

NASA Applied Remote Sensing Training Program (ARSET)

Using Satellites for Improved Flood Monitoring and Prediction

The World Bank
Washington DC

March 7, 2013

ARSET

Applied Remote Sensing Training

A project of NASA Applied Sciences



Objective

Introduction to Remote Sensing Data for Flood Monitoring



Outline

- Meteorology and hydrology parameters useful for flood monitoring
- Overview of NASA satellites and models for flood monitoring
- NASA remote sensing and model based data
Information for flood monitoring

Flood ?

Flood:

Overflow of water from a water body on otherwise dry land

Measured in terms of **stream flow** or the rate at which a volume of water flows – measure of depth, width, and speed of water flow – expressed in cubic meters per second (m^3/s)

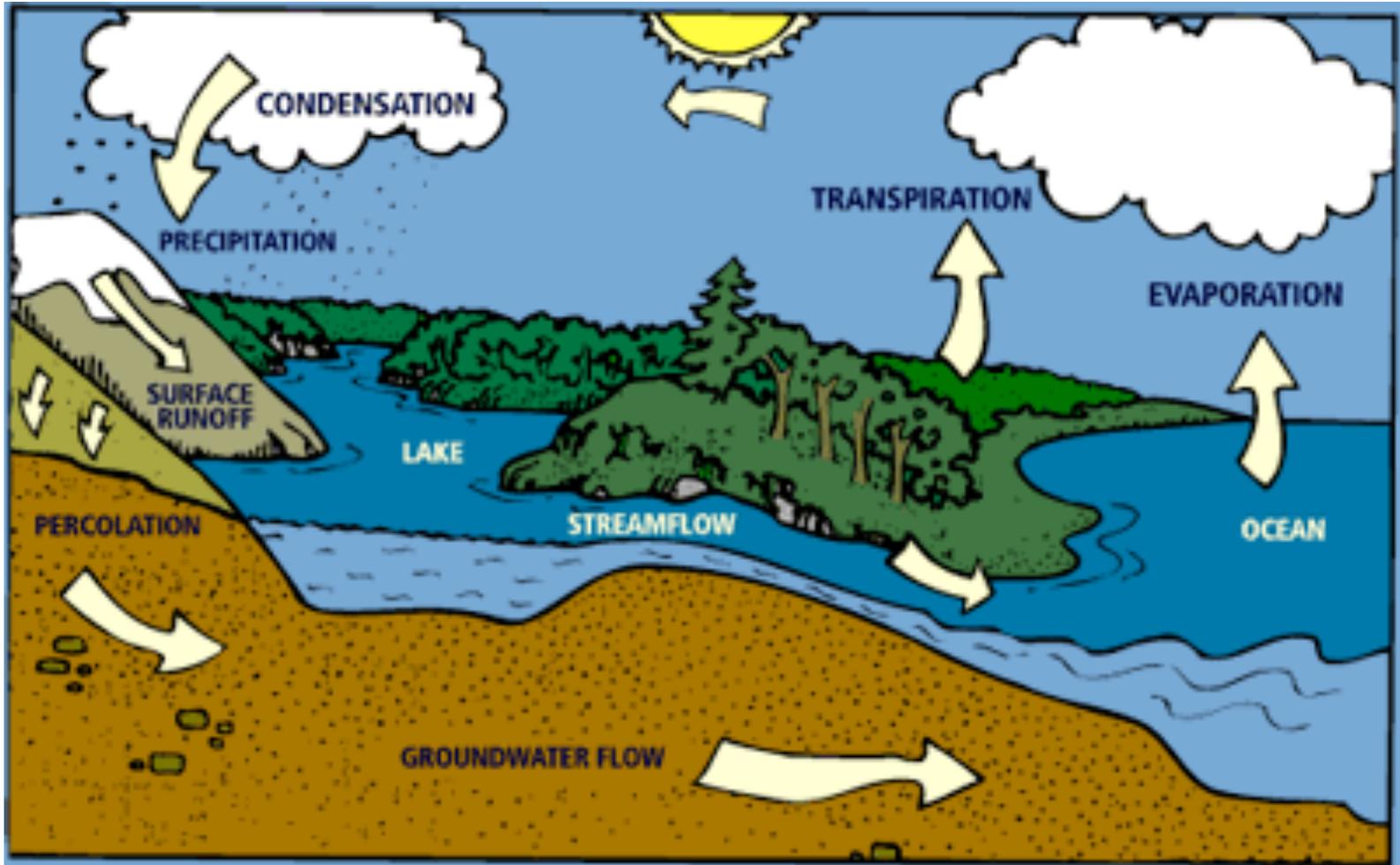
Flash Flood:

A flood caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours

Inundation:

Usually dry land surface that is covered with water – due to flooding or heavy rain

Meteorology and Hydrological Information Crucial for Flood Monitoring

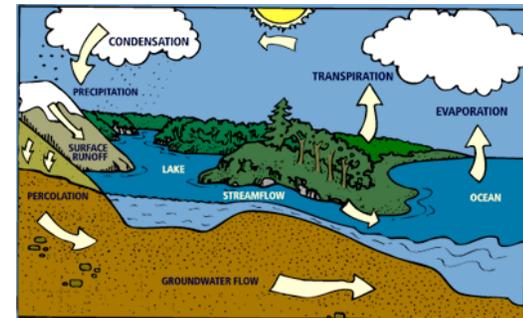


Meteorology and Hydrological Information Crucial for Flood Monitoring

➤ Rain Rate and Accumulated Rain Amount

➤ Snow Melt Rate

➤ Terrain



➤ Soil Condition: soil moisture, temperature, and cover

➤ Reservoir/River Level

➤ Storm Water Drainage System (urban floods)

NASA satellites and atmosphere-land models provide global scale geophysical parameters on hourly, daily, seasonal, multi-year time scales useful for flood monitoring and prediction

- Rain
- Temperature
- Humidity
- Winds
- Soil Moisture
- Snow/Ice
- Clouds
- Terrain
- Ground Water
- Vegetation Index
- Evapotranspiration
- Run off

**For direct observations and/or
for inputs to hydrology models**

All these quantities are available from satellite observations as well as from models
Quantities in green are derived from satellite observations
Quantities in red are from land and atmosphere-land models in which satellite observations are assimilated

NASA has --

- Several satellites in orbit with various instruments or sensors
- plans for future satellite missions
- Several earth system models which use satellite remote sensing observations

-- Providing quantities useful for flood monitoring

NASA Satellites for Hydrology



Landsat (07/1972-present)

TRMM (11/1997-present)

Terra (12/1999-present)

Aqua (5/2002-present)

GRACE (3/2002-present)

TRMM: Tropical Rainfall Measuring Mission

GRACE: Gravity Recovery and Climate Experiment

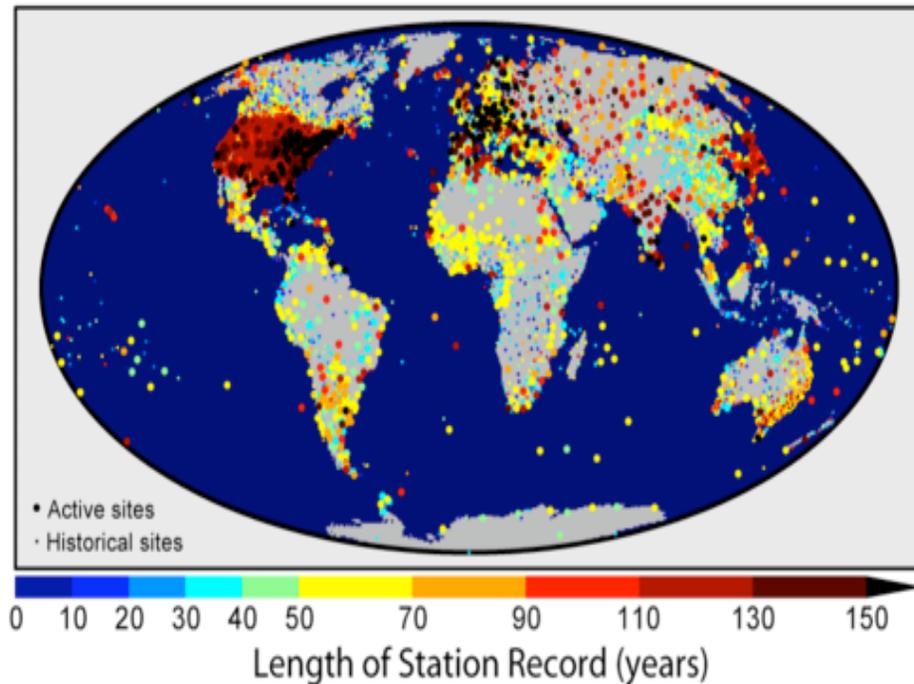
NASA Remote Sensing Quantities useful for Flood Monitoring

Satellite	Sensors	Quantities
TRMM	Precipitation Radar (PR) TRMM Microwave Imager (TMI) Visible Infrared Scanner (VIRS)	Rain Rate, Vertical Rain Rate Profile, Accumulated Rain
Terra and Aqua	MODerate Resolution Imaging Spectroradiometer (MODIS)	Snow Cover, Vegetation Index, Leaf Area Index, Land Cover, Cloud Cover
Aqua	Atmospheric Infrared Sounder (AIRS)	3-dimensional Atmospheric Temperature and Humidity, Cloud Cover
	Advanced Microwave Scanning Radiometer for EOS (AMSR-E)	Snow Water Equivalent, Sea Ice, Soil Moisture, Rain Rate
Landsat	(Enhanced) Thematic Mapper (ETM)	Land Cover, Vegetation Index, Leaf Area Index
Grace	K-Band Ranging Assembly	Terrestrial Water

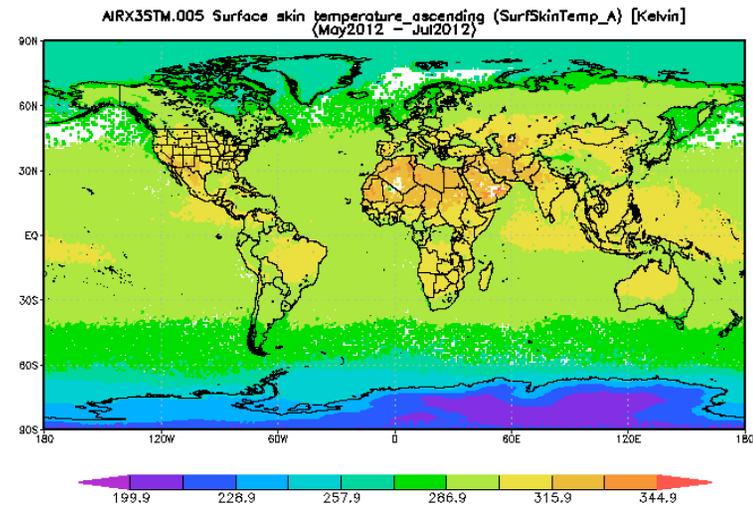
Remote Sensing observations provide information where there are no ground-based measurements

Non-uniform spatial and temporal coverage by surface stations

Global Climate Network Temperature Stations



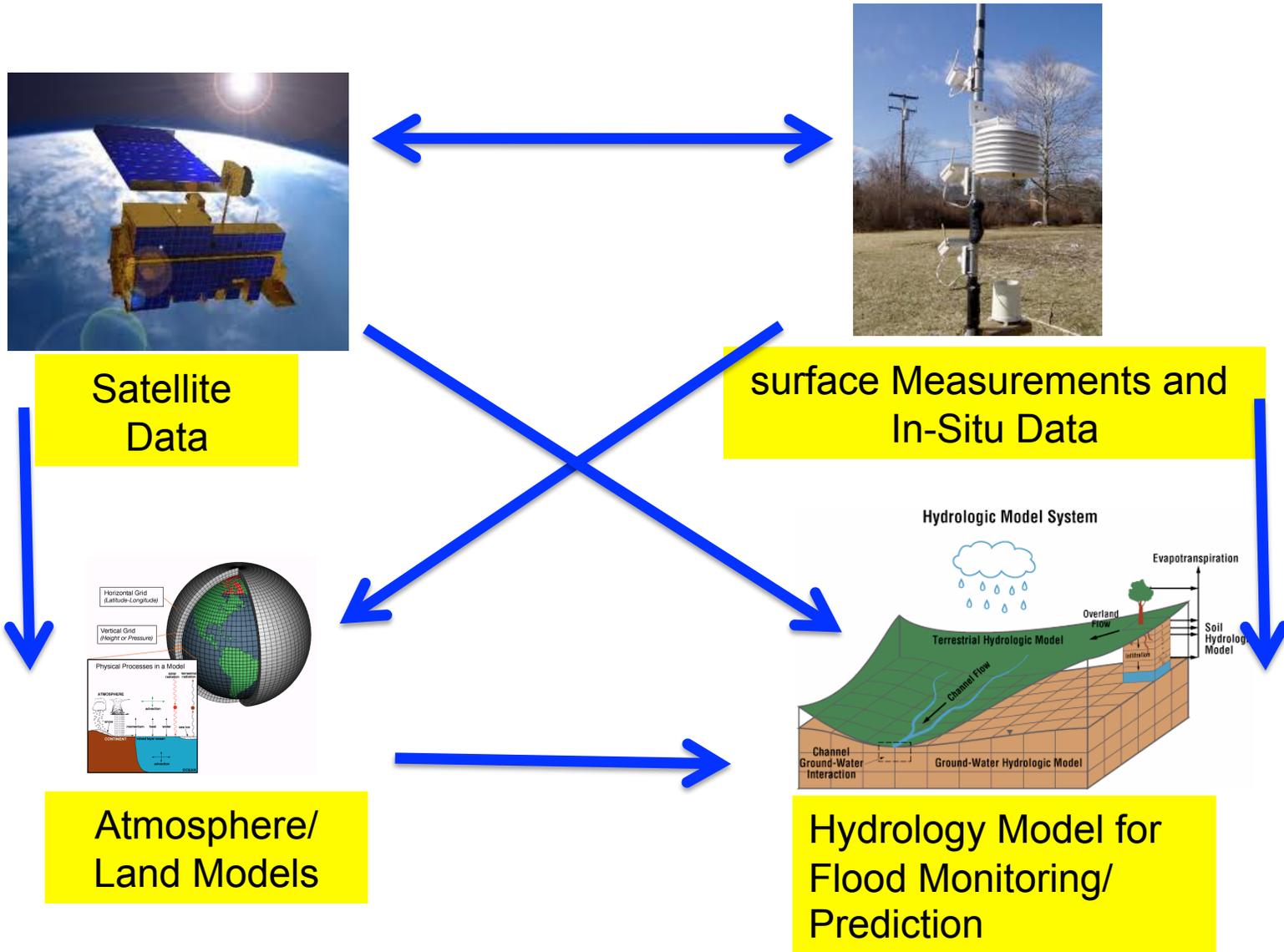
Summer time surface air temperature derived from measurements taken by Atmospheric Infrared Sounder instrument on-board NASA's Aqua satellite



NASA Model-derived Quantities for Flood Monitoring

Value-added Information

Remote Sensing + Surface Observations + Numerical Models



NASA Models for Weather, Climate, and Hydrological Quantities

(Atmosphere-Ocean-Land Models)

- **GEOS-5 :** The Goddard Earth Observing System Version 5
- **MERRA:** Modern Era Retrospective-analysis for Research and Application
- **GLDAS :** Global Land Data Assimilation System
- **NLDAS :** North American Land Data Assimilation System

NASA Models and Flood Related Quantities

Models	Quantities
MERRA	3-dimensional Winds, Temperature, Humidity, Clouds, Rain Rate ,Snow Mass, Snow Cover, Snow Depth, Surface Snowfall Rate, Evapotranspiration
GLDAS/NLDAS /VIC	Evapotraspiration, Multi-layer Soil Moisture, Snowfall Rate, Snow Melt, Snow-Water Equivalent, Surface and Sub-surface Runoff

Focus Today

- TRMM** TMI-PR-VIRS and multi-satellite merged data
(Rain)
- Terra/Aqua** MODIS data (Surface Cover)
- MERRA** Global Model (Surface Temperature, Humidity,
Winds)

TRMM Rain Data

Tropical Rainfall Measuring Mission (TRMM) satellite observations used for flood monitoring:

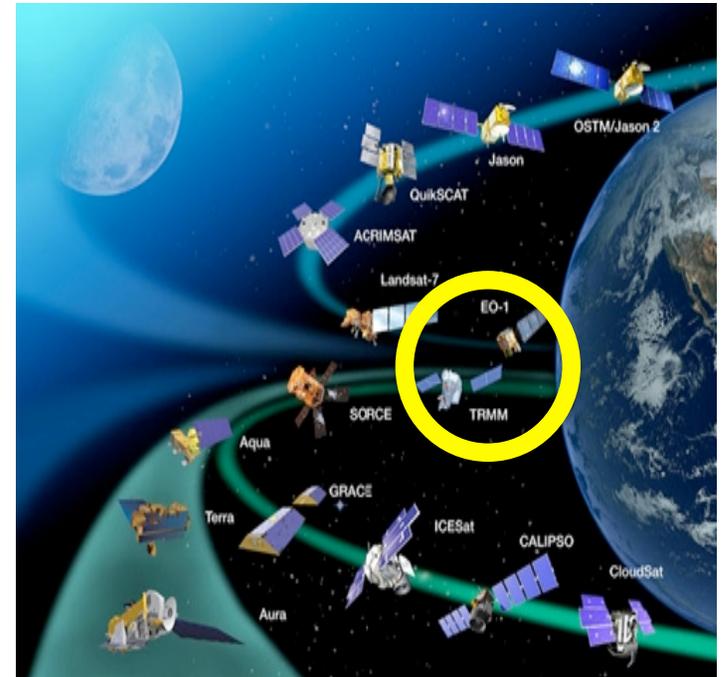
The TRMM Multi-satellite Precipitation Analysis (TMPA):
Quasi-Global, Multiyear, Combined-Sensor Precipitation
Estimates at Fine Scales:

- *Monitor near-real time rainfall – including flood inducing extreme rain events*
- *Input/forcing to hydrological models that are used to calculate streamflow for mapping flood and landslide potential*

TRMM: Tropical Rainfall Measuring Mission

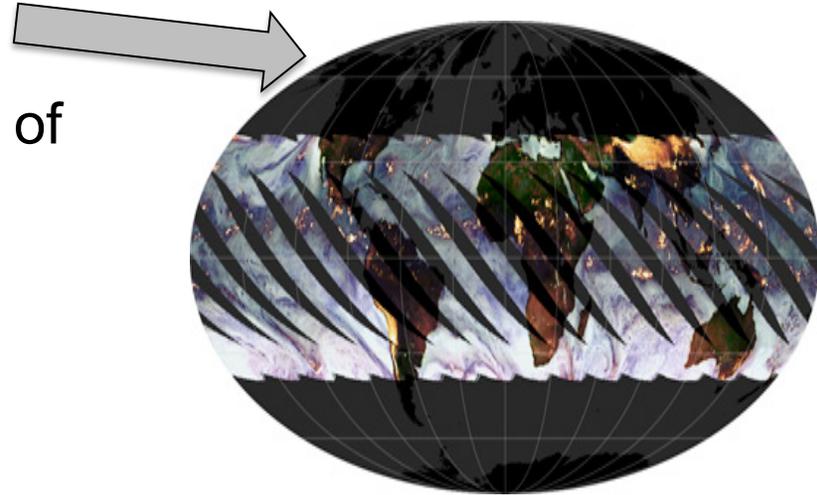
<http://trmm.gsfc.nasa.gov>

- The first satellite mission **dedicated to measuring tropical and subtropical rainfall** - Launched on 27 November 1997
- First satellite to carry a microwave Precipitation Radar
- Predecessor to Global Precipitation Measurement (GPM) mission to be launched in 2013-14.



TRMM

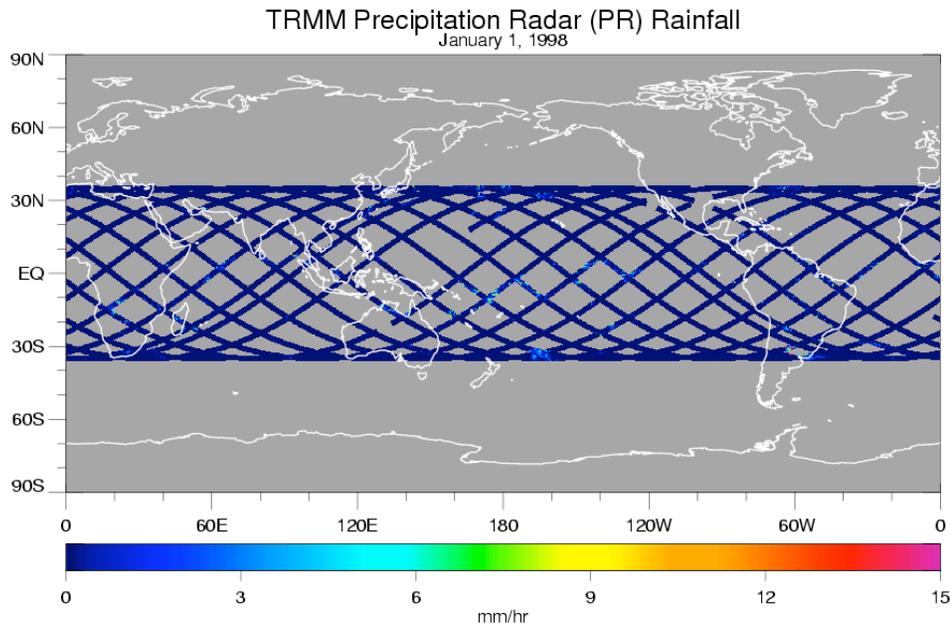
- A non-polar, low inclination orbit
Revisit time ~11-12 hours, but time of observation changes daily
- One active and two passive rain sensors
- *Precipitation Radar (PR)*
- *TRMM Microwave Imager (TMI)*
- *Visible and Infrared Scanner (VIRS)*
- Multiple rain products available from individual sensors, at varying spatial resolutions, (details given in Appendix)



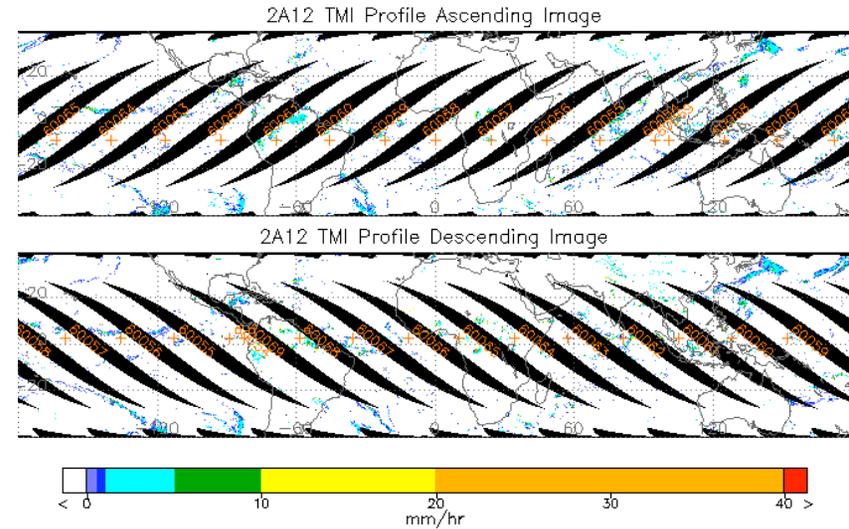
There are 16 TRMM orbits a day covering **global tropics between 35° S to 35°N latitudes**

Altitude - of approximately 350 Km, raised to 403 Km after 23 August 2001

TRMM PR and TMI Rain Data



PR: Swath = 220 km (247 km)
Pixel Size: 5 km



2008/05/31 image contains 16 orbits, orbit numbers from 60054 to 60069

TMI: Swath = 760 km (870 km)
Pixel Size : 5 to 45 km
(channel-dependent)

Strength: High pixel resolution, Accurate measurements

Limitation: No global coverage on daily basis

TRMM Multi-satellite Precipitation Analysis (TMPA)

TRMM Product Name 3B42

(Used for flood monitoring applications)

TRMM 3B42:

Combines PR and TMI rain rates

Inter-calibrates passive microwave rain rates from
SSM/I, AMSR and **AMSU-B** satellite sensors

Inter-calibrates with national and international **geostationary and NOAA low earth orbiting satellites infrared measurements** by using **VIRS**

Final rain product is calibrated with rain gauge analyses on a monthly time scale.

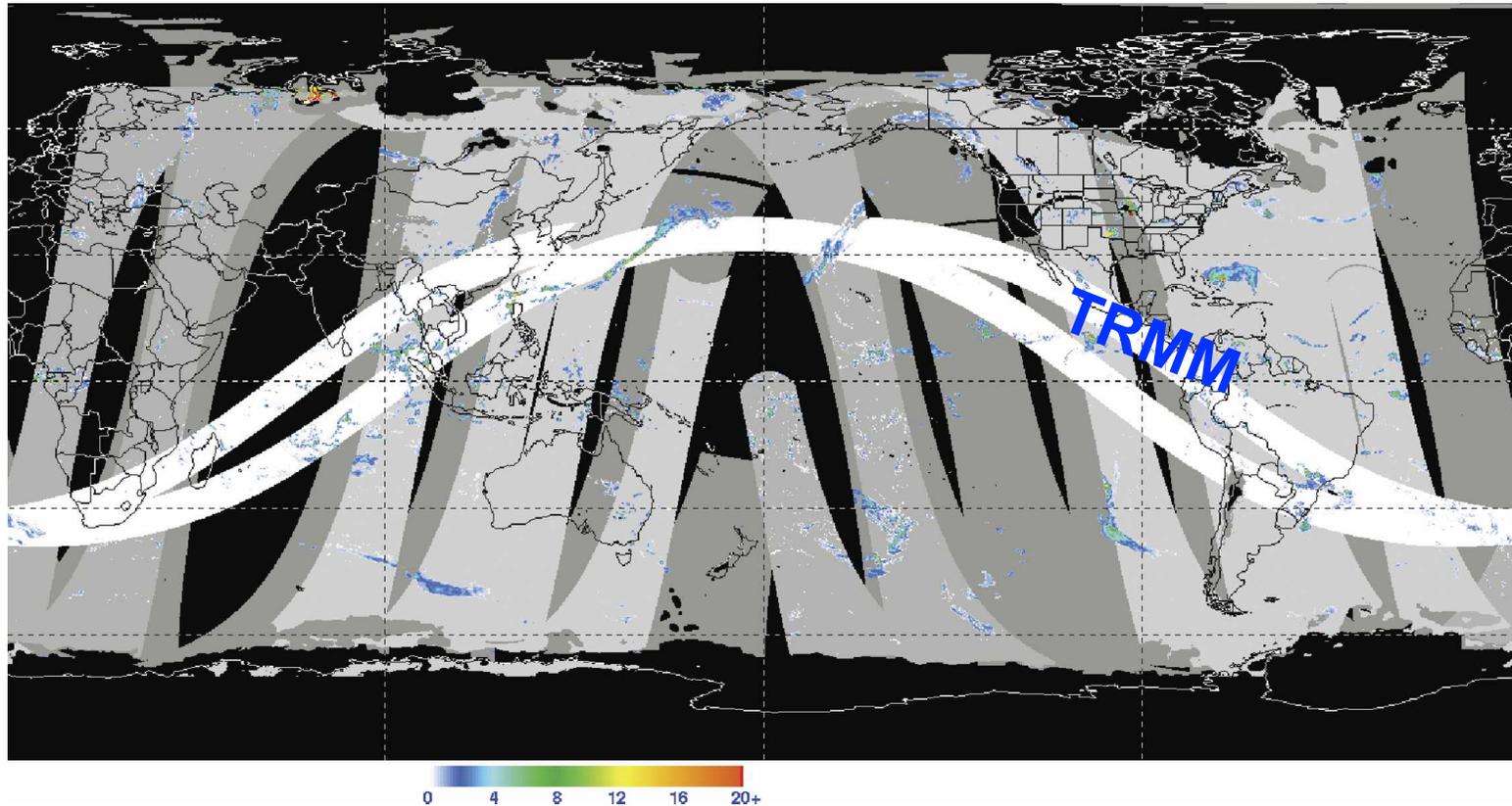
SSM/I: Special Sensor Microwave Imager

AMSR: Advanced Microwave Scanning Radiometer

AMSU: Advanced Microwave Sounding Unit

The TRMM Multi-satellite Precipitation Analysis (TMPA) Combined Microwave Estimates

(From Huffman et al. 2006, J. of Hydrometeorology)



Combined microwave precipitation estimate for the 3-h period centered at 0000 UTC 25 May 2004 in mm/h⁻¹. Blacked-out areas denote regions that lack reliable estimates

TMPA uses accurate PR/TMI rain rates to calibrate rain rates from other sensors to essentially increase temporal resolution from 12 hours to 3 hours

TMPA Surface Rain Rate Data (mm/hour)

TRMM 3B42RT : Near-Real Time

TRMM 3B42 : Adjusted with surface rain gauge measurements on monthly basis

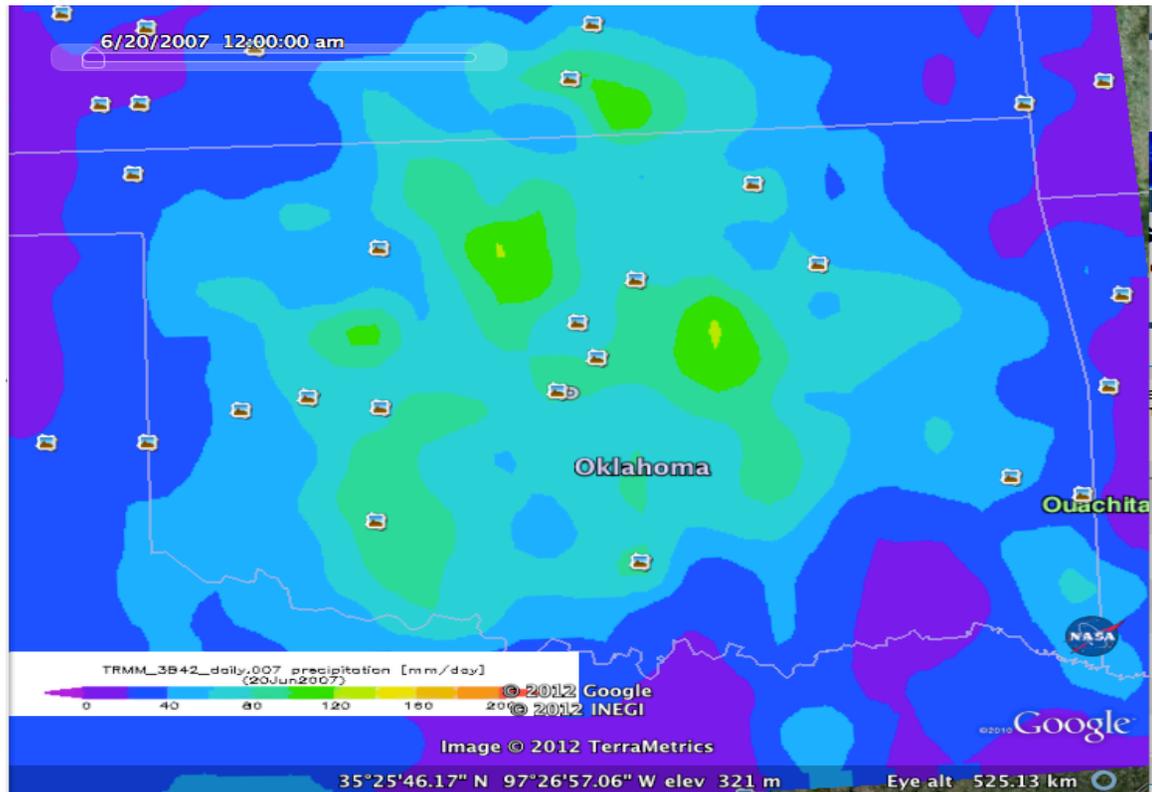
Spatial Resolution: 0.25°x0.25° latitude-longitude

Spatial Coverage: 50° S to 50° N, Global

Temporal Resolution: 3-hourly, Daily,

Temporal Coverage: 1998 to present

Examples: Flood Monitoring



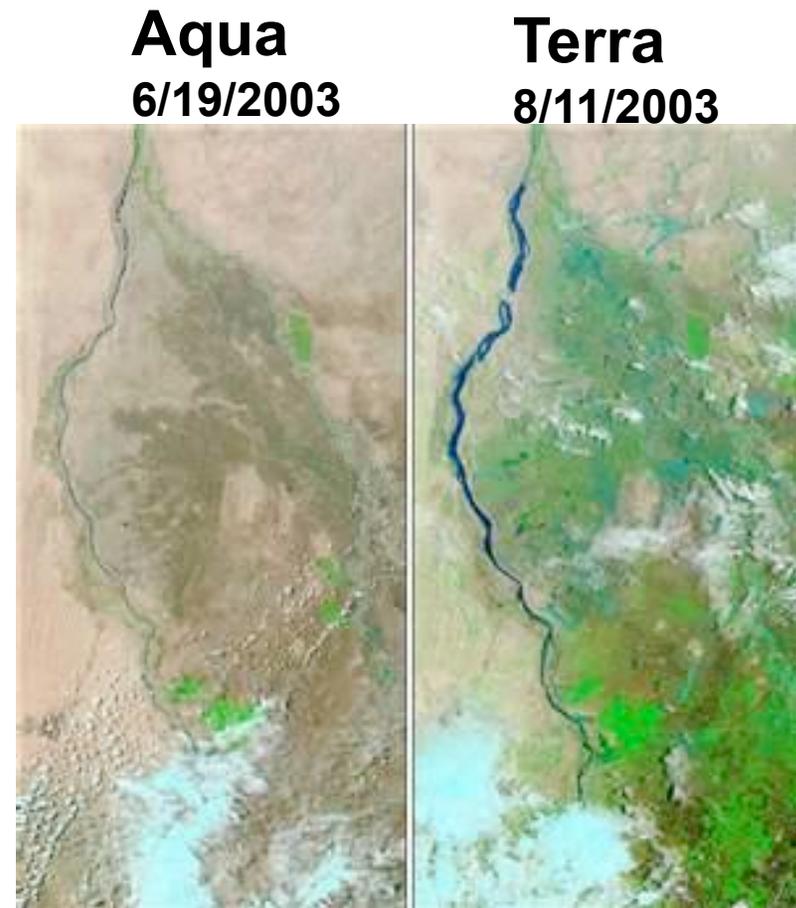
Heavy rains (in mm/day) and flooding over Oklahoma as observed from TRMM (6/20/2007)

**Terra/Aqua
MODIS
Used for Inundation Mapping**

MODerate Resolution Imaging Spectroradiometer (MODIS)

<http://modis.gsfc.nasa.gov>

- Flying on-board Terra and Aqua – polar orbiting satellites
- Global measurements, 2 times per day
- 36 spectral bands observing atmosphere, ocean, and land properties
- Measurement footprints vary from about **250 m to ~1 km**



Flooding along the White Nile, Sudan
From : Natural Hazards
earthobservatory.nasa.gov

MODIS Data for Inundation Mapping

MODIS Data:

Reflectance in Optical Bands 1, 2, and 7

Spatial Resolution: 250 m x250m

Spatial Coverage: Global

Temporal Resolution: Daily, 8-day, 16-day

Temporal Coverage: 1998 to present

Note: MODIS also provides observations of vegetation indices

Strength: Globally consistent

Limitation: Data can not be retrieved when clouds are present

Modern Era Retrospective-analysis for Research and Applications: MERRA

<http://gmao.gsfc.nasa.gov/merra/>

- Merges remote sensing and in-situ observations with the latest Earth systems models
- Weather, climate, climate variation for both research and applied decision making

MERRA

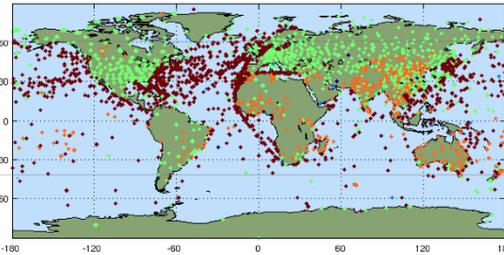
- Blends the vast quantities of observational data with output data of the Goddard Earth Observing System (GEOS) model [1979-present]

The Changing Observing System

07-Jan-1973 12UTC All data: 77098 observations

all lat; all lon; all lev; all kt; all kc; all gcc; all gch
/data/austin/b500_swp_73/all_obs_workdir/SAVE_ODS/b500_swp_73.ana.obs.19730107_12z.ods

Observation Locations

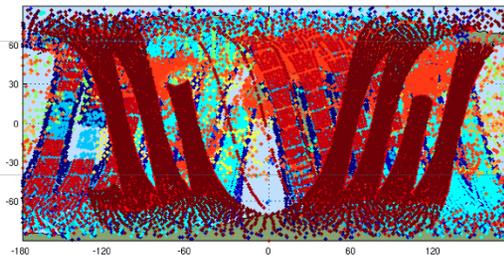


1973 – 77K Obs every 6hrs

02-Aug-1987 12UTC All data: 550602 observations

all lat; all lon; all lev; all kt; all kc; all gcc; all gch
/data/austin/b500_b10p9_b4/all_obs_workdir/b500_b10p9_b4.ana.obs.19870802_12z.ods

Observation Locations

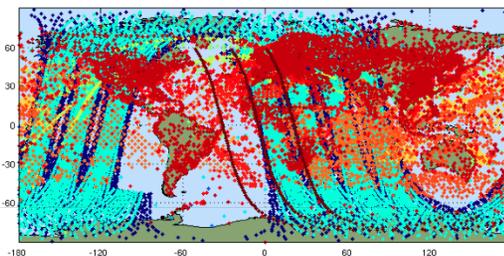


1987 – 550K Obs every 6hrs

07-Jan-1979 12UTC All data: 325765 observations

all lat; all lon; all lev; all kt; all kc; all gcc; all gch
/data/austin/b500_swp_73/all_obs_workdir/SAVE_ODS/b500_swp_73.ana.obs.19790107_12z.ods

Observation Locations

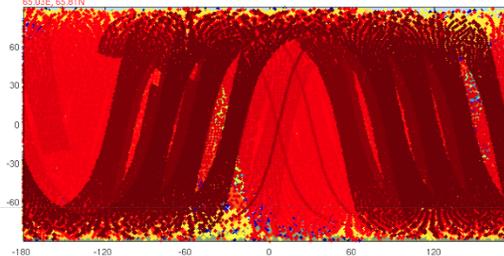


1979 – 325K Obs every 6hrs

07-Jan-2006 12UTC All data: 4217655 observations

all lat; all lon; all lev; all kt; all kc; all gcc; all gch
/data/austin/d5_b10p9stab12_jan06/all_obs_workdir/d5_b10p9stab12_jan06.ana.obs.20060107_12z.ods

Observation Locations



2006 – 4.2M Obs every 6hrs

Current satellite coverage assimilated in MERRA

From: Michael Bosilovich, NASA-GSFC-GMAO

MERRA Temperature, Humidity, and Wind

Surface skin and Air Temperature

Temperature Profile

East-West and North-South wind components

Humidity (Water Vapor) Profile

Column-integrated Water Vapor (Precipitable Water)

Spatial Resolution:	$2/3^{\circ} \times 1/2^{\circ}$ latitude-longitude and $1.25^{\circ} \times 1.25$, 42 vertical levels
Spatial Coverage:	Global
Temporal Resolution:	Hourly, Daily, Monthly
Temporal Coverage:	1979 to present

**NASA interactive web-tool for data access,
analysis, visualization:**

Giovanni

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

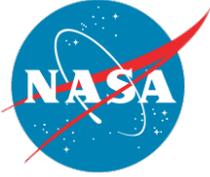
**NASA interactive web-tool for data search,
spatial and temporal selection, and access**

MIRADOR

<http://mirador.gsfc.nasa.gov>

See the Appendix for more information

Data-specific Hands-on Training can be arranged with ARSET



NASA Remote Sensing and Model-derived Data

- NASA remote sensing and model-based **data are FREE**
- Web-based tools available for data access, analysis, and downloading
- Choices of quantities from various sources according to applications and end-user needs
- **ARSET Team directly works with end-users through 'hands-on' trainings to facilitate applications and decision support activities with NASA data**

Thank You!

Amita Mehta

email: amita.v.mehta@nasa.gov

Appendix

Information about

- **Data Products**
- **Data Access**

TRMM Data

Characteristic	Visible Infrared Scanner (VIRS)	TRMM Microwave Imager (TMI)	Precipitation Radar (PR)
Frequency/ Wavelength	0.63, 1.6, 3.75, 10.8, 12 μm Helps calibrate TRMM measurements with those of Polar Orbiting Environmental Satellites (POES) and Geostationary Operational Environmental Satellites (GOES)	10.65, 19.35, 37.0, 85.5 GHz dual polarization, 22.235 GHz vertical polarization	13.8 GHz horizontal polarization
Pixel Size	2.1 km	Ranges from 5 km at 85.5 GHz to 45 km at 10.65 GHz	4.3 km at nadir
Swath Width	720 km (833 km)	760 km (870 km)	220 km (247 Km)

TRMM Rain Data (Level 1 and 2)

Level	Visible Infrared Scanner	TRMM Microwave Imager	Precipitation Radar	PR and TMI Combined Products
Level 1	Visible & IR radiances	Microwave brightness temperatures (1B11)	Radar return power & reflectivity (1B21, 1C21)	NA
Level 2	NA	TMI profile for CLW, prec. water, cloud ice, prec. ice, latent heat, & surface rain (2A12)	PR surface cross-section & path attenuation (2A21) , rain type, storm, & freezing height; (2A23) PR profile for rain rate, reflec., attenuation, & rain top/bottom height (2A25)	Rain rate , drop size dist. parameters, path integrated attenuation (2B31)

These data are available for each swath at pixel resolution

Rain product names are given in red

What is Giovanni?

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

Giovanni: GES-DISC (Goddard Earth Sciences Data and Information Services Center) Interactive Online Visualization ANd aNalysis Infrastructure

Giovanni is a Web-based application to visualize, analyze, and access geophysical data without having to download the data.

Giovanni is comprised of a number **‘portals’**, each for gridded, Level-3 geophysical quantities from different satellite/sensors and models.

Rain: Giovanni Hydrology Portal

TRMM Online Visualization and Analysis System (TOVAS)

NASA GES DISC Goddard Earth Sciences Data and Information Services Center

Search GES DISC
Search

GES DISC Home **Data Services** **Science Portals** **Mission Portals**

Analyze Data with Giovanni Search for Data with Mirador Simple Subset Wizard More...

Giovanni - The Bridge Between Data and Science

OVERVIEW

- + What is Giovanni?
- + Who Uses Giovanni?
- + Giovanni Parameters
- + Giovanni Plot Types
- + How to Use Giovanni
- + How to Acknowledge Giovanni
- + Acknowledgements

Additional Features

- + News
- + Users Manual
- + Publications
- + Newsletters
- + Feedback
- + FAQ

You are here: [GES DISC Home](#) » [Giovanni](#) » [Overview](#) » Giovanni

Giovanni

Giovanni Portals **Giovanni Parameter List**

- ▶ **Atmospheric Portals (scroll down to view complete list)**
- ▶ **Application and Education Portals**
- ▶ **Meteorological Portals**
- ▶ **Ocean Portals**
- ▼ **Hydrology Portals**
 - [Global Land Data Assimilation System Monthly Data](#)
 - [Global Land Data Assimilation System 3-Hourly Data](#)
 - [North American Land Data Assimilation System Hourly Data](#)
 - [TRMM Online Visualization and Analysis System \(TOVAS\)](#)

Hide News

Giovanni – Select Data

You are here: [GES DISC Home](#) » [Precipitation](#) » [TRMM Online Visualization and Analysis System \(TOVAS\)](#)

TRMM Online Visualization and Analysis System (TOVAS)

Welcome to TOVAS, a member of the Giovanni (GES-DISC Interactive Online Visualization AND aNalysis Infrastructure) family, which provides users with an easy-to-use, Web-based interface for the visualization and analysis of global precipitation data.

Welcome to TOVAS, a member of the [Giovanni](#) (GES-DISC (Goddard Earth Sciences Data and Information Services Center) Interactive Online Visualization AND aNalysis Infrastructure) family, which provides users with an easy-to-use, Web-based interface for the visualization and analysis of global precipitation data. See the [FAQ](#) for further usage on this tool.

Instances

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 \(3B42RT derived\)](#)
[TMPA-RT Intermediate IR Product: 3B41RT \(VAR\)](#)
[TMPA-RT Intermediate Microwave Product: 3B40RT \(HQ\)](#)

Satellite Rainfall Archives

[Monthly Global Precipitation \(GPCP\)](#)
[3-hourly TRMM and Other Rainfall Estimate \(3B42 V7\)](#)
[Daily TRMM and Other Rainfall Estimate \(3B42 V7 derived\)](#)
[Monthly TRMM and Other Data Sources Rainfall Estimate \(3B43, 3A12, 3A25 V7\)](#)

Ground Observation Archives

[Monthly Willmott and Matsuura Global Precipitation \(1950 - 1999\)](#)
[Monthly GPCC Rainfall \(1986 - Present, Monitoring Product\)](#)

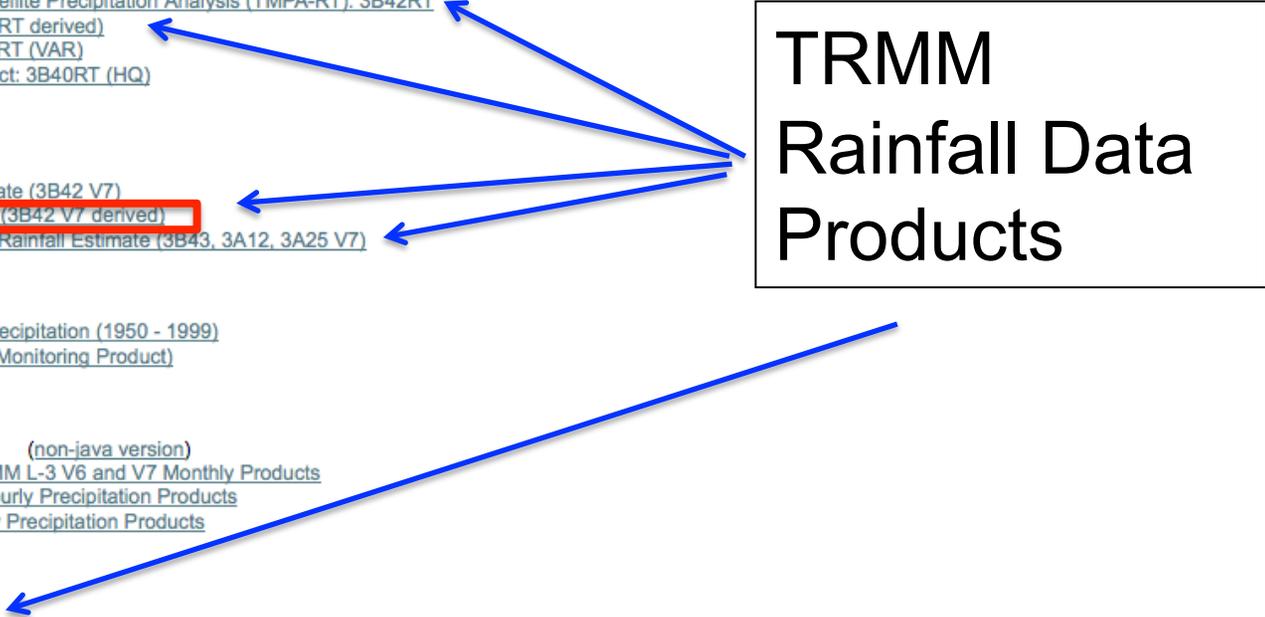
Rainfall Product Intercomparison

[Inter-Comparison of Rainfall Climatology \(non-java version\)](#)
[Beta Prototype: Inter-Comparison of TRMM L-3 V6 and V7 Monthly Products](#)
[Beta Prototype: Inter-Comparison of 3-hourly Precipitation Products](#)
[Beta Prototype: Inter-comparison of Daily Precipitation Products](#)

Climatology

[TRMM Composite Climatology](#)

TRMM
Rainfall Data
Products



Giovanni: Select Spatial-Temporal-Visualization Options

The screenshot displays the Giovanni web interface with several key sections highlighted by red boxes and arrows:

- Spatial Selection:** A map showing a selected area of interest (AOI) over the United States and Mexico. The AOI coordinates are: West: -131.814, North: 55.348, South: -8.285, East: -36.838. The map also shows cursor coordinates: -35.83789, -8.28515.
- Parameter Selection:** The 'Parameters' section shows 'precipitation' selected as the parameter, with units of 'mm/day' and data product info 'TRMM_3B42_daily.007'.
- Temporal Selection:** The 'Temporal' section shows 'Begin Date' and 'End Date' both set to August 31, 2012.
- Visualization Selection:** The 'Select Visualization:' dropdown menu is open, showing options like 'Lat-Lon map, Time-averaged', 'Time series', 'Latitude-Time Hovmoller Diagram', etc.
- Generate Visualization:** A button labeled 'Generate Visualization' is highlighted.

Red arrows point from the text labels to the corresponding interface elements:

- 'Parameter Selection' points to the 'Parameters' section.
- 'Spatial Selection' points to the map and AOI coordinates.
- 'Temporal Selection' points to the 'Temporal' section.
- 'Visualization Selection' points to the 'Select Visualization:' dropdown menu.
- 'Generate Visualization' points to the 'Generate Visualization' button.

Additional interface elements include a 'Display:' section with 'Data Product Info' and 'Units' checked, and a footer with NASA contact information and a 'Privacy Policy and Important Notices' link.

Temperature Humidity, Winds from MERRA: Giovanni Meteorological Portal

NASA GES DISC Goddard Earth Sciences Data and Information Services Center

Search GES DI...
Search

GES DISC Home **Data Services** **Science Portals** **Mission Portals**

Analyze Data with Giovanni Search for Data with Mirador Simple Subset Wizard More...

Giovanni - The Bridge Between Data and Science

» OVERVIEW

- + What is Giovanni?
- + Who Uses Giovanni?
- + Giovanni Parameters
- + Giovanni Plot Types
- + How to Use Giovanni
- + How to Acknowledge Giovanni
- + Acknowledgements

Additional Features

- + News
- + Users Manual
- + Publications
- + Newsletters
- + Feedback
- + FAQ

You are here: [GES DISC Home](#) » [Giovanni](#) » [Overview](#) » Giovanni

Giovanni

Giovanni Portals **Giovanni Parameter List**

- ▶ **Atmospheric Portals (scroll down to view complete list)**
- ▶ **Application and Education Portals**
- ▼ **Meteorological Portals**

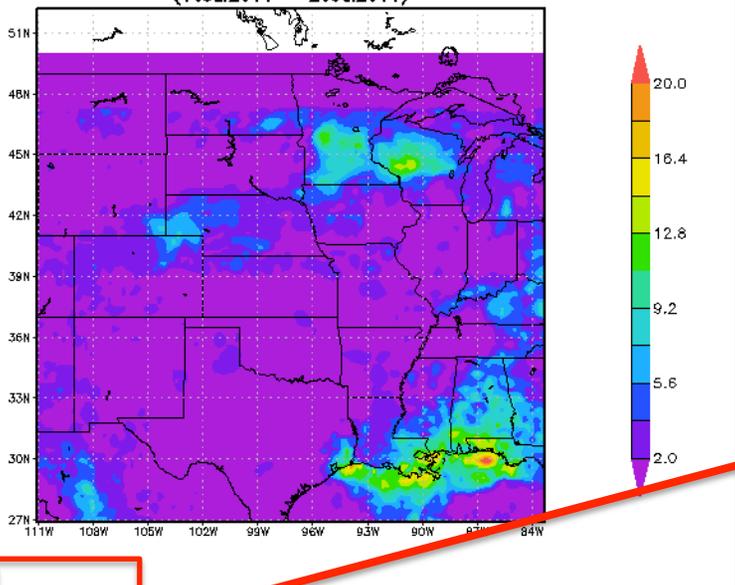
- [Modern Era Retrospective-Analysis for Research and Applications \(MERRA\): 2D Monthly](#)
- [Modern Era Retrospective-Analysis for Research and Applications \(MERRA\): 3D Monthly](#)
- [MERRA Monthly Analysis](#)
- [MERRA Monthly Chemistry Forcing](#)
- [MERRA Hourly 2D](#)
- [MERRA Hourly 3D](#)
- [TRMM Online Visualization and Analysis System \(TOVAS\)](#)
- [Clouds and the Earth's Radiant Energy System \(CERES\)](#)

Hide News ▼

Giovanni: Visualization

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

TRMM_3B42_daily.007 precipitation [mm/day]
(10Jul2011 - 20Jul2011)



Download Data

Refine plot options

Edit Plot Preferences **Refine Constraints***

Select minimum and maximum values, color palate for display

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	<input checked="" type="radio"/> Yes <input type="radio"/> No	Determine whether decorations (axes, reticles, labels, etc.) are displayed for the resultant plot.
Color Bar	Mode: <input type="radio"/> Dynamic <input type="radio"/> Pre-Defined <input checked="" type="radio"/> Custom Palette: Rainbow Min Value: 2 Max Value: 20	Select color map mode, select a palette, or, if shown in this preference bloc, specify min parameter value to map. The 'Palette' and Min/Max Value options are enabled only when mode is selected. Values entered for 'Min Value' and 'Max Value' will override parameter for parameter min and max, respectively.
Projection	Equidistant Cylindrical	Select a projection for the plot(s)
Smooth Flag	<input checked="" type="radio"/> Yes <input type="radio"/> No	Determine whether the pixel interpolation should use a smoothing routine
precipitation (TRMM_3B42_daily.007) Return to plot	Parameter Min: 0.0 Parameter Max: 200.0	Set parameter preference values

Submit Refinements Reset

Giovanni: Data Download Options

HDF, NCDF, ASCII Formats

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 Download in Batch

Data Product	Start Time	File Size (b)	Download Files
TRMM_3B42_daily.007 (precipitation)	2011-07-10T00:00:00Z	626047	<input type="checkbox"/> HDF <input type="checkbox"/> NCD
TRMM_3B42_daily.007 (precipitation)	2011-07-11T00:00:00Z	636034	<input type="checkbox"/> HDF <input type="checkbox"/> NCD
TRMM_3B42_daily.007 (precipitation)	2011-07-12T00:00:00Z	652838	<input type="checkbox"/> HDF <input type="checkbox"/> NCD
TRMM_3B42_daily.007 (precipitation)	2011-07-13T00:00:00Z	644246	<input type="checkbox"/> HDF <input type="checkbox"/> NCD
TRMM_3B42_daily.007 (precipitation)	2011-07-14T00:00:00Z	632734	<input type="checkbox"/> HDF <input type="checkbox"/> NCD

Two Dimensional Map Plot Download in Batch

Input Files	Start Time	File Size (b)	Download Files
TRMM_3B42_daily.007 (precipitation)	2011-07-10T00:00:00Z	46608	<input type="checkbox"/> HDF <input type="checkbox"/> NCD <input type="checkbox"/> ASC

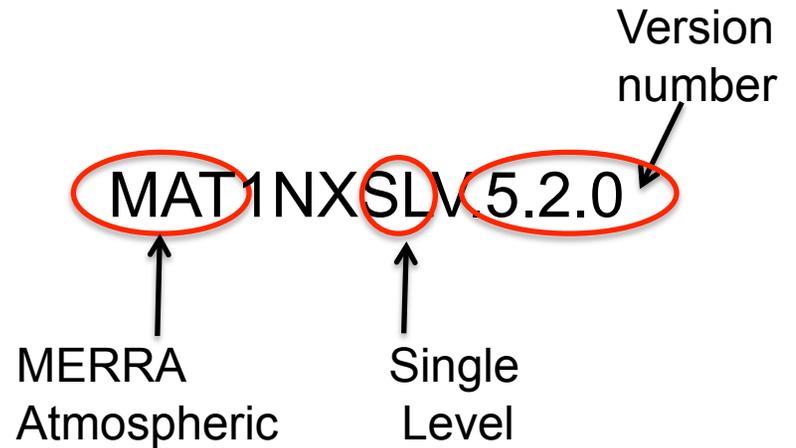
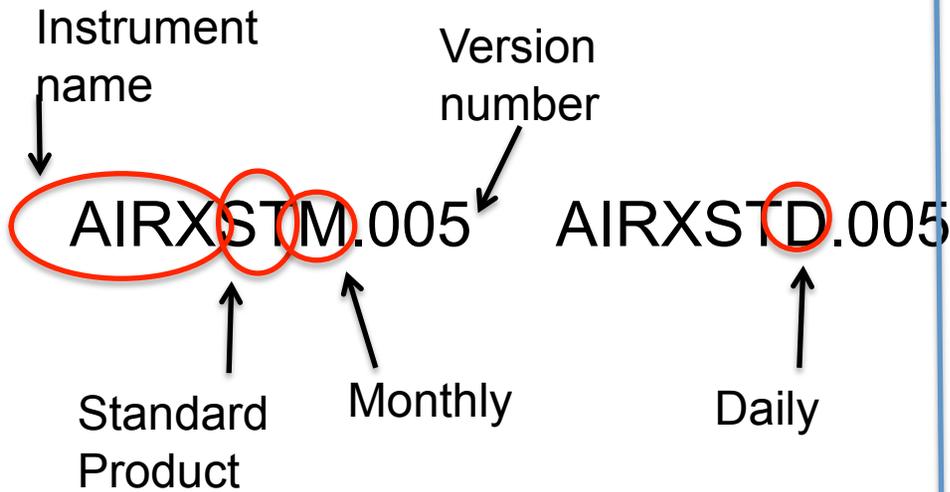
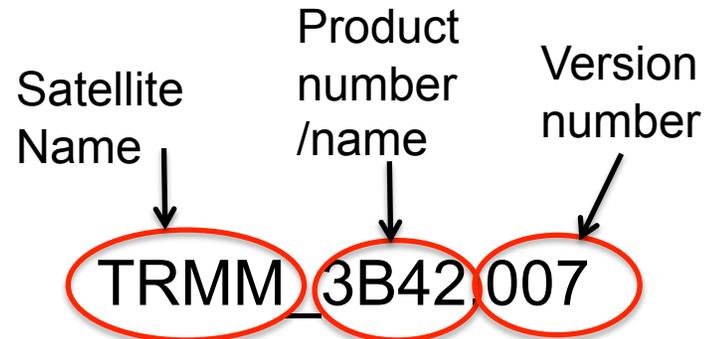
Output Files

File Name	File Size (b)	Download Files
precipitation.TRMM_3B42_daily.007.AreaMap.2011-07-10.gif	22597	<input type="checkbox"/> KMZ

GIF Image

Display on Google Map

Data Product Names: What to know? Examples



What is MIRADOR ?

<http://mirador.gsfc.nasa.gov>

[Mirador](#) : is an earth science data search tool developed at the GES DISC. It has a simplified interface that allows spatial and temporal parameter subsetting, and an interactive shopping cart.

Mirador – Simple Search

<http://mirador.gsfc.nasa.gov/>

A simple, clean interface that employs the Google mini appliance for metadata keyword searches.

The screenshot shows the Mirador search interface. At the top, there is a NASA logo and the text 'National Aeronautics and Space Administration' and 'Goddard Earth Sciences Data and Information Services Center'. A search bar labeled 'Search DISC' is present with a '+ GO' button and a link to '+ Advanced Search'. Below the search bar, there are several tabs: '+ ACDC', '+ AgDISC', '+ A-TRAIN', '+ AIRS', '+ HURRICANES', '+ NEESPI', '+ OCEAN COLOR', and '+ PDISC'. The main content area features a 'Mirador' header with the tagline 'Data Access Made Simple' and a breadcrumb trail 'You are here: Keyword Search'. The search form includes fields for 'Keyword' (with a green circle around it), 'Location' (with a purple circle around it and the value 'chesapeake'), 'Time Span' (with an orange circle around it), and 'Event' (with a red circle around it). There are also 'From' and 'To' date pickers. Below the search form, there is a list of available data sources: 'AIRS, OMI, MLS, HIRDLS, TOMS, UARS, TRMM, GLDAS, SORCE, and Subsets from A-Train Sensors (e.g MODIS, AIRS, OMI and MLS)'. There is also a 'What's New' section and an 'Acknowledgements' section with links to 'National GeoSpatial Information Agency', 'Unisys', 'EPA', and 'Smithsonian Global Volcanism Program'. The interface also includes a sidebar with 'Additional Features' like 'News', 'Restricted Data', 'Feedback', and 'FAQ'.

Mirador supports
Searching by:

Keyword

Time span

Location

Event

Semantic
Mirador

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

Search results lists all available data products that match criteria, along with product information and statistics.

The screenshot shows the Mirador search interface. On the left is a sidebar with navigation links: + GES DISC Home, Mirador, Keyword (MERRA cloud precipitation), Time Span (1978-01-01 00:00:00 to 2003-12-03 23:59:59), Location (Worldwide), and Event. The main area displays search results for 'MERRA cloud precipitation'. Two data sets are listed: 'MERRA Chem 3D IAU States Cloud Precip, Time average 3-hourly (eta coord, 1.25x1L72) (MAT3FVCHM)' and 'MERRA Chem 2D IAU Diagnostics, Fluxes and Meteorology, Time Average 3-hourly (surface, 1.25x1L1) (MAT3FXCHM)'. Each result shows the number of files found (321,802 MB and 19,296 MB respectively) and parameters like spatial and temporal resolution. At the bottom, it says 'NASA Search Results (Number of files found may not be entirely accurate) Page: 1'.

Viewable and downloadable granule lists for each product.

Spatial and Parameter Subsetting

This screenshot shows the 'File Listing For MAT3FVCHM' interface. It displays a table of file names and start times. The search criteria on the left sidebar are the same as in the previous screenshot. The table has columns for 'File Name' and 'Start Time'. A 'Select All' checkbox is checked. Below the table, there are links for 'Download Now: [Data] [Metadata]' for each file.

File Name	Start Time
<input checked="" type="checkbox"/> MERRA300.prod.assim.tavg3_3d_chm_Fv.20001231.hdf (316.53 MB)	2000-12-31 00:00:00
<input checked="" type="checkbox"/> MERRA300.prod.assim.tavg3_3d_chm_Fv.20001230.hdf (317.05 MB)	2000-12-30 00:00:00
<input checked="" type="checkbox"/> MERRA300.prod.assim.tavg3_3d_chm_Fv.20001229.hdf (317.16 MB)	2000-12-29 00:00:00
<input checked="" type="checkbox"/> MERRA300.prod.assim.tavg3_3d_chm_Fv.20001228.hdf (315.74 MB)	2000-12-28 00:00:00

Mirador – Checkout

Checkout offers multiple ways to download the data:

Java-based Downloader

URL List

FTP Batch Script

On The Fly Tar

DownThemAll

The screenshot shows the Mirador 2.11 checkout interface. At the top, it says "Mirador 2.11 Data Access Made Simple". Below that, a message states "Your cart is now empty." The main heading is "CHECKOUT - CHOOSE FROM DOWNLOAD OPTIONS:". There are five main options, each with a corresponding button and description:

- JAVA-BASED DOWNLOADER**: A green circle highlights this option. A green arrow points from the text "Java-based Downloader" on the right to this option. Below the heading is a "Download" button and a paragraph of text describing the downloader as a platform-independent HTTP and FTP client.
- URL LIST FOR USE WITH DATA TRANSFER CLIENTS (WGET, CURL, ETC.)**: An orange circle highlights this option. An orange arrow points from the text "URL List" on the right to this option. Below the heading are three buttons: "Download Data only", "Download XML only", and "Download DATA and XML".
- FTP BATCH SCRIPT**: A purple circle highlights this option. A purple arrow points from the text "FTP Batch Script" on the right to this option. Below the heading are three buttons: "Download Data only", "Download XML only", and "Download DATA and XML".
- ON THE FLY TAR**: A red circle highlights this option. A red arrow points from the text "On The Fly Tar" on the right to this option. Below the heading are instructions for running the script on SGI/Linux, DOS/SunOS, and Windows/Mac platforms.
- DOWNTHEMALL**: A blue circle highlights this option. A blue arrow points from the text "DownThemAll" on the right to this option. Below the heading is a "Download from goldsmr3.sci.gsfc.nasa.gov" button and a paragraph of text explaining that On The Fly TAR allows downloading all files to a single tar file.