B42_daily.2009.12.27.bin (226 MB)</td>
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<tr>
<td>3B42_daily.2009.12.25.bin (226 MB)</td>
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<td>3B42_daily.2009.12.22.bin (226 MB)</td>
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<td>2.26 MB</td>
<td>2000-12-20 22:30:00</td>
<td>Metadata</td>
</tr>
</tbody>
</table>
For event, did you mean...

- KATRINA tropical depression
- KATRINA tropical storm
- KATRINA hurricane category 1
- KATRINA hurricane category 2
- KATRINA hurricane category 3
- KATRINA hurricane category 4
- KATRINA hurricane category 5

More Services (e.g. https 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.

- TRMM and Other Sources Rainfall Product (TRMM Product 3B43) (TRMM_3B43)
  - View Files | Info | Data Calendar
  - Approx. 1 files found (Avg Size: 4.415 MB)
  - Parameters: PRECIPITATION RATE
  - Spatial Resolution: 0.25 degree x 0.25 degree
  - Temporal Resolution: 30 Day(s)

- Daily TRMM and Others Rainfall Estimate (3B42 V6 derived) (TRMM_3B42_daily)
  - View Files | Info | Data Calendar
  - Approx. 11 files found (Avg Size: 2.197 MB)
  - Parameters: PRECIPITATION RATE
  - Spatial Resolution: 0.25 degree x 0.25 degree
  - Temporal Resolution: 1 Day(s)

- TRMM 3-Hourly 0.25 deg. TRMM and Other-GPI Calibration Rainfall Data (TRMM_3B42)
  - View Files | Info | Data Calendar
  - Approx. 185 files found (Avg Size: 0.312 MB)
  - Parameters: PRECIPITATION RATE
  - Spatial Resolution: 0.25 degree x 0.25 degree
  - Temporal Resolution: 3 Hour(s)

- TRMM Precipitation Radar (PR) Gridded Surface Rain Total Product (TRMM Product 3A26) (TRMM_3A26)
  - View Files | Info | Data Calendar
  - Approx. 1 files found (Avg Size: 5.502 MB)
  - Parameters: PRECIPITATION RATE
  - Spatial Resolution: 3 degrees x 5 degrees
  - Temporal Resolution: 31 Day(s)

- TRMM Ground Validation (GV) Calibrated Radar Reflectivity Product (TRMM GV Product 1C51) (TRMM_1C51)
  - View Files | Info
Overview of TOVAS
What is TOVAS?

TOVAS stands for the TRMM Online Visualization and Analysis System. The NASA GES DISC is home of TRMM data archive. To facilitate data access, we have developed TOVAS.
What can TOVAS do?

TOVAS allow an easy access to many popular TRMM Level-3 gridded precipitation products, near-real-time products and other precipitation products without downloading data and software.
An easy access:

- Generate customized maps, plots, animation, etc.
- Obtain customized data (maps, time series, Hovmoller diagram)
- Format conversion (NetCDF, binary, ASCII)
TOVAS System Description

- Reliable
- Flexible
- Low-cost

Visualization and Analysis Server

Receive Parameters from Interface CGI

Compose GrADS Script

Execute GrADS Script

Generate Plot/ASCII Output

Output to Web Browser

Output to Web Client

Receive Parameters from Web Client

Data: Binary or GDS

6/13/2011

TRMM Data Service Update
TRMM and Other Precipitation Products in TOVAS:

- Near-real-time 3-hourly
- Daily
- Monthly
- Climatology and anomaly
- Willmott Climate Data (monthly, land only)
- Global Precipitation Climatology Centre (monthly, land only)
Services/functions:

- Lat-lon map
- Time series
- Hovmoller diagram
- Scatter plot
- Animation
- Difference/overlay (map and time series)
Services/functions (cont.):

- Anomaly and percent of normal
- Outputs (ASCII, NetCDF, HDF, binary, etc.)
- KMZ (Google Earth)
TOVAS Landing Page:

TOVAS New Release (2008/09/12)
Giovanni TOVAS is in transition to a new web host. Two new transitioned instances of TOVAS have been released:
- Experimental Real-Time TRMM Multi-Satellite Precipitation Analysis (TMPA-RT)
- TMPA-RT Intermediate IR Product
- TMPA-RT Intermediate Microwave Product
- 3-hourly product (3B42 V6)
- Daily TRMM and Other Rainfall Estimates (3B42 V6 derived)
- Monthly products (3B42 V6, 3B12 V6, and 3B25 V6)
Several new functions and parameters have been added along with additional data download formats (HDF, NetCDF and KMF).
As planned, all current TOVAS instances, listed below in this page, will be similarly converted to the new system.

Welcome to TOVAS, a member of the Giovanni (GES-DISC DAAC Online Visualization and Analysis System) family, which provides users with an easy-to-use, Web-based interface for the visualization and analysis of Earth Science data.

Note: The Java Version uses Java applet for interactively selecting an area of interest. If you have difficulties in using the Java Version, please try the Non Java Version.

Near-Real-Time Monitoring Product (For research, use Archive Data.)

Experimental Real-Time TRMM Multi-Satellite Precipitation Analysis (TMPA-RT): 3B42RT
Daily Global and Regional Rainfall (TMPA-RT 3B42RT derived)
TMPA-RT Intermediate IR Product: 3B41RT (VAR)
TMPA-RT Intermediate Microwave Product: 3B40RT (HQ)

Rainfall Archives

Monthly Global Precipitation (GPCP)
Prototype Interactive Intercomparison of Rainfall Products
3-hourly TRMM and Other Rainfall Estimate (3B42 V6)
Daily TRMM and Other Rainfall Estimate (3B42 V6 derived)
Monthly TRMM and Other Data Sources Rainfall Estimate (3B43 V6)
Monthly Rainfall (3B43 V6) Anomaly
Inter-Comparison of Rainfall Climatology
Monthly TMI rain, latent heat, cloud liquid water profiles (3A12 V6)
Monthly Rainfall (3A25 V6)

Ground Observation Archives

Monthly Willmott and Motzka Global Precipitation (1950 - 1999)
Monthly GPCP Rainfall (1986 - Present, Monitoring Product)
TOVAS Interface:

Near-Real-Time Monitoring Product (For research, use Archive Data.)

Experimental Real-Time TRMM Multi-Satellite Precipitation Analysis (TMPA-RT): 3B42RT

This interface is designed for visualization and analysis of the Experimental Real-Time TRMM Multi-Satellite Precipitation Analysis (TMPA-RT): 3B42RT. Users can generate plots or ASCII output for area average (Lat-Lon Map), time series (Time Series), and Hovmoller diagram. The animation is available for Lat-Lon Maps. Selecting the help button will open a new window with detailed help. More details about the data are also available.

Alert: A new window may be opened when a link or a button is selected below.

Click and drag to select area; or input latitudes (-60, 60) and longitudes (-180 ~ 180) or click for non Java/JavaScript version
More information on supported browsers and platforms

Click and drag to select area; or input latitudes (-60, 60) and longitudes (-180 ~ 180) or
Click for non Java/JavaScript version
More information on supported browsers and platforms

3-hourly TMPA-RT

Due Date: 2011 January 13 09:20 (Date Begin: 2000/10/01)
End Date: 2011 January 13 09:20 (Date End: 2011/01/13)
Please check TMPA-RT Data Outages page

Color Options:
- Pre-defined
- Customized (linear only): Min: Max:

Time Series Plot
- Dynamic
- Customized; Min: Max: Interval:

ASCII Output Resolution:
- 0.25x0.25

Generate Plot
ASCII Output
Reset Form
TOVAS Interface (cont.):

TRMM Online Visualization and Analysis System (TOVAS)
TRMM Level-3 Monthly Products.

This web-based tool is designed for visualization and analysis of the TRMM Level-3 data products. Users can generate plots for Lat-Lon Map, Time Series, Histogram, and more. Animation is available for Lat-Lon Maps. Results can be downloaded in HDF, NetCDF, ASCI, and Google Earth KMZ formats.

Note: The latent heating products of TRMM 2A12 and 3A12 over ocean surfaces should be regarded as experimental. Please center first with the algorithm developers (by contacting the GES DISC) when using the latent heating product over ocean. Over-land latent heating estimates from TRMM products 2A12 and 3A12 should not be used, as they have not been evaluated quantitatively or qualitatively.

Select:

Spatial

Cursor Coordinates: 04.78688, 30.98854

Vertical Profile

Select a vertical profile range. The range selection is disabled unless a qualifying parameter is selected. In order to enable this option (and populate the list of profiles), select a 3D parameter. 3D parameters have at least three dimensions and are labeled with a (3D) in the 'Parameter' section.

NOTE: Selected 3D parameters must have the same vertical (e.g., 3rd dimension) units in order to enable the vertical menu.
### TRMM Online Visualization and Analysis System (TOVAS)

#### TRMM Level-3 Monthly Products.

<table>
<thead>
<tr>
<th>Initial Data Retrieval</th>
<th>Start Time</th>
<th>File Size (b)</th>
<th>Download Files</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Product</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRMM_3B43.006 (precipitation)</td>
<td>2010-12-01 00:00:00Z</td>
<td>3964341</td>
<td></td>
</tr>
</tbody>
</table>

#### Two Dimensional Map Plot

<table>
<thead>
<tr>
<th>Input Files</th>
<th>Start Time</th>
<th>File Size (b)</th>
<th>Download Files</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRMM_3B43.006 (precipitation)</td>
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</table>

<table>
<thead>
<tr>
<th>Output Files</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>precipitation.TRMM_3B43.006.AreaMap.2010-12.gif</td>
<td>22509</td>
<td>KMZ</td>
</tr>
</tbody>
</table>

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.
Examples of TOVAS
TOVAS Functions – Area Plot

![TOVAS Functions Area Plot](image_url)

- **West Longitude**: 50.0
- **North Latitude**: 40.0
- **East Longitude**: 74.0
- **South Latitude**: 20.0

Click and drag to select area; or input latitudes (-60.0 ~ 60.0) and longitudes (-180.0 ~ 180.0).

Click for non Java/JavaScript version.

**Parameter:**
- **Monthly Rain Rate (mm)**
- **Color Level Option:**
  - Pre-defined
  - Dynamic
  - Customize: Min. Max.

**Plot type:** Area Plot

**Begin date:** 2002-12

**End date:** 2003-01

**Generate Plot**

**ASCII Output**

*Alert: A new window will be opened when “Generate Plot” or “ASCII Output” is selected.*
TOVAS Functions (cont.) – Time Plot
TOVAS Functions (cont.) – Hovmoller
TOVAS Functions (cont.) – Custom Plot
TOVAS Functions (cont.) – Animation

Click and drag to select area or input latitudes (-60.0 ~ 60.0) and longitudes (-180.0 ~ 180.0).

West Longitude: 120.0
North Latitude: 10.0
East Longitude: 156.0
South Latitude: -10.0

Click for non Java/JavaScript version

Parameter:
Accumulated Rainfall

Color Level Option:
- Pre-defined
- Dynamic
- Customize: Min __ Max __

Plot type:
Animation

Begin date: 2004 January 1
End date: 2004 January 1

Alert: A new window will be opened when "Generate Plot" or "ASCII Output" is selected.

Alternate way to view the images
Other tools and examples (YOTC, HDAT, Giovanni)
YOTC (Year of Tropical Convection)

- **YOTC-GS L3** is a web-based graphics and analysis tool to explore Level 3 data products.
- **YOTC-GS L2** is a web-based graphics and analysis tool to explore Level 2 data products.
YOTC Examples: YOTC-GS L3

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Data Product Id</th>
<th>Description</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clouds (200000000 - 20110601)</td>
<td>MOD02_D3.005</td>
<td>MODIS Terra Ver. 5</td>
<td>200006024</td>
<td>201006014</td>
</tr>
<tr>
<td>Cirrus Reflectance (CA-w)</td>
<td>MOD02_D3.005</td>
<td>MODIS Terra Ver. 5</td>
<td>200006024</td>
<td>201006014</td>
</tr>
<tr>
<td>Cloud Effective Emissivity</td>
<td>MOD02_D3.005</td>
<td>MODIS Terra Ver. 5</td>
<td>200006024</td>
<td>201006014</td>
</tr>
<tr>
<td>Cloud Effective Emissivity Day</td>
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<tr>
<td>Cloud Effective Emissivity Night</td>
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<td>201006014</td>
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<td>MODIS Terra Ver. 5</td>
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<td>201006014</td>
</tr>
<tr>
<td>Surface air temperature, ascending (SurfAirTemp_A)</td>
<td>ARBXSTD0.005</td>
<td>Aqua - ARS standard</td>
<td>200006031</td>
<td>201106011</td>
</tr>
<tr>
<td>Surface air temperature, descending (SurfAirTemp_D)</td>
<td>ARBXSTD0.005</td>
<td>Aqua - ARS standard</td>
<td>200006031</td>
<td>201106011</td>
</tr>
<tr>
<td>Surface skin temperature, ascending (SurfSkinTemp_A)</td>
<td>ARBXSTD0.005</td>
<td>Aqua - ARS standard</td>
<td>200006031</td>
<td>201106011</td>
</tr>
<tr>
<td>Surface skin temperature, descending (SurfSkinTemp_D)</td>
<td>ARBXSTD0.005</td>
<td>Aqua - ARS standard</td>
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<td>201106011</td>
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<tr>
<td>Aerosol Optical Thickness</td>
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<td>201006014</td>
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<tr>
<td>Aerosol Optical Depth at 550 nm</td>
<td>MOD03_D2.005</td>
<td>MODIS Terra Ver. 5</td>
<td>200006024</td>
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<tr>
<td>Aerosol Single Scattering Albedo</td>
<td>OMEROT0.001</td>
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<tr>
<td>Aerosol Cloud Molecular Scattering Coefficient</td>
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<td>MODIS Terra Ver. 5</td>
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<tr>
<td>Aerosol Cloud Molecular scattering Coefficient</td>
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<tr>
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<td>Geopotential height, descending (GPHeight_D)</td>
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<td>Geopotential height (microwave), descending (GPHeight_MW_D)</td>
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<td>Water Vapor (06/01/01 - 06/30/01)</td>
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<td>Height (06/01/01 - 06/30/01)</td>
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<td>Aqua - ARS standard</td>
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<td>201106011</td>
</tr>
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<td>H2O - Total Column (GA-w, IR)</td>
<td>MOD07_D2.005</td>
<td>MODIS Terra Ver. 5</td>
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<td>H2O - Total Column (GA-w, IR)</td>
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<tr>
<td>H2O - Total Column (GA-w, IR)</td>
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<td>201006014</td>
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<td>sea surface temperature, ascending (SST_A)</td>
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<td>AMSR-E</td>
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<tr>
<td>sea surface temperature, ascending (SST_D)</td>
<td>AE_DY09012</td>
<td>AMSR-E</td>
<td>20030601</td>
<td>20100810</td>
</tr>
<tr>
<td>Sea Surface Wind Speed, Ascending (SBWSP_A)</td>
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<td>AMSR-E</td>
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<tr>
<td>Sea Surface Wind Speed, Ascending (SBWSP_D)</td>
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<td>20100810</td>
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<td>Sea Surface Wind Speed, LowRes (38 km/10.7 GHz)</td>
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<tr>
<td>Sea Surface Wind Speed, VeryLowRes (62 km/19.9 GHz)</td>
<td>AE_DY09012</td>
<td>AMSR-E</td>
<td>20030601</td>
<td>20100810</td>
</tr>
</tbody>
</table>
YOTC Examples: YOTC-GS L2

TRMM Data Service Update
Sample plots:
Hurricane Data Analysis Tool:

The Hurricane Data Analysis Tool (currently the TRMM QuickLat Analysis tool) allows users to overlay various data products relevant to the study of hurricanes in an area plot, a time plot or an animation using an interactive tool. The data products being offered include CPC/PCP 4-km Global 60-day N/E-60 day S/Merged IR Brightness Temperature Data, TRMM's product DWD, TRMM's new surface temperature, NCEP Reanalysis sea level pressure, Surface SLP wind and global Merged IR products. This tool is beneficial for users to obtain a visualization of a single product, animation or a comparison of two products during a hurricane event.

Please see the FAQ for more information.
Samples:

Shaded-3B42(mm) Vector-QuikSCAT(m/s)

(01 Jun 2006 – 30 Nov 2006)
Shaded-3B42(mm) Vector-QuikSCAT(m/s)

Shaded-TMI SST(deg.) Vector-QuikSCAT(m/s)

(01 Jun 2006 – 30 Nov 2006)
Shaded-TMI SST(deg.) Vector-QuikSCAT(m/s)
AF Flight-447: Satellite Observation of Mesoscale Convective System Development on 1 June, 2009
Examples: Category 2 cyclone Catarina – Landfall
Giovanni (the GES-DISC (Goddard Earth Sciences Data and Information Services Center) Interactive Online Visualization ANd aNalysis Infrastructure:

You are here:  GES-DISC Home > Giovanni

GIOVANNI

Giovanni is a Web-based application developed by the GES-DISC that provides a simple and intuitive way to visualize, analyze, and access vast amounts of Earth science remote sensing data without having to download the data.

Giovanni is comprised of a number of instances, called instances, each tailored to meet the needs of different Earth science research communities. To access a Giovanni instance, click on one of the four categories below.

- **Atmospheric Instances**: Aqua/AIRS Daily and Monthly; Aqua/AIRS Global and Monthly; Aura High Resolution Dynamics Limb Sounder (HRDL); Aura Microwave Limb Sounder (MLS); Aura OM Level 3 and Level 2; MISR Daily and Monthly; Clouds and the Earth's Radiant Energy System (CERES FM4); Modern Era Retrospective-Analysis for Research and Applications (MERRA); 3D Monthly and 2D Monthly; MODIS Terra and Aqua Daily and Monthly; Earth Probes and Nimbus-7 TOMS; Tropical Emission Sounding Spectrometer (TESS); Upper Atmospheric Research Satellite (UARS) Halogen Occultation Experiment (HALOE).

- **Environmental Instances**: Agriculture; Air Quality; Monsoon Atlas Integrated Regional Study (MAIRS); Monthly and 8-Day; Northern Eurasia Earth Science Partnership Initiative (NEESPI) Daily and Monthly.

- **Ocean Instances**: Ocean Color Radiometry (SeaWiFS, MODIS, and derived and model products); Ocean Model Daily and Monthly.

- **Hydrology Instances**: Modern Era Retrospective-Analysis for Research and Applications (MERRA); 3D Monthly, 2D Monthly, Monthly Analysis, and Chemical Forcing; MODIS Terra and Aqua Daily and Monthly; Northern Eurasia Earth Science Partnership Initiative (NEESPI); Daily and Monthly; TRMM Online Visualization and Analysis System (TOMVAS); Global Land Data Assimilation System (GLDAS) Monthly.

If you already know which instance to choose, please select it from the table below:

<table>
<thead>
<tr>
<th>Instance</th>
<th>Aerosol Daily</th>
<th>Aerosol Monthly</th>
<th>Agriculture</th>
<th>Air Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aqua/AIRS Daily</td>
<td>Astronaut</td>
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<tr>
<td>Aqua/AIRS Monthly</td>
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<td>Aura HRDL</td>
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<td>Aura OMI L3</td>
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<td>NEESPI Daily</td>
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<tr>
<td>UARS HALOE</td>
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Other services at GES DISC

- OPeNDAP
- WMS
DATA AVAILABLE VIA OPeNDAP (DODS)

The Open Source Project for a Network Data Access Protocol (OPeNDAP) provides remote access to individual variables within datasets in a form usable by many tools, such as IDV, MetDAISY, Panoply, Ferret, and GRADS. Currently, the GES DISC offers the following datasets through OPeNDAP (i.e., not all OPeNDAP datasets work in all tools).

**Atmospheric Infrared Sounder (AIRS) Moisture, Temperature, Cloud and Trace Gases**

Visible, infrared and microwave sensors provide daily global temperature profiles with accuracy of 1 K per 1 km thick layer in the troposphere and moisture profiles with accuracy of 20% per 2 km thick layer in the lower troposphere (20-60% in the upper troposphere). Version 5.100 includes profiles of CO and CH4 in addition to total column of ozone, CO and water vapor, cloud height and cloud fraction, and other atmospheric dynamic parameters.

**Microwave Sounding Unit (MSU) Deep Layer Temperatures and Ocean Precipitation Data**

Deep layer temperatures and oceanic precipitation rates derived from 18 years of measurements taken by the Microwave Sounding Unit (MSU) flown aboard NOAA's Polar Orbiting Operational Satellites (POES).

**Tropical Rainfall Measuring Mission (TRMM) Gridded Rainfall Data**

TRMM is dedicated to measuring tropical and subtropical rainfall through microwave and visible infrared sensors, and includes the first space borne rain radar. The TRMM orbit is circular, non-sun-synchronous, at an altitude of 350 km and an inclination of 35 degrees to the Equator, providing extensive coverage in the tropics.

**Total Ozone Mapping Spectrometer (TOMS) Daily Global Gridded Data**

Since 1978 TOMS has been flown on a number of spacecrafts for monitoring global and regional trends in total ozone. It has provided a long-term (over 25 yrs) continuous record of total ozone. TOMS also provided measurements of atmospheric aerosols, volcanic SO2, ultraviolet irradiance, erythmal UV exposure, and effective surface reflectivity.

**Ozone Monitoring Instrument (OMI) Daily Global Gridded Data**

OMI is a Dutch instrument flown (July 2004) on the EOS-Aura spacecraft (equator around 1:30 P.M. in ascending node) to continue the monitoring of global and regional ozone. OMI also provides the major atmospheric pollutants: Tropospheric Ozone, Nitrogen Dioxide, Sulfur Dioxide, Aerosols, Formaldehyde in addition to BrO, Erythmal surface UV-radiation and Clouds.
DATA AVAILABLE VIA OGC WEB MAP SERVICE

The Open Geospatial Consortium (OGC) Web Map Service (WMS) is an interface that allows the use of data and enables clients to build customized maps with data coming from a different network.

The GES DISC provides the following data through the WMS interface:

- **Atmospheric Infrared Sounder (AIRS) Near-Real-Time**
  - BT_diff_S02 (an indicator of volcanic S02), RGB, and CO images are available for the near-real-time AIRS
  - Calibrated Radiance data: [WMS GetCapabilities](#)

- **Atmospheric Infrared Sounder (AIRS) Data Products**
  - Visible, infrared and microwave sensors provide daily global atmospheric temperature moisture and trace gases throughout the atmosphere.
  - AIRS WMS layers include surface temperature, total column ozone, CO and water vapor, cloud fraction, and other atmospheric dynamic parameters. [WMS GetCapabilities](#)

- **Tropical Rainfall Measurement Mission (TRMM) Gridded Rainfall Data**
  - The TRMM is the first mission dedicated to measuring tropical and subtropical rainfall through microwave and visible infrared sensors, and includes the first spaceborne rain radar. [WMS GetCapabilities](#)

- **Ozone Monitoring Instrument (OMI) Data Products**
  - The OMI employs hyperspectral imaging to observe solar backscatter radiation in the visible and ultraviolet.
  - OMI WMS layers include total ozone and other atmospheric parameters related to ozone chemistry and climate. [WMS GetCapabilities](#)

**How does it work?**

OGC WMS interacts with their clients via the HTTP protocol. In most cases, a WMS is a CGI program. The WMS specification defines a number of request types, and for each of request type it defines a set of query parameters and associated behaviors. Listed below are the requests available from the WMS.
Future plans:

- TRMM Version 7 (data, TOVAS, documentation update, etc.)
- Add TRMM Composite Climatology (1998-2009) to TOVAS
- GPM (to be launched on July 21, 2013)
URLs:

- TOVAS: http://disc2.nascom.nasa.gov/Giovanni/tovas/
- HDAT: http://disc.sci.gsfc.nasa.gov/HDAT
- YOTC: http://disc.sci.gsfc.nasa.gov/YOTC
- Mirador: http://mirador.gsfc.nasa.gov/
- Giovanni: http://disc.sci.gsfc.nasa.gov/giovanni
- OPeNDAP, WMS: http://disc.sci.gsfc.nasa.gov/services
- GES DISC: http://disc.sci.gsfc.nasa.gov/

Contact: Zhong.Liu@nasa.gov