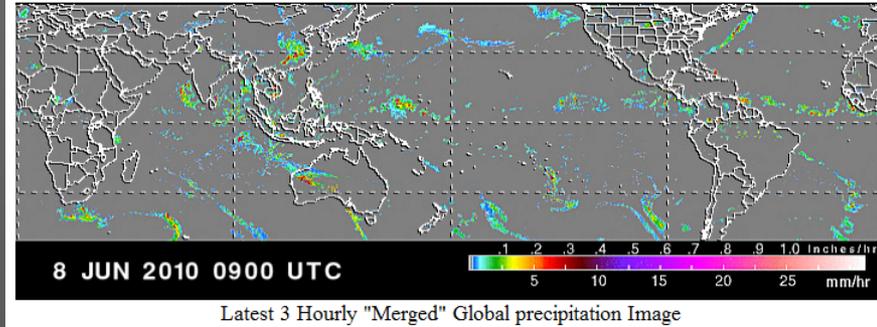
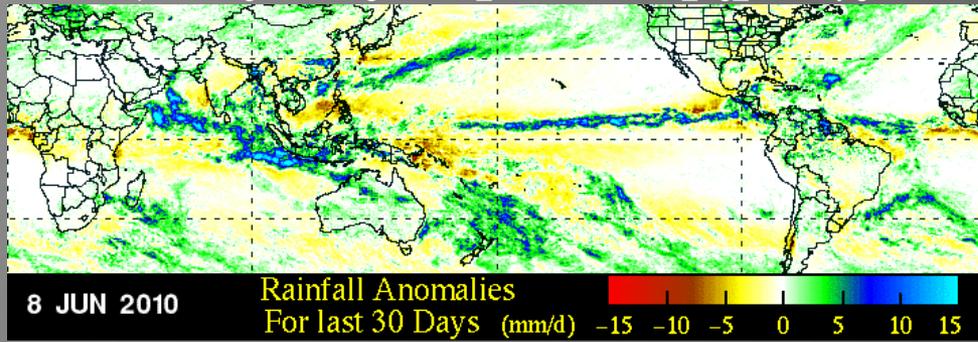
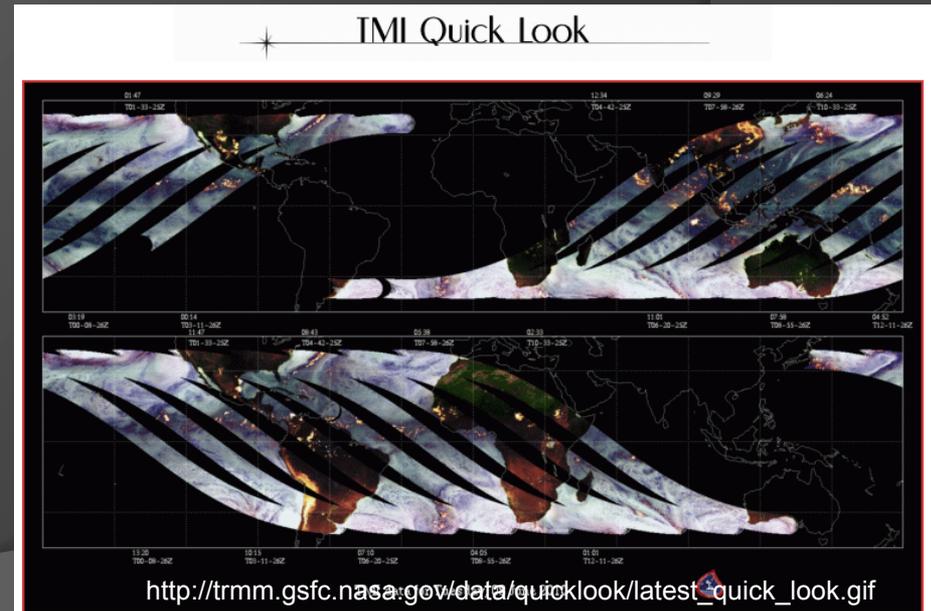
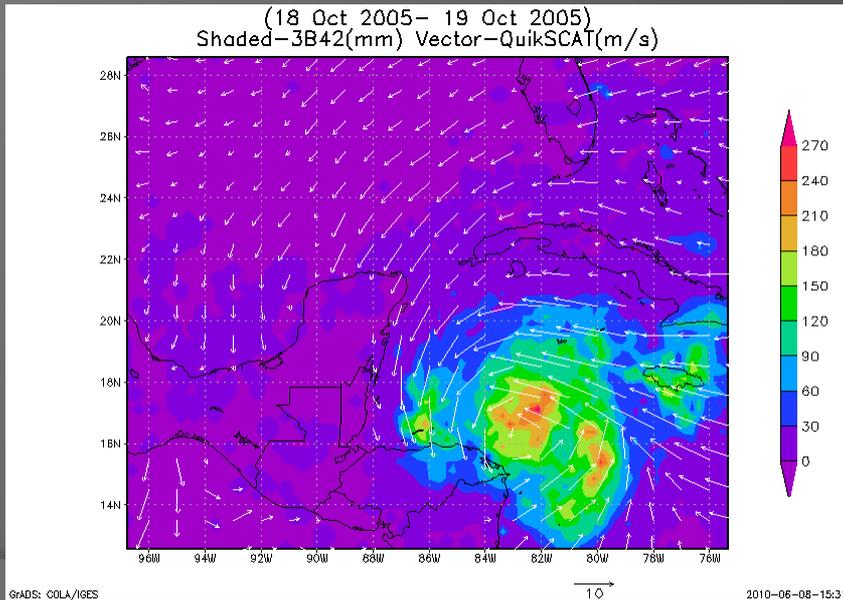


3-hr Realtime Rainfall Analyses



TRMM TOOLS FOR HYDROLOGY ANALYSIS



TRMM - NASA

TOP STORY

FIRST TROPICAL STORM OF THE 2010 EAST PACIFIC HURRICANE SEASON BRINGS HEAVY RAINS TO CENTRAL AMERICA

The 2010 East Pacific hurricane season began pretty much on schedule. While the season officially begins on May 15 and runs through November 30, in an average year, the first named storm of the season forms around June 10th; this year the first storm of the season, [Tropical Storm Agatha](#), formed on May 29th off the coast of Guatemala from a broad area of low pressure within the Intertropical Convergence Zone (or ITCZ), a band of low pressure that circumnavigates the globe near the Equator where the trade winds converge. Although Agatha's maximum sustained winds were never estimated to be greater than 75 kph (45 mph) by the National Hurricane Center, it still turned out to be a very deadly storm as a result of flash floods and landslides brought about by Agatha's heavy rains.

The Tropical Rainfall Measuring Mission satellite (known as TRMM) was placed into service in November of 1997. Armed with an array of active radar and passive microwave sensors, TRMM's main objective is to measure rainfall from space. For increased coverage, TRMM can be used to calibrate rainfall estimates from other additional satellites. The TRMM-based, near-real time Multi-satellite Precipitation Analysis (TMPA) at the NASA Goddard Space Flight Center is used to monitor rainfall over the global Tropics. TMPA rainfall estimates for the 1-week period 25 May to 1 June 2010 for Central America show that the heaviest rains fell just off shore and right along the Pacific coast side of Guatemala, El Salvador, Honduras and northwestern Nicaragua. Over 500 mm (~20 inches, shown in red) fell in two areas off the coasts of Guatemala and El Salvador. Over land, between 250 mm (~10 inches, shown in bright green) and 350 mm (~14 inches, shown in darker orange) of rain fell over the coastal areas of Guatemala and between 150 mm (~6 inches, shown in bright blue) and 250 mm fell over the coastal sections of El Salvador, Honduras and Nicaragua. [\(CLICK HERE TO READ MORE\)](#)

TRMM is a joint mission between NASA and the Japanese space agency JAXA.

Image by Hal Pierce (SSAI/NASA GSFC) and Caption by Steve Lang (SSAI/NASA GSFC)

3 June 2010
TROPICAL CYCLONE PHET

RESOURCES

- Realtime 3 Hourly & 7 Day Rainfall
- Global Flood & Landslide Monitoring
- Hurricanes & Typhoons
- Rain Averages & Anomalies + ESPI
- TRMM based Climatology
- "QUICKLOOKS" at TRMM Orbits
- Educational Resources

- <http://trmm.gsfc.nasa.gov>
- The TRMM website describes the TRMM mission, instruments, news, publications, and data collected
- The homepage includes Top Stories of events that TRMM has been used to analyze
- The resources on the right of the page give the user access to a multitude of information (these links will be explored further on the subsequent slides):
 - Real time 3 hourly and 7 day rainfall
 - Global flood and landslide monitoring
 - Hurricanes and typhoons
 - Rain averages and anomalies + ESPI
 - Climatology
 - QuickLooks at orbits
 - Educational resources

TRMM - NASA

- At the bottom of the homepage, there is a link to download Google Earth imagery from TRMM that is updated daily
- Clicking on the +DATA tab at the top of the homepage brings the user to a set of links to Data Products from TRMM
 - These links provide data downloads and links to other useful pages that use TRMM data

Google Earth Downloads Updated:
11 JUN 2010 1500 UTC

NASA GODDARD SPACE FLIGHT CENTER + NASA Homepage SEARCH NASA

TRMM Tropical Rainfall Measuring Mission

ABOUT TRMM NEWS PUBLICATIONS SEARCH TRMM CONTACTS **+ DATA** IMAGE POLICY

Data Products

Quick Looks - *On-Line TMI Quick Look images* TMI quick-looks available on-line. Each quick-look is generated at a resolution of 1/4 degree, thus generating an image of 1440x720 pixels, or a file size of about 500k.

PPS - *Precipitation Processing System (PPS)* also formerly known as *TRMM Science Data and Information System* The real-time processing and post-processing of the TRMM science data is performed by the TRMM Science Data and Information System (TSDES). Working with the TRMM principal investigators and science algorithm developers, PPS maintains the operational science data processing system and ensures the timely processing of all TRMM science instrument data. During routine operations, raw instrument data is received in near real-time by PPS and then processed by the first tier of science algorithms to produce calibrated, swath-level instrument data. Using this calibrated, swath-level instrument data, the second tier of algorithms are used to compute geophysical parameters, such as precipitation rate, also at the swath-level resolution. At the final stage of processings, the third tier algorithms produce gridded geophysical parameters from the first- and second-tier instrument data. All TRMM products are archived and distributed by the Goddard Distributed Active Archive Center (GES DISC DAAC). For further information concerning PPS operations go to the PPS homepage.

GES DISC DAAC - *Distributed Active Archive System* The operational archiving and distribution to the public of all TRMM science data products is provided by the [Goddard Distributed Active Archive Center \(GES DISC DAAC\)](#). In addition to archiving and distributing the TRMM science data, the GES DISC DAAC also provides necessary information and support for manipulating these data files, which are provided in NCSA's Hierarchical Data Format (HDF). These files are generally distributed on-line. Finally, the GES DISC DAAC provides first-line support for any questions concerning the TRMM science data. TO obtain TRMM science data, go to the Goddard GES DISC DAAC homepage.

Data Products & Description - In order to satisfy opposing requirements for early data distribution and the highest possible data quality, TRMM will reprocess all products with improved algorithms approximately once per year. This section, aside from presenting general product information, updates the performance of each algorithm as information becomes available to the science team. Data users should check this site before working with any TRMM data, and occasionally thereafter as more information becomes available. All information is tied to the data version number as distributed by the GES DISC DAAC.

TRMM GROUND VALIDATION - The function of the TRMM GV program at the NASA Goddard Space Flight Center is to provide support for Tropical Rainfall Measuring Mission (TRMM), in connection with the ground based validation of the TRMM satellite observations. The TRMM Satellite Validation is the focal point for the planning and implementation of a broad and integrated observational program of precipitation and related climate research, designed to meet the specific science validation objectives established by the TRMM science team, and which are also consistent with programs: requirements established by NASA Headquarters

TRMM-based precipitation estimates - A series of quasi-global, near-real-time, TRMM-based precipitation estimates is available to the research community via anonymous [ftp](#). The estimates are provided on a global 0.25° x 0.25° grid over the latitude band 50° N-5° S within about seven hours of observation time. Three products are being provided: A TRMM-calibrated merger of all available TMI, AMSR-E, SSM/I, and AMSU-B precipitation estimates (three-hourly accumulations); a geosynchronous infrared estimate which is calibrated by the merged-microwave data (hourly estimates); and a combination of the first two fields (three-hourly accumulations). The data are available under [ftp://trmmopen.gsfc.nasa.gov/pub/merged/](#). Users are urged to download the README file for additional details.

See links to other web sites related to TRMM

Google Earth Downloads Updated:
11 JUN 2010 1500 UTC

- The Google Earth link brings the user to a new page
- Updated daily, this page includes 3 sections of global Google Earth data
 - Top section: links to realtime 30 day rainfall average and 30 day rainfall anomaly (mm/hr) globally
 - Middle section: links to realtime rainfall accumulation for 3 hr, 24 hr, 72 hr, and 168 hr data
 - Bottom section: links to realtime flood potential for 24 hr, 72 hr, and 168 hr time periods

TRMM Tropical Rainfall Measuring Mission

ABOUT TRMM | NEWS | WEB POLICY | PUBLICATIONS | SEARCH TRMM | DATA

LAST UPDATED: **11 JUN 2010 1500 UTC**

REALTIME 30 Day Average Rainfall and 30 Day Anomalous Rainfall

Select from the following list to download files which show REALTIME 30 Day Average Rainfall and 30 Day Anomalous Rainfall images like those above in GOOGLE EARTH.
1. You must have Google Earth installed and running in order to load and use these KML files.
2. You may wish to download the latest version of GOOGLE EARTH from <http://earth.google.com/>.

http://trmm.gsfc.nasa.gov/trmm_rain/Events/30_day_average.kml
http://trmm.gsfc.nasa.gov/trmm_rain/Events/30_day_anomaly.kml

REALTIME RAINFALL ACCUMULATION

Select from the following list to download files which show REALTIME RAINFALL ACCUMULATION (FROM SB42) images in GOOGLE EARTH.
1. You must have Google Earth installed and running in order to load and use these KML files.
2. You may wish to download the latest version of GOOGLE EARTH from <http://earth.google.com/>.

http://trmm.gsfc.nasa.gov/trmm_rain/Events/3R-42_rain_accumulation_3hr.kml
http://trmm.gsfc.nasa.gov/trmm_rain/Events/3B-42_rain_accumulation_24hr_b.kml
http://trmm.gsfc.nasa.gov/trmm_rain/Events/3B-42_rain_accumulation_72hr_b.kml
http://trmm.gsfc.nasa.gov/trmm_rain/Events/3B-42_rain_accumulation_168hr_b.kml

REALTIME FLOOD POTENTIAL

Select from the following list to download files which show REALTIME FLOOD POTENTIAL images in GOOGLE EARTH.
(Note: You must have Google Earth installed in order to be able to load these KML files.)

http://trmm.gsfc.nasa.gov/trmm_rain/Events/24hr_flood_potential.kml
http://trmm.gsfc.nasa.gov/trmm_rain/Events/72hr_flood_potential.kml
http://trmm.gsfc.nasa.gov/trmm_rain/Events/168hr_flood_potential.kml

LET ME KNOW ABOUT PROBLEMS OR GIVE SUGGESTIONS -> placsa@ghas.gsfc.nasa.gov

http://trmm.gsfc.nasa.gov/affinity/download_kmz.html

Realtime Rainfall Accumulation Image in Google Earth

24 hours of rainfall accumulation ending:
11 JUN 2010 1500 UTC

1 2 3 4 5 6 7 8 9 Inches
25 50 75 100 125 150 175 200 225 mm

My Places
Sightseeing Tour
New Zealand
Temporary Places
3B42_rain_accumulation_24hr...
24hr_flood_potential.kml
30_day_anomaly.kml
trmm_google_hydro_model_b...
NASA Goddard TRMM_3B42.00...
3 Hours TRMM_3B42.006 precip
precipitation
NASA LOGO

Layers
Primary Database
Borders and Labels
Places of Interest
Panoramic Photos
Roads
3D Buildings
Ocean
Street View
Weather
Gallery
Global Awareness
More
Terrain

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2010 Europa Technologies
US Dept of State Geographer
© 2010 Tele Atlas

©2009 Google

Eye alt 14314.56 km

4:24 PM

Rainfall Anomaly Image in Google Earth

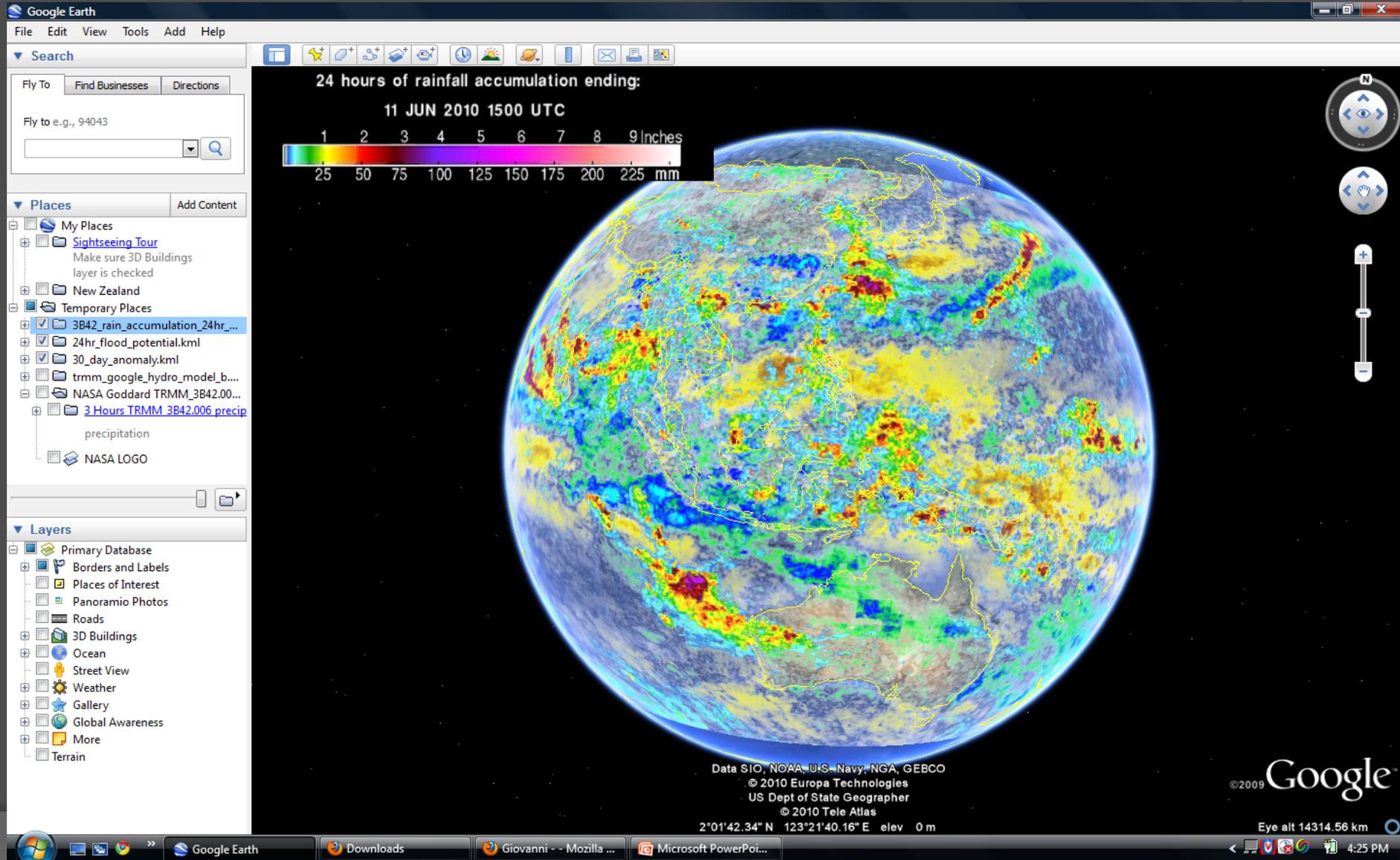
The screenshot displays the Google Earth interface with a rainfall anomaly map. The map is titled "Rainfall Anomalies for last 30 days ending: 11 JUN 2010". A color scale legend at the top indicates rainfall anomalies in mm/day, ranging from -15 (dark red) to +15 (dark blue), with 0 being white. The map shows significant positive anomalies (yellow and orange) over the Indian subcontinent and parts of Southeast Asia, and negative anomalies (blue) over the Pacific and Atlantic oceans.

The interface includes the following panels:

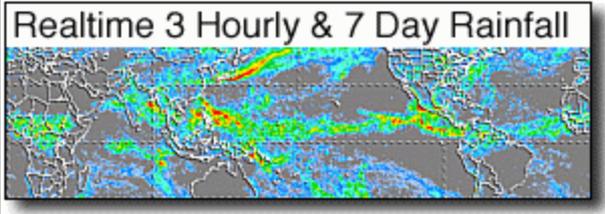
- Search:** "Fly To" field with "Find Businesses" and "Directions" buttons. Input field contains "Fly to e.g., 94043".
- Places:** "Add Content" button. A tree view shows "My Places" (Sightseeing Tour, New Zealand), "Temporary Places" (3B42_rain_accumulation_24hr..., 24hr_flood_potential.kml, 30_day_anomaly.kml, trmm_google_hydro_model_b..., NASA Goddard TRMM_3B42.00..., 3 Hours TRMM 3B42.006 precip), and "NASA LOGO".
- Layers:** "Primary Database" (Borders and Labels, Places of Interest, Panoramio Photos, Roads, 3D Buildings, Ocean, Street View, Weather, Gallery, Global Awareness, More, Terrain).

At the bottom, the Google logo and copyright information are visible: "Data SIO, NOAA, U.S. Navy, NGA, GEBCO © 2010 Europa Technologies US Dept of State Geographer © 2010 Tele Atlas". The Google logo also includes "©2009". The bottom right corner shows "Eye alt 14314.56 km".

Realtime Rainfall Accumulation, 24 hr Flood Potential, 30 Day Anomaly Images Layered in Google Earth



TRMM – NASA: Resources



- Realtime 3 Hourly & 7 Day Rainfall brings the user to a site with two Realtime maps

TRMM Tropical Rainfall Measuring Mission

+ ABOUT TRMM + NEWS + PUBLICATIONS + SEARCH TRMM + CONTACTS + DATA + IMAGE POLICY

8 JUN 2010 0900 UTC

1 2 3 4 5 6 7 8 9 10 Inches/hr
5 10 15 20 25 mm/hr

Latest 3 Hourly Global Rainfall [Click to See a Medium \[1.7 MB\] Animation](#)

8 JUN 2010 0900 UTC

4 8 12 16 20 24 28 32 36 40 44 Inches
100 300 500 700 900 1100 mm

Latest Week of Global Rainfall Accumulation [Click to See a Medium \[1.7 MB\] Animation](#)
[Click to Select Regional Rainfall Animations](#)
[Click to Select Global Rainfall Animations](#)
[See rainfall images in Google Earth](#)

- At the bottom of the page, there are links for a weekly animation, and regional and global rainfall animations
- There is also a link to view the data in Google Earth (takes the user to the same page as the Google Earth link on the homepage)

TRMM – NASA: Resources

- Global Flood & Landslide Monitoring is a very useful site for observing maps of heavy rain, flood, and landslide estimates globally
- Clicking on any of the maps brings the user to more in depth analysis by region
- The user can also download the data into Google Earth



TRMM Tropical Rainfall Measuring Mission

ABOUT TRMM | NEWS | PUBLICATIONS | SEARCH TRMM | CONTACTS | DATA | IMAGE POLICY

Current Heavy Rain, Flood and Landslide Estimates

(Rain information from Real-Time TRMM Multi-Satellite Precipitation Analysis [TMPA/3B42])

NOTICE: See New GOOGLE EARTH Download (KML) http://trmm.gsfc.nasa.gov/trmm_rain/Events/trmm_google_hydro_model_b.kml

See TEXT REPORT of areas with estimates of severe flooding near weather station locations

8 JUN 2010 0900 UTC
(Observation Time of Last Data Processed)

Point & Click 24 HR Rain Values	Point & Click 72 HR Rain Values	Point & Click 168 HR Rain Values
---	---	--

[See HEAVY RAIN AREA MAPS](#) [See Potential LANDSLIDE MAPS](#)

[\(CLICK TO SEE\) TROPICAL CYCLONE HARGIS QUICKTIME ANIMATION \(14.3 MB\)](#)
[\(CLICK TO SEE\) TROPICAL CYCLONE HARGIS MPEG ANIMATION \(3.8 MB\)](#)

Click on the maps below for **regional displays** with more information

60E 120E 180 120W 60W
Flood Potential Using Hydrological Model

A Relevant publication (pdf) for the hydrological model shown above is: Hong, Y., R. F. Adler, F. Hossain, S. Curtis, and G. J. Huffman (2007), **A First Approach to Global Runoff Simulation using Satellite Rainfall Estimation**, Water Resources Research, Vol. 43, No. 8, W08602, doi: 10.1029/2006WR005729

[Click to see a FULL GLOBE HYDROLOGICAL MODEL FLOOD POTENTIAL IMAGE](#) [Click to see a SMALLER FULL GLOBE HYDROLOGICAL MODEL FLOOD POTENTIAL IMAGE](#)

60E 120E 180 120W 60W
Seven Days of Rainfall

GOOGLE EARTH DOWNLOADS

CLICK on the KML file below to download a file which show a **REAL-TIME FLOOD POTENTIAL** image using **GOOGLE EARTH**.

Updated October 31, 2008 (Note: you must have Google Earth installed in order to be able to load these KML files.)
http://trmm.gsfc.nasa.gov/trmm_rain/Events/trmm_google_hydro_model_b.kml

Flood Potential Image in Google Earth

Google Earth

File Edit View Tools Add Help

Search

Fly To Find Businesses Directions

Fly to e.g., 94043

Places Add Content

- My Places
 - Sightseeing Tour
 - Make sure 3D Buildings layer is checked
 - New Zealand
- Temporary Places
 - 3B42_rain_accumulation_24hr_...
 - 24hr_flood_potential.kml
 - 30_day_anomaly.kml
 - trmm_google_hydro_model_b...

Layers

- Primary Database
- Borders and Labels
- Places of Interest
- Panoramio Photos
- Roads
- 3D Buildings
- Ocean
- Street View
- Weather
- Gallery
- Global Awareness
- More
- Terrain

11 JUN 2010 1200 UTC
Flood Potential Using Hydrological Model

Flood Potential Flooding Severe

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2010 Europa Technologies
US Dept of State Geographer
© 2010 Tele Atlas

© 2009 Google

Eye alt 13503.16 km

4:11 PM

TRMM – NASA: Resources

- Hurricanes & Typhoons is an analysis of tropical cyclones globally
- The first section explains the two types of analysis maps that are included on the page, using historical examples
- By clicking on an ocean basin on the map, the user is connected to a page with links to historical tropical cyclone precipitation maps and time series maps separated by year and name of storm from 1998 to 2006
- The next section includes a description of how TRMM data can be used to look at tropical cyclone rain and precipitation radar as vertical cross section slices
- Links at the bottom include this year's storms, this year's animations, and previous precipitation radar animations

Hurricanes & Typhoons

TRMM Tropical Rainfall Measuring Mission

ABOUT TRMM NEWS PUBLICATIONS SEARCH TRMM CONTACTS DATA IMAGE POLICY

The images on the right are examples of hurricane and typhoon (tropical cyclone) rainfall analyses. The first example is a plan view showing the distribution of rainfall accumulation near a tropical cyclone. The second panel example shows the time-radius distribution and the time-azimuthal distribution of rainfall near the same tropical cyclone. These analyses use the [3B42 global rainfall estimates](#). The technical point of contact for information about the images on the right is [Dr Scott Braun](#). You can see many other plots for storms in the [Atlantic](#), [Pacific](#), and [Northern Indian Ocean](#) by clicking on the relevant area on the map below.

Click Ocean Basins On The Map Below To See Tropical Cyclone Rainfall Plots

Indian Ocean Western Pacific Eastern Pacific Atlantic Ocean South Pacific

The image below is the result of automatic processes designed to show the latest hurricanes and typhoons (tropical cyclones) observed by the TRMM satellite. The images are made and stored in near "realtime". TRMM [VIRS](#) [TMI](#) and [PR](#) are processed for use in these displays. The "A" to "B" line on the static image on the left below is drawn where the highest value of radar reflectivity was found. Animations show multiple vertical cross sections (slices) of Precipitation Radar reflectivity.

TRMM Precipitation Radar

Light Rain Moderate Rain Heavy Rain

15 20 25 30 35 40 45 50 55 dBZ

6/2/2010 0140Z PHET Arabian Sea

click to [SEE ALL 2010 STORMS](#) click to see [LATEST ATLANTIC STORMS](#) [VERY LARGE \[8.0 mb\]](#) Quicktime animation [LARGE \[4.0 mb\]](#) Quicktime animation

[click to see 2009 Precipitation Radar vertical slice animations](#)

[click to see 2008 Precipitation Radar vertical slice animations](#)

[click to see 2007 Precipitation Radar vertical slice animations](#)

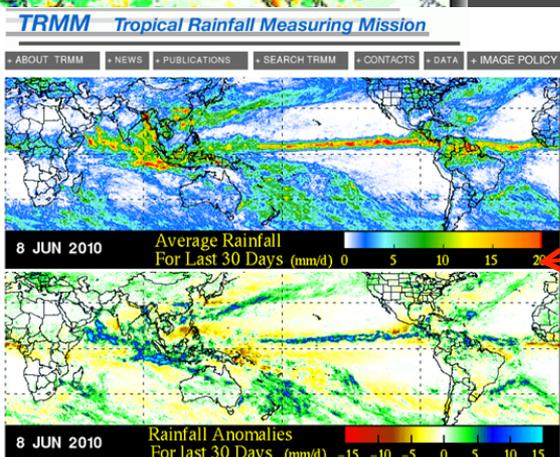
[click to see 2006 Precipitation Radar vertical slice animations](#)

TRMM – NASA: Resources

Rain Averages & Anomalies + ESPI

TRMM Tropical Rainfall Measuring Mission

ABOUT TRMM | NEWS | PUBLICATIONS | SEARCH TRMM | CONTACTS | DATA | IMAGE POLICY



8 JUN 2010 Average Rainfall For Last 30 Days (mm/d) 0 5 10 15 20

8 JUN 2010 Rainfall Anomalies For last 30 Days (mm/d) -15 -10 -5 0 5 10 15

[CLICK TO ENLARGE](#)

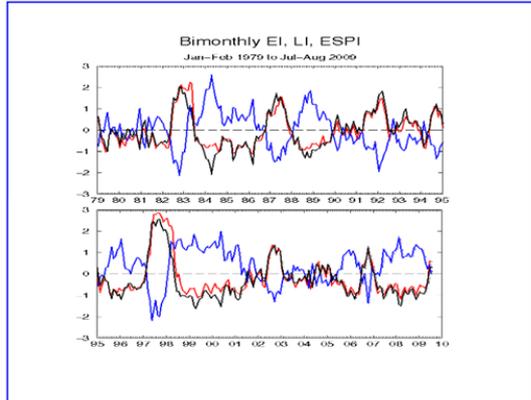
[See 30-day rainfall images above in Google Earth](#)

The ENSO Precipitation Index (ESPI) for the last 30 days is **-0.80**

ESPI is calculated with precipitation anomalies from two areas ([Figure 1](#)) in the Pacific Ocean and quantifies the strength of ENSO, in terms of regional rainfall changes. A detailed summary of the methodology can be found in <http://trmm.gsfc.nasa.gov/ESPIsummary.html>. Time series of the bimonthly El Niño Index (EI), La Niña Index Precipitation Index (ESPI) are shown in [Figure 2](#).



[Figure 1 \(click to enlarge\)](#)

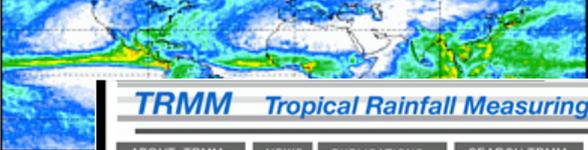


[Figure 2 \(click to enlarge\)](#)

- Rain Averages & Anomalies + ESPI is excellent for looking at monthly trends in rainfall and examining the ENSO cycle
- The first section displays maps of average rainfall and rainfall anomalies for the last 30 days
 - This includes a link to view the maps in Google Earth (takes the user to the same page as the Google Earth link on the homepage)
- The next section deals with ENSO and analyzing the current and past conditions using the ENSO Precipitation Index (ESPI)
 - ESPI is a precipitation based measure of ENSO using precipitation anomalies across the equatorial Pacific
 - For a summary of the indices in ESPI, click the link, or visit:
<http://trmm.gsfc.nasa.gov/ESPIsummary.html>

TRMM – NASA: Resources

TRMM based Climatology



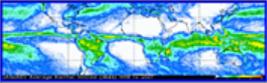
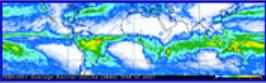
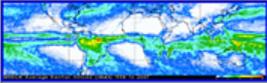
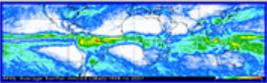
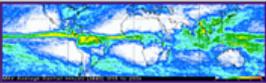
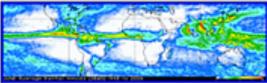
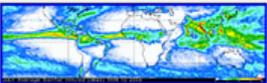
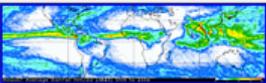
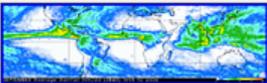
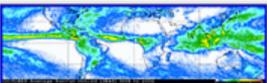
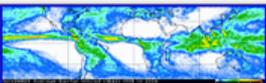
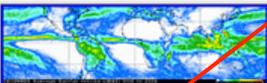
TRMM Tropical Rainfall Measuring Mission

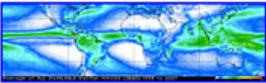
+ ABOUT TRMM + NEWS + PUBLICATIONS + SEARCH TRMM + CONTACTS + DATA + IMAGE POLICY

RAINFALL CLIMATOLOGY FROM 3B43

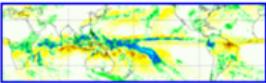
The images below are the result of averaging all available Monthly 0.25 ° x0.25 ° 3B43 merged TRMM and other sources estimates data. The images cover the globe from 40 ° North to 40 ° South. For more information see [3B43.html](#).

Click on the tables or images below to see full resolution images.

 JANUARY	 FEBRUARY	 MARCH
 APRIL	 MAY	 JUNE
 JULY	 AUGUST	 SEPTEMBER
 OCTOBER	 NOVEMBER	 DECEMBER


[ALL MONTHS](#)

[Click here to see a Quicktime animation \(3MB\) of 12 monthly mean images.](#)
[Click here to see a Mpeg animation \(.35MB\) of 12 monthly mean images.](#)


[SEE RAINFALL ANOMALIES FOR ALL MONTHS \(1998-2009\)](#)

- TRMM based Climatology is the average monthly global rainfall based on 3B43 merged TRMM and other data from 1998 to 2009
 - Climatology is defined as average weather conditions over a period of time, and is used to develop relationships, build models, make forecasts, and find patterns in the weather over time
- By clicking on the months, the user can view the full resolution images
- The user can also access the yearly averaged total rainfall map from 1998 to 2008 and animations of the images
- Finally, the user can view monthly global rainfall anomalies by clicking the last link
 - This opens a new page with maps of rainfall anomalies from 1998 to 2010

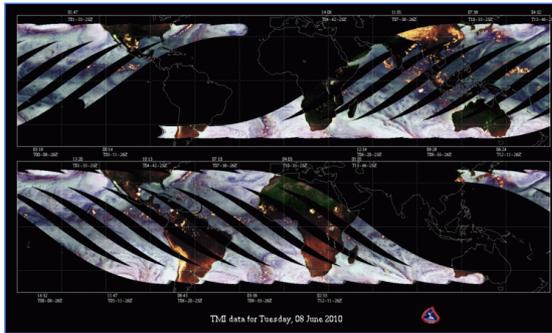
TRMM – NASA: Resources



TRMM Tropical Rainfall Measuring Mission

[NASA](#) | [JAXA](#) | [GSFC](#) | [News](#) | [Monthly Rainfall](#) | [Overview](#) | [Images](#) | [Publications](#) | [Data](#) | [Education](#) | [Validation](#) | [Links](#) | [Contacts](#) | [Privacy Statement](#) | [Image Policy](#)

IMI Quick Look



[Click for high resolution version](#)

Quick Look images are made from TRMM Microwave Imager (TMI) data. Microwave brightness temperatures at 85.5 GHz and at 37.0 GHz are combined in the red, green and blue components (gunt) of the images. For more information see "Nagai, Andrew J., Robert F. Adler, Christian D. Kummerow, 1989: False-Color Display of Special Sensor Microwave/Imager (SSM/I) Data. Bulletin of the American Meteorological Society, Vol. 70, No. 2, pp. 146-151."

See the table below for the meaning of colors.

Water surfaces
 Dry atmosphere - blue
 moist atmosphere - dark blue

Other Surfaces
 Polar snow/ice - white/yellow
 Sea ice - green/brown

Land surfaces
 Snow Cover - white/grey
 land (non-desert) - grey/brown
 Deserts - light green
Clouds/precipitation
 Scattering (by cloud ice) - yellow
 Emission (over water) - black

Current and Previous Month

May 2010						
S	M	Tu	W	Th	F	S
-	-	-	-	-	-	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	-	-	-	-	-

June 2010						
S	M	Tu	W	Th	F	S
-	-	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	-	-	-

Past Years

- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010

To obtain TRMM science data,
 go to [TRMM Data Search and Order System](#) at the Goddard DAAC.

- “QUICKLOOKS” is a map of the TMI data collected by TRMM during its orbit
- The main map displays the current day’s data
- The legend explains what each color represents
- The user can also view other orbits from the current and previous months, and past years

TRMM – NASA: Resources

Educational Resources

TRMM Tropical Rainfall Measuring Mission

ABOUT TRMM | NEWS | PUBLICATIONS | SEARCH TRMM | CONTACTS | DATA | IMAGE POLICY

PROBLEM-BASED CLASSROOM MODULES (pdf files)

- CLOUDS** (grades 5-8)
- WINDS** (grades 5-8)
- Precipitation** (grades 5-8)
- WEATHER** (grades 5-8)
- ENERGY** (grades 9-12)

TRMM EDUCATIONAL VIDEOS (EXTREMELY LARGE FILES)

- NASA and NASA's TRMM Satellite
- Orbiting Earth
- Tropical Rainfall Measuring Mission: Three Hourly Rain Measurements
- Tropical Rainfall Measuring Mission: Precipitation and Uncertainty of Weather Forecasting
- Tropical Rainfall Measuring Mission: The Hadley Circulation
- Tropical Rainfall Measuring Mission: The Heat Energy Inside Clouds
- Tropical Rainfall Measuring Mission: Investigating the Atmosphere's Water and Energy Cycles
- Tropical Rainfall Measuring Mission: Measuring Lightning
- Tropical Rainfall Measuring Mission: Investigating El Niño
- Tropical Rainfall Measuring Mission: Investigating Hurricanes
- Tropical Rainfall Measuring Mission: Overview

- Educational Resources features a set of tools used to teach people about the climate system and the TRMM mission
- Problem-based classroom PDF Modules are available for grades 5-8 (clouds, winds, precipitation, weather) and 9-12 (energy)
- A variety of videos examining different aspect of the TRMM mission are also available

GIOVANNI

- Select one of the products for analysis from the top section
- Now the user can select spatial location, parameters, date and time, and the type of visualization wanted
 - Visualizations include lat/lon maps, Hovmoller diagrams, scatter plots, time series, correlation maps, overlays, and animations
- Click “Generate Visualization” to submit

Giovanni - The Bridge Between Data and Science

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

TRMM Online Visualization and Analysis System (TOVAS)

3-hourly TRMM and Other Rainfall Estimate (3B42 V6)

Home Remove All

This interface is designed for visualization and analysis of the 3-hourly TRMM and Other Rainfall Estimate (3B42 V6). Users can generate plots for area average (Lat-Lon Map), time series (Time Series), Hovmoller diagram and more. The animation is available for Lat-Lon Maps. Results can be downloaded in HDF, ASCII, and Google Earth KMZ formats.

Select:

Spatial

Cursor Coordinates: 0.00000, 0.00000

Area of Interest: West: -180 North: 50 South: -50 East: 180 Update Map

Parameters

Display: Data Product Info Units

Parameter	Data Product Info	
<input checked="" type="checkbox"/> precipitation	TRMM_3B42.006	1997/12/31 - 2010/04/30
<input type="checkbox"/> relativeError	TRMM_3B42.006	1997/12/31 - 2010/04/30

Temporal

Begin Date Year 2010 Month Apr Day 30 Hour 00 (Date Begin: 31 Dec 1997)

End Date Year 2010 Month Apr Day 30 Hour 00 (Date End: 30 Apr 2010)

Note: This product is 3-hourly in UTC or Z.

Select Visualization:

Lat-Lon map, Time-averaged [Edit Preferences](#) [Visualization Help](#)

Generate Visualization Reset

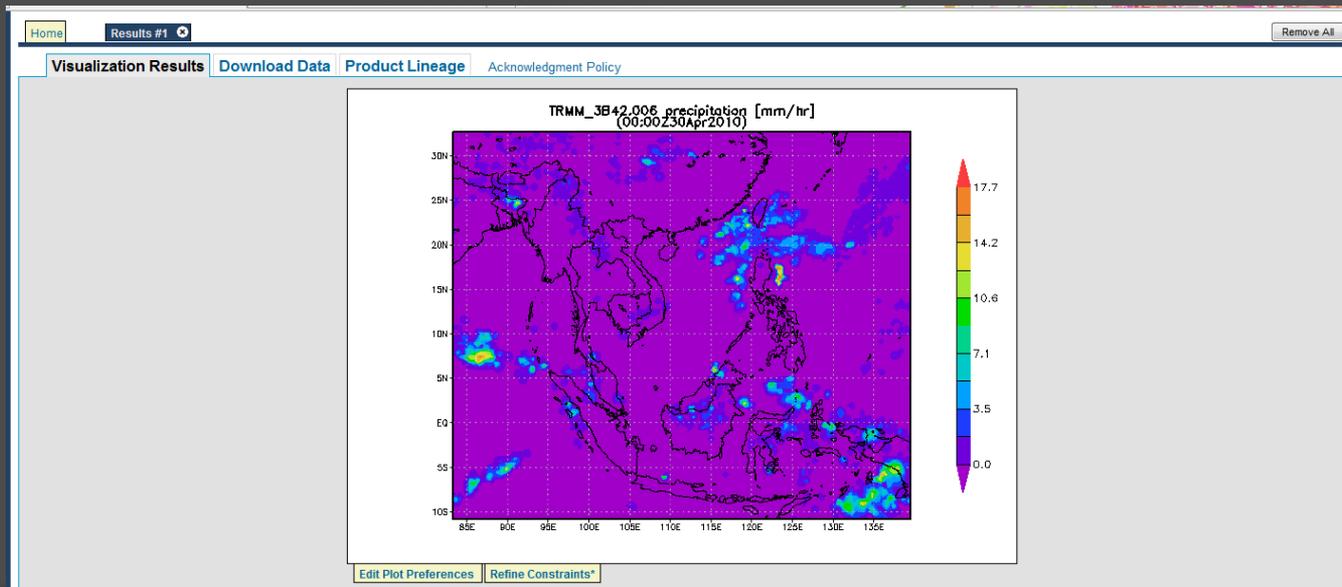
GIOVANNI

Home Results #1 Remove All

Execution Status

StepNumber	Operation	Status	StartTime	CompletionTime
1	Data Fetching	COMPLETE	Tue Jun 8 21:21:52 GMT 2010	Tue Jun 8 21:21:54 GMT 2010
2	Preprocessor	COMPLETE	Tue Jun 8 21:21:54 GMT 2010	Tue Jun 8 21:21:55 GMT 2010
3	Parameter Masking	COMPLETE	Tue Jun 8 21:21:55 GMT 2010	Tue Jun 8 21:21:56 GMT 2010
4	Grid Subsetter	COMPLETE	Tue Jun 8 21:21:56 GMT 2010	Tue Jun 8 21:21:56 GMT 2010
5	Anomaly	COMPLETE	Tue Jun 8 21:21:57 GMT 2010	Tue Jun 8 21:21:57 GMT 2010
6	Time Averaging	COMPLETE	Tue Jun 8 21:21:57 GMT 2010	Tue Jun 8 21:21:58 GMT 2010
7	Dimension Averaging	COMPLETE	Tue Jun 8 21:21:58 GMT 2010	Tue Jun 8 21:21:58 GMT 2010
8	Two Dimensional Map Plot	Active	Tue Jun 8 21:21:59 GMT 2010	

- Once the user clicks “Generate Visualization”, the window will have a table of actions that the computer is performing
- When it is complete, the image will appear



GIOVANNI

- Above the image, the user has the option to Download the data
- The files can be downloaded individually as HDF, NCD, or ASC, or as the final product as KMZ (for Google Earth) files

The screenshot shows the GIOVANNI web interface. At the top, there are navigation links: Home, Results #1 (with a close icon), Visualization Results, Download Data (highlighted with a red box), Product Lineage, and Acknowledgment Policy. A Remove All button is in the top right corner.

Below the navigation is a yellow informational box with the following text: "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."

The main content area is divided into three sections:

- Initial Data Retrieval**: A table with columns Data Product, Start Time, File Size (b), and Download Files. A "Download in Batch" button is above the table. The table contains one row: TRMM_3B42.006 (precipitation), 2010-04-29T22:30:00Z, 435561, and checkboxes for HDF and NCD.
- Two Dimensional Map Plot**: A table with columns Input Files, Start Time, File Size (b), and Download Files. A "Download in Batch" button is above the table. The table contains one row: TRMM_3B42.006 (precipitation), 2010-04-29T22:30:00Z, 25672, and checkboxes for HDF, NCD, and ASC.
- Output Files**: A table with columns File Name, File Size (b), and Download Files. The table contains one row: precipitation.TRMM_3B42.006.AreaMap.2010-04-30-00:00Z.gif, 24853, and a checkbox for KMZ.

GIOVANNI Image in Google Earth

The screenshot displays the Google Earth interface with a TRMM precipitation image overlaid on a satellite view of Southeast Asia. The image shows a color-coded precipitation map of the region, with a legend at the bottom indicating values in mm/hr. The legend ranges from 0 (purple) to 5.731 (red), with intermediate markers at 1.148, 2.292, 3.438, and 4.585. The map data is dated from 00:00Z 30 Apr 2010 to 21:00Z 30 Apr 2010. The Google Earth interface includes a search bar, a places list with '3 Hours TRMM 3B42.006 precip' selected, and a layers list with 'Weather' checked. The bottom status bar shows the eye alt at 8000.00 km and the time as 4:23 PM.

Google Earth

File Edit View Tools Add Help

Search

Fly To Find Businesses Directions

Fly to e.g., 94043

Places

- My Places
 - Sightseeing Tour
 - Make sure 3D Buildings layer is checked
- New Zealand
- Temporary Places
 - 3B42_rain_accumulation_24hr...
 - 24hr_flood_potential.kml
 - 30_day_anomaly.kml
 - trmm_google_hydro_model_b...
 - 3 Hours TRMM 3B42.006 precip**
 - precipitation
 - NASA LOGO

Layers

- Primary Database
- Borders and Labels
- Places of Interest
- Panoramio Photos
- Roads
- 3D Buildings
- Ocean
- Street View
- Weather
- Gallery
- Global Awareness
- More
- Terrain

Apr 29, 2010 6:30:00 pm

TRMM_3B42.006 precipitation [mm/hr]
(00:00Z30Apr2010 - 21:00Z30Apr2010)

0 1.148 2.292 3.438 4.585 5.731

Map Data © 2010 AND
© 2010 Europa Technologies
US Dept of State Geographer
© 2010 Tele Atlas

© 2009 Google

Eye alt 8000.00 km

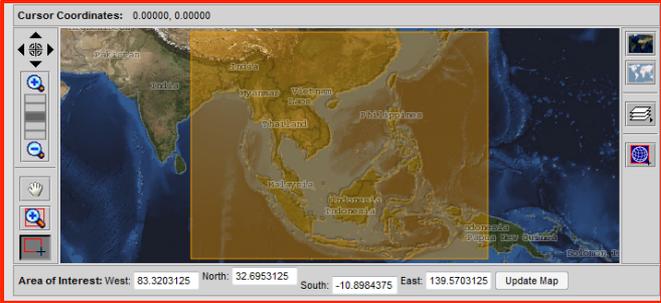
4:23 PM

GIOVANNI

Refine Constraints [Top]:

Spatial

Cursor Coordinates: 0.00000, 0.00000



Area of Interest: West: 83.3203125 North: 32.6953125 South: -10.8984375 East: 139.5703125 Update Map

Temporal

Begin Date Year 2010 Month Apr Day 30 Hour 00 (Date Begin: 31 Dec 1997)

End Date Year 2010 Month Apr Day 30 Hour 00 (Date End: 30 Apr 2010)

Note: This product is a 3-hourly GPCP v2.3.

Edit Preferences [Top]:

Plot Preferences

Image Width 700 Set the width of the plot image (in pixels)

Image Height 500 Set the height of the plot image (in pixels)

Decoration Flag Yes No Determine whether decorations (axes reticles, labels, etc.) are displayed for the resultant images

Color Bar

Mode: Dynamic Pre-Defined Custom Select color map mode, select a palette, or, if shown in this preference bloc, specify min and max parameter value to map. The 'Palette' and Min/Max Value options are enabled only when the 'Custom' mode is selected. Values entered for 'Min Value' and 'Max Value' will override parameter specific values for parameter min and max, respectively.

Palette: Rainbow

Min Value: Overrides ALL parameter min/max values.

Max Value: Overrides ALL parameter min/max values.

Projection Equidistant Cylindrical Select a projection for the plot(s)

Smooth Flag Yes No Determine whether the pixel interpolation should use a smoothing routine

precipitation (TRMM_3B42.006) Return to plot

Parameter Min

Parameter Max

Submit Refinements Reset

- Beneath the image, the user can refine constraints and edit preferences, including max and min value, color bar palette, projection type, and size

GIOVANNI

- To use the older version of data, there is a JAVA version and a non-JAVA version
- The options for creating the visualizations are the same: select area, parameters, plot type, date, and other options
- “Generate Plot” will create the visualization

Rainfall Analysis Tools

Monthly Rainfall (3B43 V6) Anomaly

This interface is designed for visualization and analysis of the Monthly Rainfall (3B43 V6) Anomaly. Users can generate plots for area average (Lat-Lon Map), Time Series, and Hovmoller diagram. The animation is available for Lat-Lon Maps. Selecting [here](#) or the **Help** buttons 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 (-50, 50) and longitudes (-180 ~ 180) or [Click for non Java/JavaScript version](#)
[More information on supported browsers and platforms](#)



North latitude: 50.0 N
West: 180.0 W East: 180.0 E
South latitude: 50.0 S
Zoom In Zoom Out

Monthly TRMM 3B43(V6)
Rainfall Anomaly (mm)
Normalized Anomaly (%)

Climatology:
Cort Willmott (1950/01 - 1999/12)
GPCC (1951/01 - 2000/12)

Plot Type: Lat-Lon Map

Begin Year: 2010 Begin Month: April (Data Begin: 1998/01)
End Year: 2010 End Month: April (Data End: 2010/04)

Color Options: Dynamic
 Customized (linear only): Min Max

Color Options: Dynamic
 Customized (linear only): Min Max

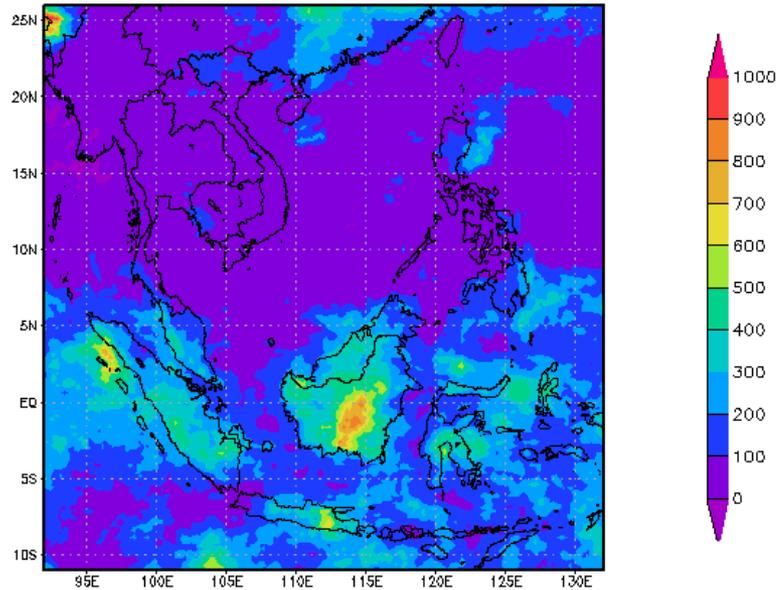
Time Series Plot Y-Axis Options: Dynamic
 Customized: Min Max Interval

Help

GIOVANNI

Monthly Rainfall (3B43 V6) Anomaly Lat-Lon Map

Monthly TRMM 3B43(V6) Apr2010
Accumulated Rainfall [mm]



GrADS: GOLA/IGES

2010-08-08-21:47

Generated by NASA's Giovanni (giovanni.gsfc.nasa.gov)

Unit Options: mm inch

Color Options: Dynamic

Customized (linear): Min Max

Customized (nonlinear):

Please input numerical values separated by comma.

- The user will end up with a similar image, with options to re-generate the plot

Global Precipitation Analysis (GPCP)

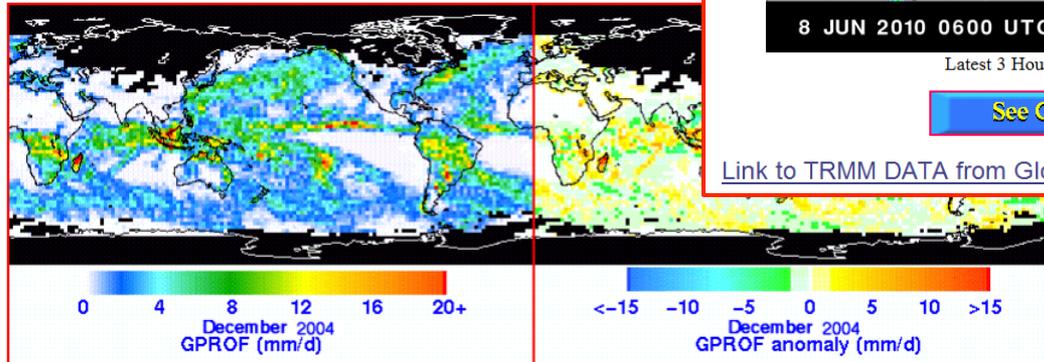
- ◎ The Global Precipitation Climatology Project (GPCP) is a project whose goal is to develop a better understanding of global precipitation
- ◎ GPCP uses data from rain gage stations and satellites (including TRMM) to estimate global monthly rainfall from 1979 to present
 - Over 6,000 rain gage stations
 - Geostationary and low-orbit infrared, passive microwave, and sounding observations from satellites
- ◎ For a complete list and explanation of the data products, visit <http://lwf.ncdc.noaa.gov/oa/wmo/wdcamet-ncdc.html>

Global Precipitation Analysis (GPCP)

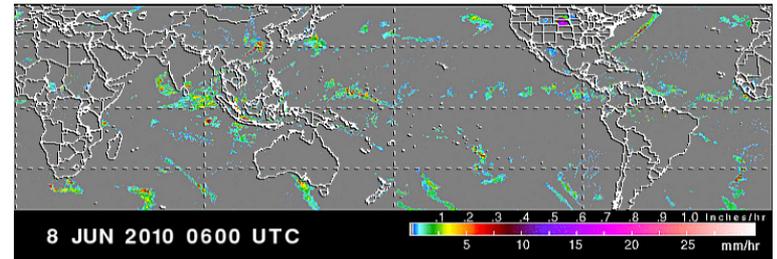
Global Precipitation Analysis

Laboratory for Atmospheres
NASA Goddard Space Flight Center

- Global Real-Time 3-Hourly Precipitation Analysis of **TRMM DATA**
- Global Monthly Merged Precipitation Analyses of GPCP ([1979-present](#))
- Global Daily Merged Precipitation Analyses of the GPCP ([1997-present](#))
- Monthly and Pentad SSM/I-based Precipitation Analyses using GPROF6
- ENSO Precipitation Analyses (Research and Monitoring)
- Precipitation patterns in the tropical Pacific over the [last 12 months](#)



3-hr Realtime Rainfall Analyses



Latest 3 Hourly "Merged" Global precipitation Image

[See Global Rain Animation](#)

[Link to TRMM DATA from Global Real-Time 3-Hourly Precipitation Analyses](#)

- <http://precip.gsfc.nasa.gov/>
- Clicking "TRMM DATA" brings the user to a real-time global map of precipitation
- By clicking the link beneath the map, an animation of about a week of recent global precipitation is generated
- The user can also access the TRMM data

Global Precipitation Analysis (GPCP)

Tropical Rainfall Measuring Mission (TRMM)

Monthly Data	Pentad Data	3-Hourly Data	Near-Real-Time	Climatology
Summary		Summary	Summary	
Data		Data	Data	
Images			Images	

Scrolling down to the bottom of the homepage, there is a variety of TRMM links including Summary, Data, and Images of monthly, 3-hourly, and near-real-time data

- Summary is a written description of the data and how it is compiled
- Data is the actual data files
- Images shows global images of the data
 - Monthly data images displays monthly averages of the TRMM precipitation data from 1998 to 2009
 - Near-Real-Time images displays the same page as the TRMM DATA link at the top of the page