



Monitoring Extreme Rain Events using Giovanni

Amita Mehta and Ana Prados

NASA-UMBC Joint Center for Earth Systems Technology (JCET)

Email: amita.v.mehta@nasa.gov



We use **Giovanni** for research, teaching university students, and training end-users who may want to use NASA water products for water resource management and planning

The screenshot shows the NASA Earth Data website interface. At the top, there is a navigation bar with links for "NASA Earth Data", "Data Discovery", "Data Centers", "Community", "Science Disciplines", and "Search EOSDIS". Below this is the "GES DISC" logo and the text "Goddard Earth Sciences Data and Information Services Center". A search bar is located on the right side of the header.

The main navigation area includes tabs for "GES DISC Home", "Data Services", "Science Portals", and "Mission Portals". Below these are links for "Analyze Data with Giovanni", "Search for Data with Mirador", "Simple Subset Wizard", and "More...".

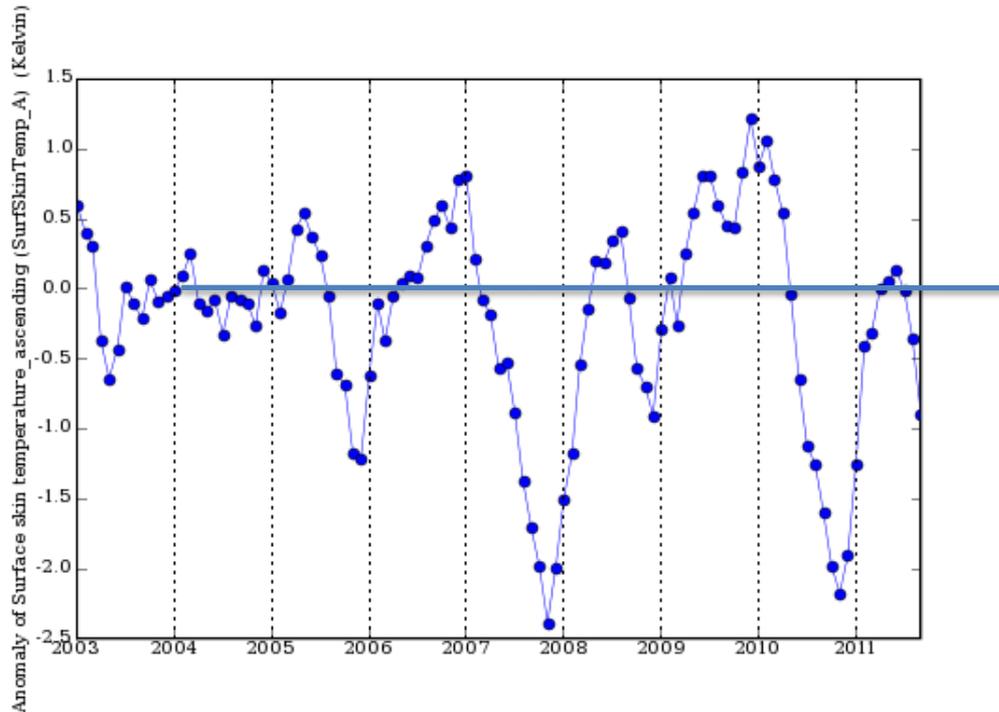
A banner image features the text "Giovanni - The Bridge Between Data and Science" over a collage of satellite data images, including a hurricane and various atmospheric maps.

The left sidebar contains an "OVERVIEW" section with a list of links: "+ What is Giovanni?", "+ Who Uses Giovanni?", "+ Giovanni Parameters", "+ Giovanni Plot Types", "+ How to Use Giovanni", "+ How to Acknowledge Giovanni", and "+ Acknowledgements". Below this is an "Additional Features" section with links for "+ News", "+ Users Manual", "+ Publications", "+ Newsletters", "+ Feedback", and "+ FAQ".

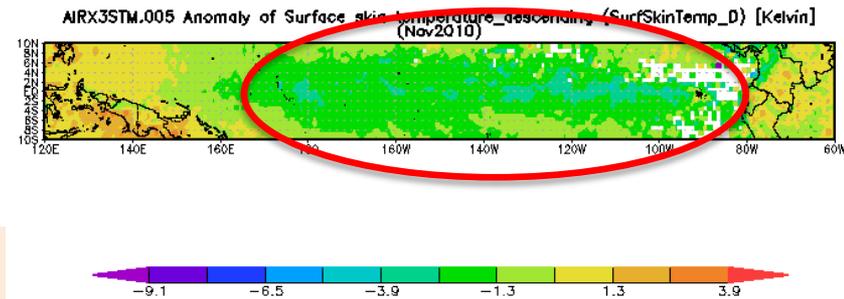
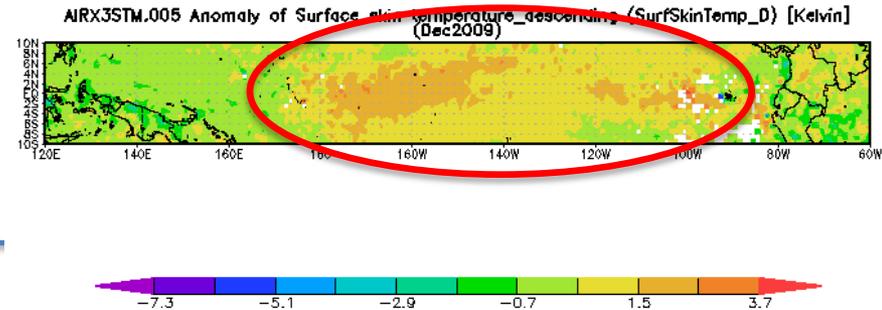
The main content area shows the breadcrumb "You are here: GES DISC Home » Giovanni » Overview » Giovanni" and the title "Giovanni". There are two tabs: "Giovanni Portals" (selected) and "Giovanni Parameter List". Under "Giovanni Portals", there is a section for "Atmospheric Portals (scroll down to view complete list)" with a list of links: "A-Train along CloudSat Track", "Aerosol Optical Thickness Measurement and Model Comparison: Daily", "Aerosol Optical Thickness Measurement and Model Comparison: Monthly", "MISR Daily", "MISR Monthly", "Aqua/AIRS Global: Daily", "Aqua/AIRS Global: Monthly", "Terra and Aqua MODIS: Daily", and "Terra and Aqua MODIS: Monthly". Below this are sections for "Application and Education Portals", "Meteorological Portals", and "Ocean Portals".

Looking at El Nino – La Nina by using AIRS SST Anomalies

Area-Averaged Time Series (AIRX3STM.005)
(Region: 150W-90W, 5S-5N)



December 2009:
warm SST anomalies

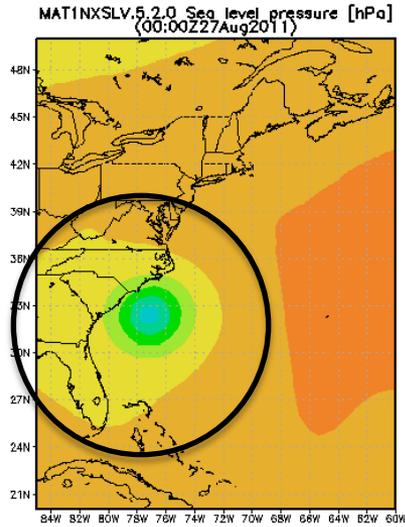


November 2010:
cold SST anomalies

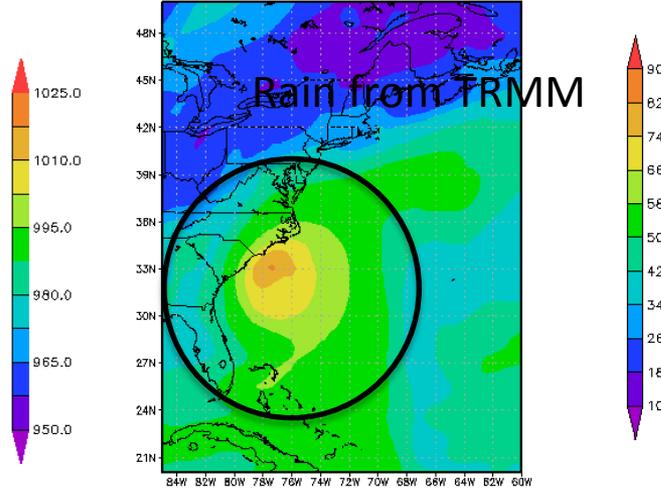
AIRS Sea Surface Temperature Anomalies over central equatorial Pacific ocean showing El Nino and La Nina events

Hurricane Irene from MERRA August 27, 2011

Sea Level Pressure

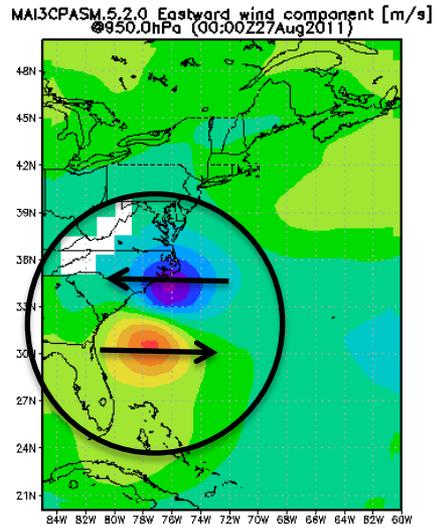


M1NXINT.5.2.0 Total Q vapor (Total precipitable water) [kg/m2]
(00:00Z27Aug2011)

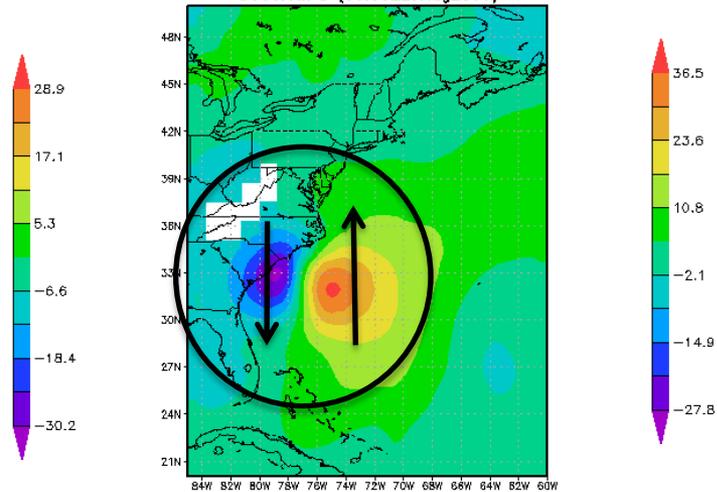


**Total Atmospheric
Moisture**

Eastward Wind

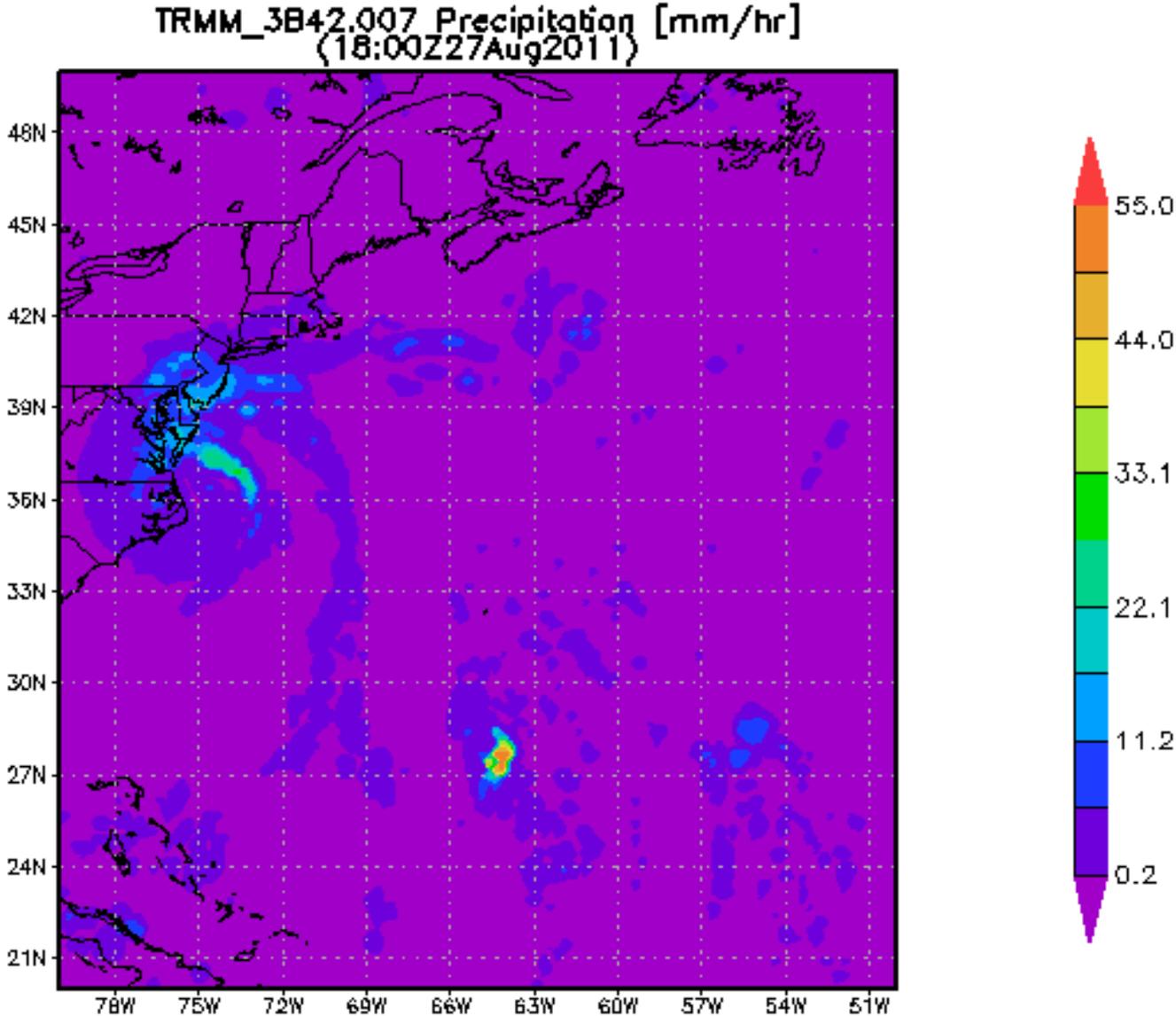


MA13CPASM.5.2.0 Northward wind component [m/s]
@950.0hPa (00:00Z27Aug2011)



**Northward
Wind**

Hurricane Irene TRMM Rain Fall August 27, 2011



We use Giovanni to give hands-on training to end-users about NASA water resource products from TRMM, MODIS, AIRS, MERRA, GLDAS/NLDAS

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



National Aeronautics and Space Administration
Goddard Space Flight Center

Search SED Site

Flight Projects | Sciences and Exploration

Applied Remote Sensing Training Water Resource Management

NASA Earth Science Division

NASA Applied Sciences Program

Home

Workshops

Case Studies

Training Materials

Visualization & Analysis

ARSET: Air Quality

Publications

▶ Personnel

Tools

Project Description

The goal of this NASA Applied Remote Sensing Education and Training project is to increase the utility of NASA Earth Science and model data for decision-makers and applied science professionals in the area of Water Resources Management Applications. The project conducts trainings and other capacity building activities on utilization of NASA satellite remote sensing and model data for a variety of water management applications including floods and snow related topics. Training activities are a combination of lectures and hands-on activities that teach professionals how to access, interpret, and apply NASA rainfall, snow, cloud, and atmospheric humidity products at regional and global scales with an emphasis of Case Studies. This website provides access to educational materials and regular updates on upcoming events and workshops.

If you would like more information about any of the activities and materials available on this site or to request a training please contact:
Ana.I.Prados@nasa.gov

Scheduled Trainings

Webinar Series: Flood and Drought Applications

November 6 to December 4, 2012
Each Tuesday from 2:00 PM to 3:00 PM EDT

[click here for agenda](#)

Course is FREE but registration is required. Send email to:
amita.v.mehta@nasa.gov

Stay Informed

If you would like to be informed of upcoming workshops and project activities please sign up for [List Serv.](#)



Goddard
SPACE FLIGHT CENTER

NASA Official: David Starr

Webmaster: Paul Przyborski

Page Last Updated: September 13, 2012

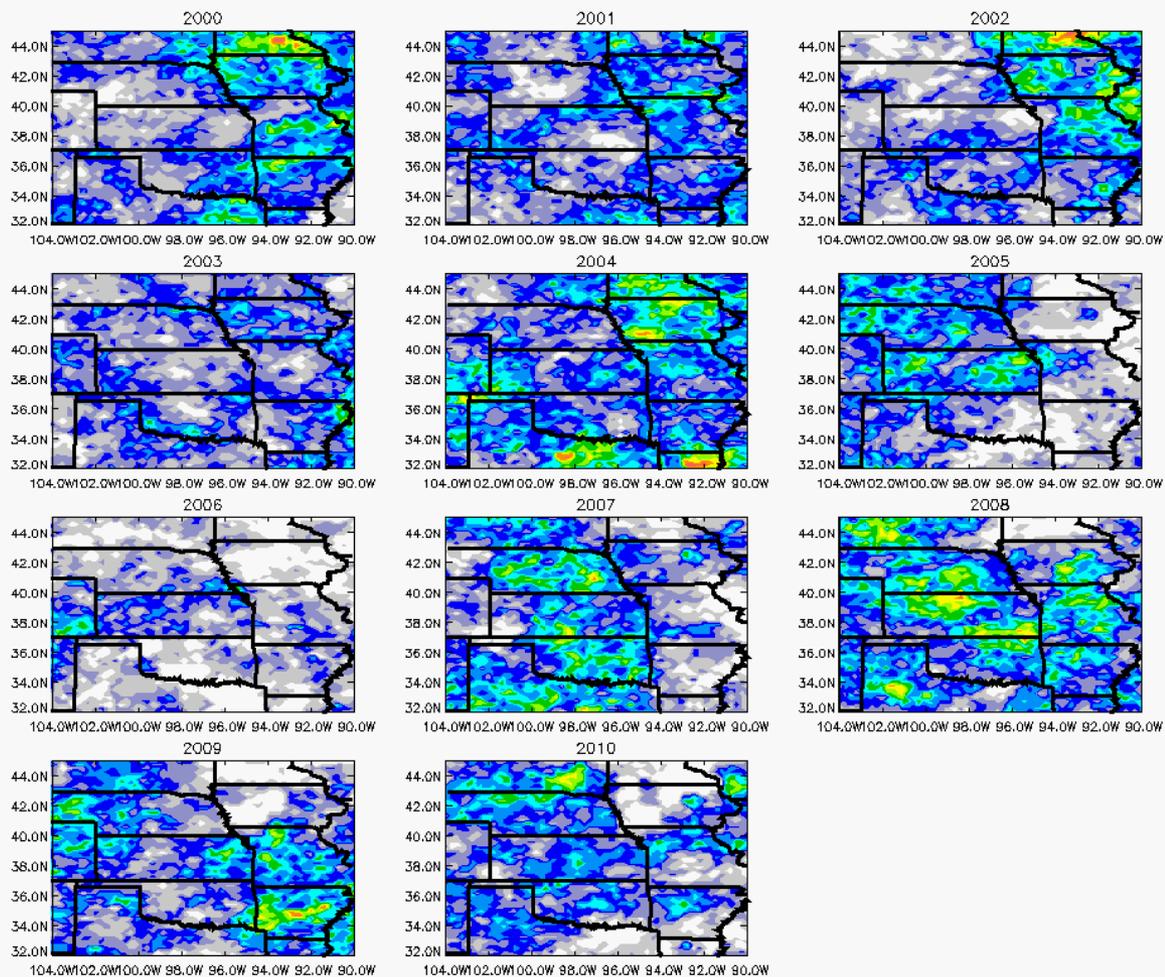
> [Privacy Policy & Important Notices](#)

> [Contact Us](#)

Most end-users, including water resource managers and always interested in heavy rain and flooding



Heavy Warm Season Rain Events over the US Great Plains from TRMM



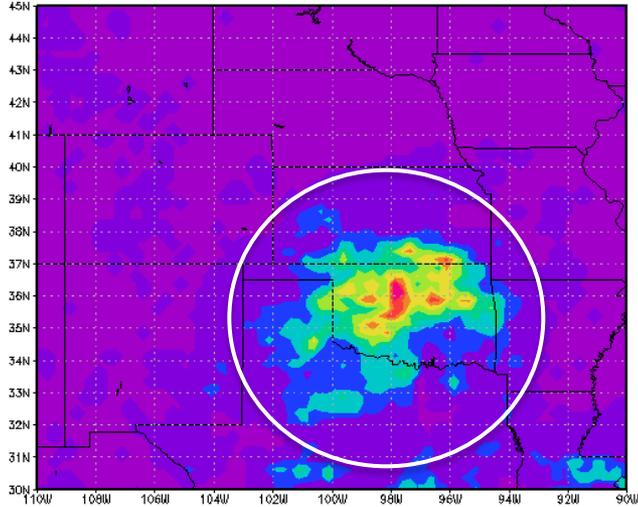
Extreme Rain Events and Flooding

“--- A projected increase in the chance of intense precipitation and flooding. Although somewhat counter-intuitive, this is because precipitation is projected to be concentrated into more intense events, with longer periods of little precipitation in between. Therefore, intense and heavy episodic rainfall events with high runoff amounts are interspersed with longer relatively dry period--” ---- **Intergovernmental Panel on Climate Change**

Objective: For known flooding events document rain, moisture, clouds, and atmospheric circulation which may help develop precursor scenarios for flooding

Extreme Rain Event over Oklahoma on June 20, 2007

Daily TRMM 3B42(v6) 20Jun2007
Accumulated Rainfall [mm]

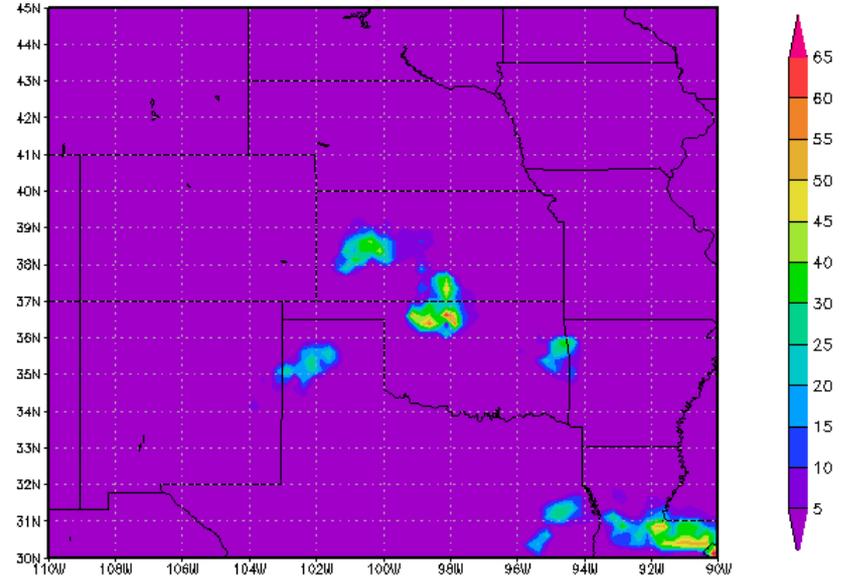


ADS: GOLA/IGES

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

2012-05-15-18:28

3-hourly TRMM 3B42(v6) 00Z20Jun2007
Accumulated Rainfall [mm]



GRADS: GOLA/IGES

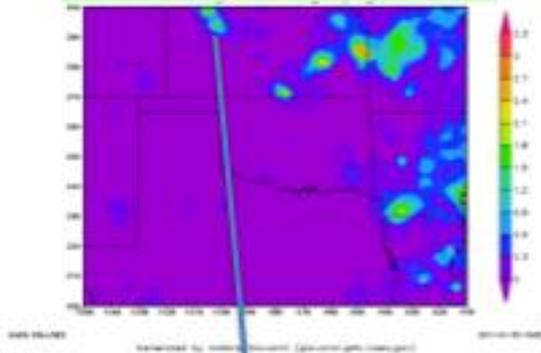
Generated by NASA's Giovanni (giovanni.gsfc.nasa.gov)

2012-05-15-18:32

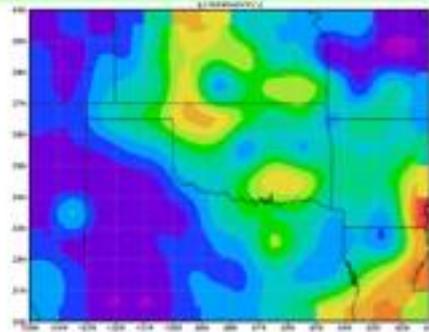
TRMM Rainfall

Case Study 1: Heavy rain even over Southern Oklahoma

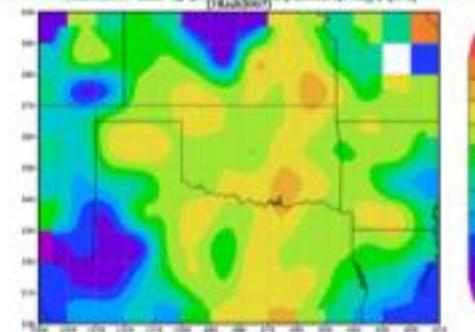
Rain Rate 07/06/19



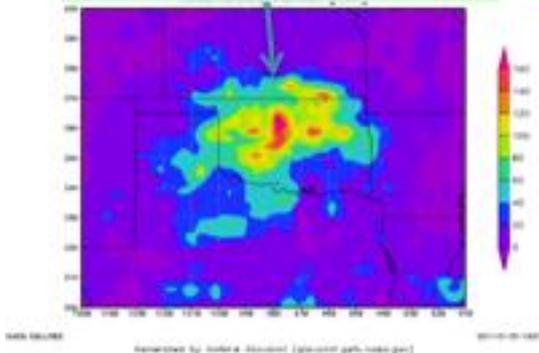
Cloud Amount 07/06/19



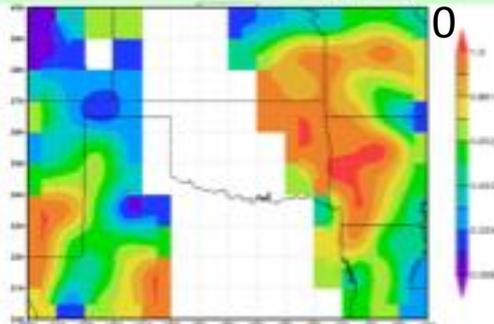
Cloud Top Pressure 07/06/19



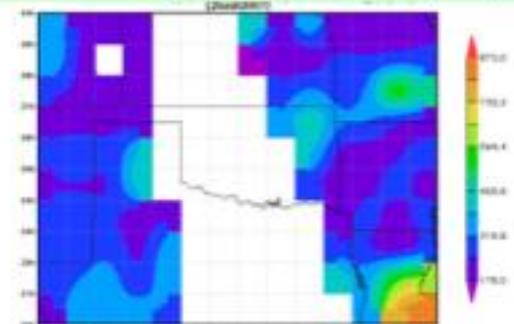
Rain Rate 07/06/20



Cloud Amount 07/06, 29



Cloud Top Pressure 07/06/20

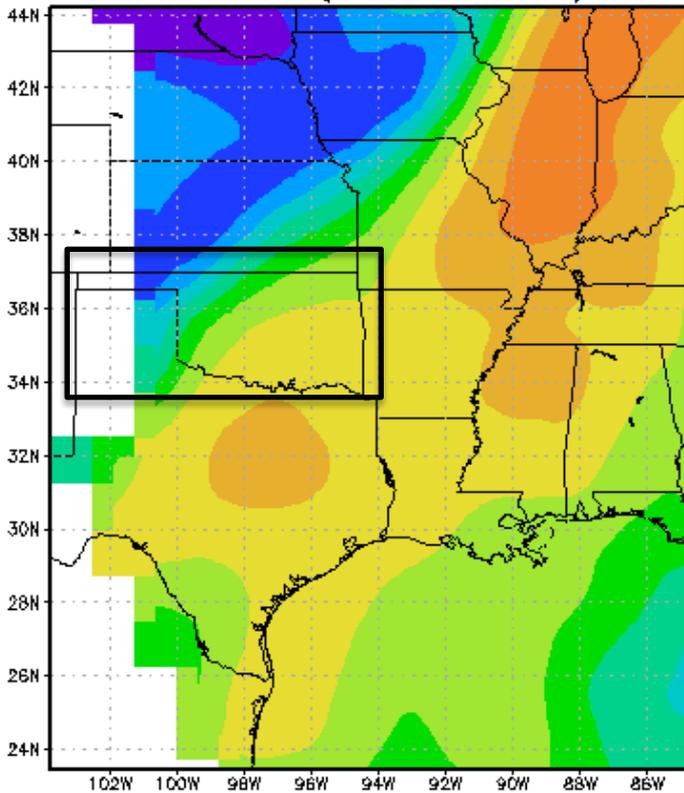


Development of the
20th June, 2007
Heavy Rain Event
over Oklahoma

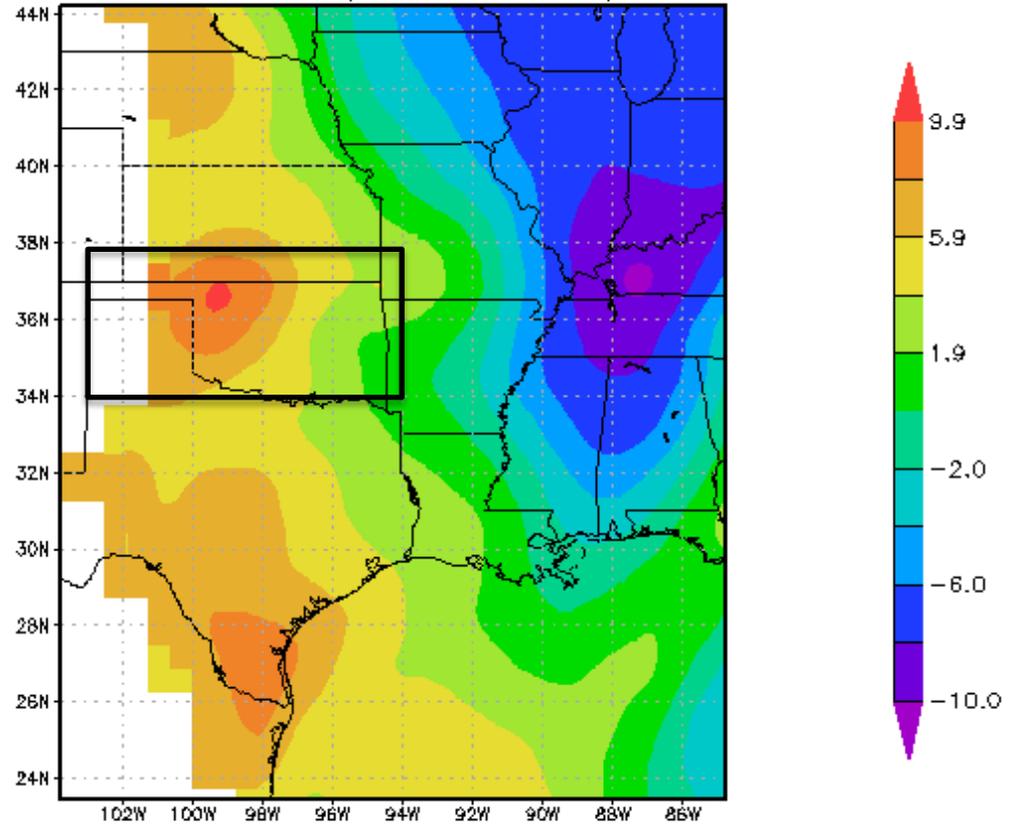
Dramatic increase
in deep convective
clouds between 19th
and 20th

Low Level Meridional Wind (900 hPa) from MERRA

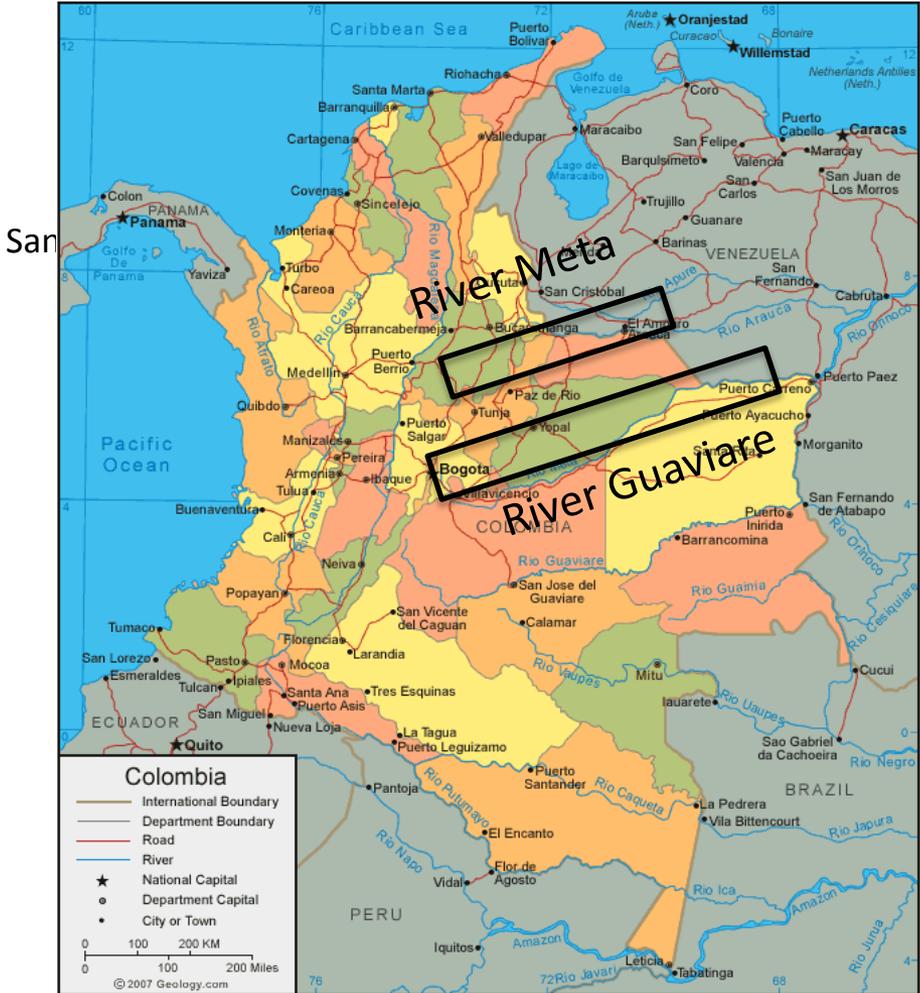
MAI3CPASM.5.2.0 Northward wind component [m/s]
@900.0hPa (00:00Z19Jun2007)



MAI3CPASM.5.2.0 Northward wind component [m/s]
@900.0hPa (00:00Z20Jun2007)

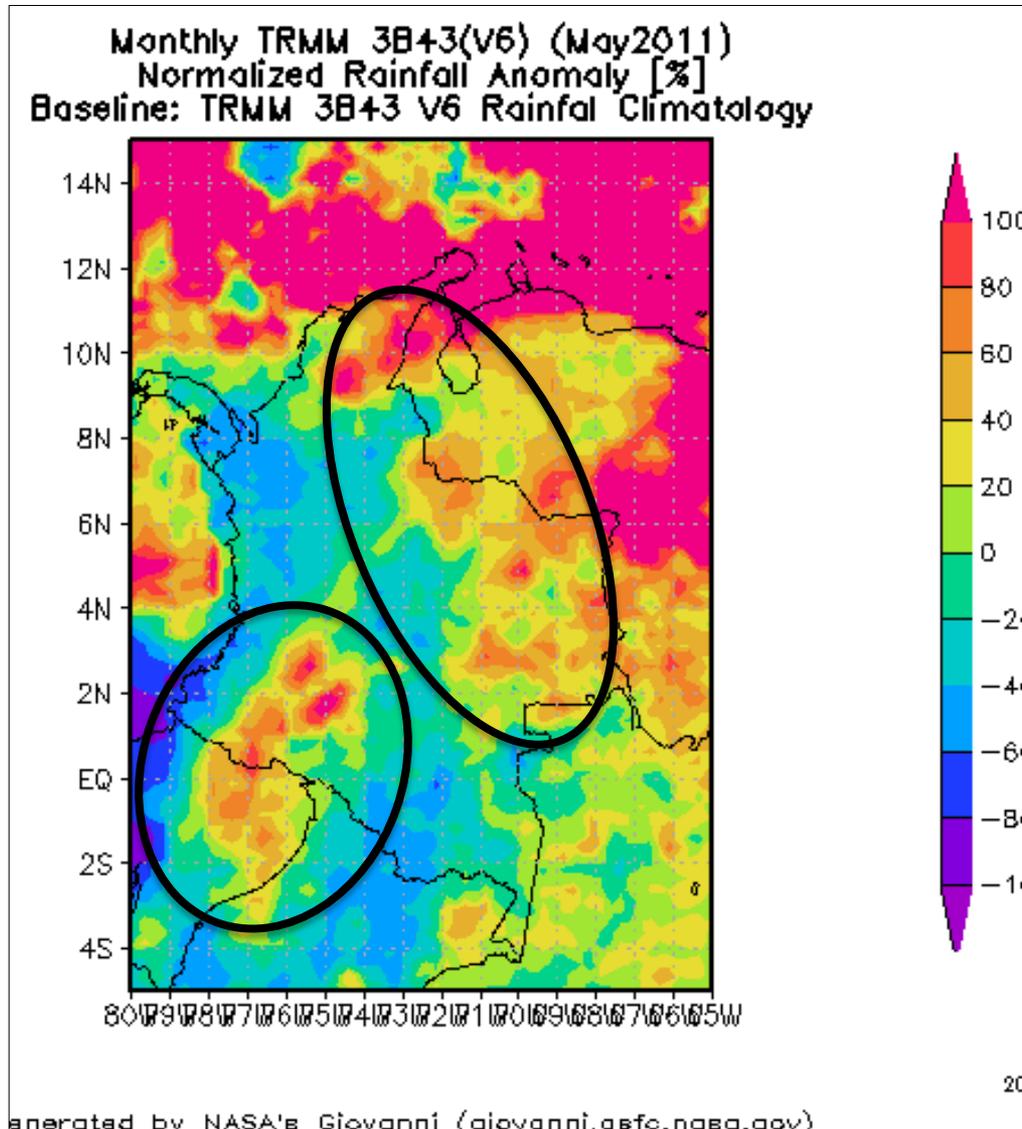


In May 2011 Heavy Rains caused flooding of the Rio Guaviare and Meta, two of the major tributaries of Orinoco river



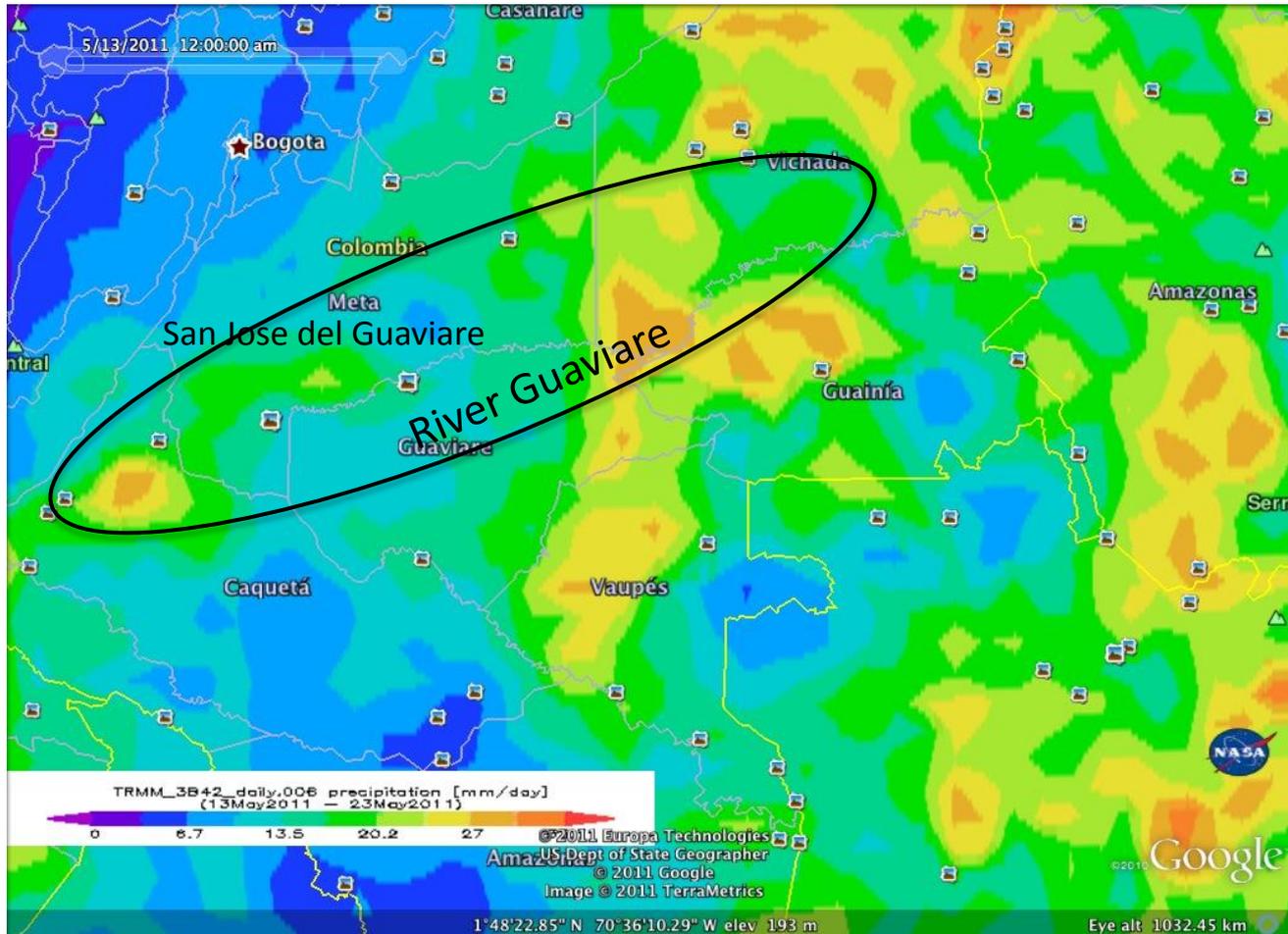
TRMM Rain Anomalies over Colombia

Monthly Deviation from Normal Rainfall in May 2011

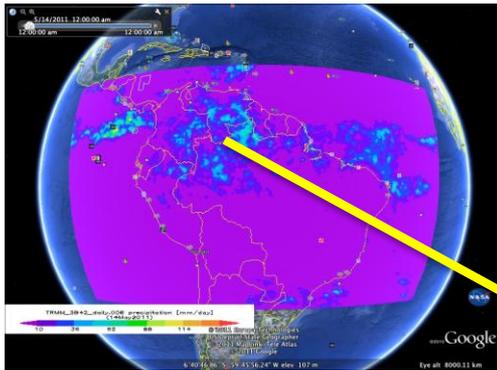


During May 2011 while rainfall over many parts of Colombia was below-normal, the northern coast and north-eastern regions along with the south west region had rainfall 20 to 80% above normal

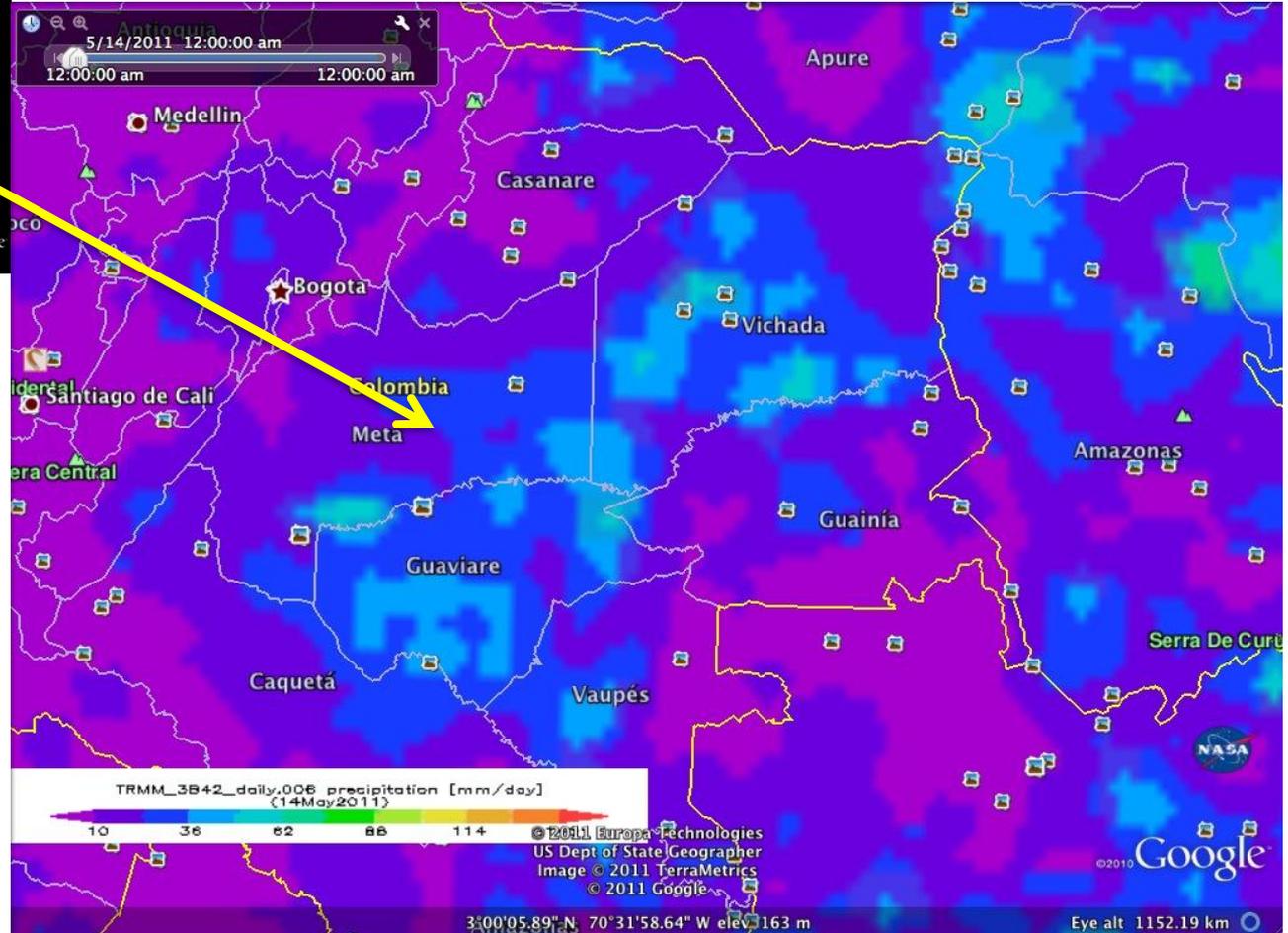
Accumulate Rainfall from TRMM over 13-23 May 2011



Colombia Heavy Rain Event 14 May 2011



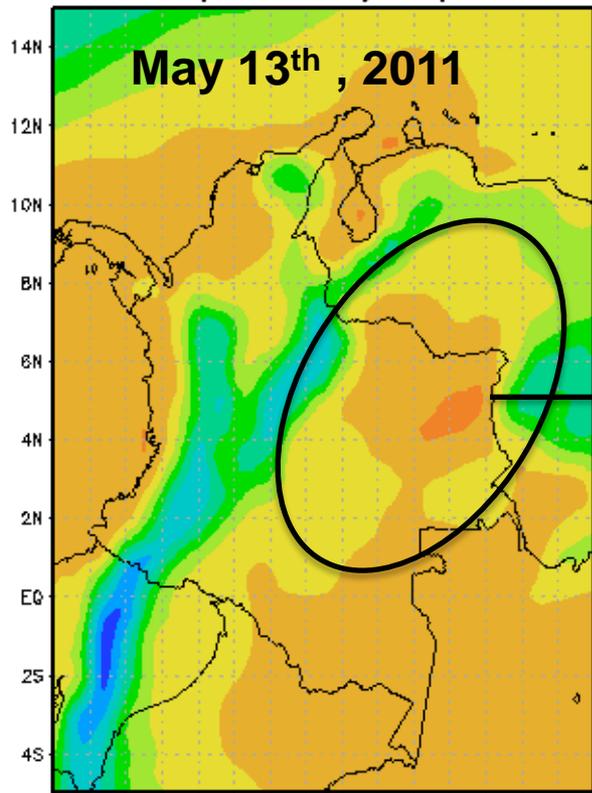
Heavy rainfall
occurred over
central and
eastern
Colombia
on 14 May
2011



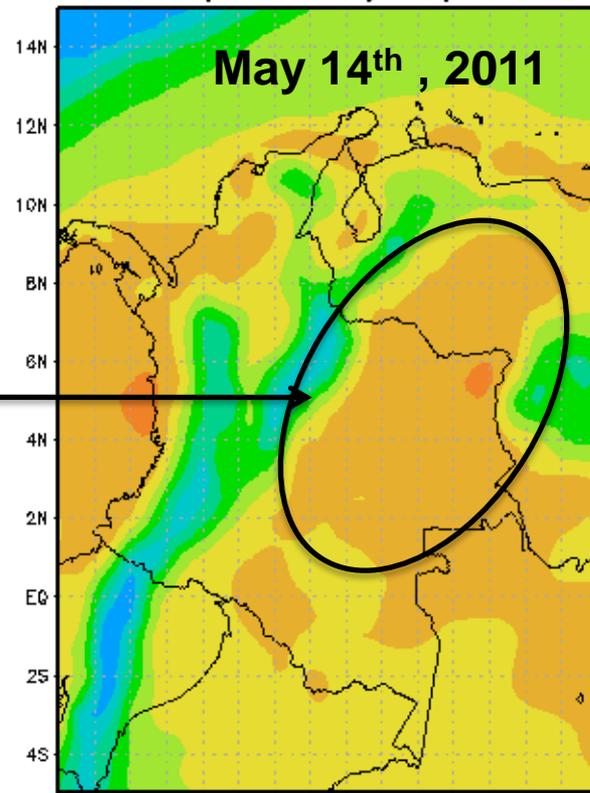
NASA MERRA Model Analysis

Showing an Increase in the Amount of Moisture from the 13th to the 14th of May

MAI1NXINT.5.2.0 Total Q vapor (Total precipitable water) [kg/m2]
(00:00Z 13 May 2011)

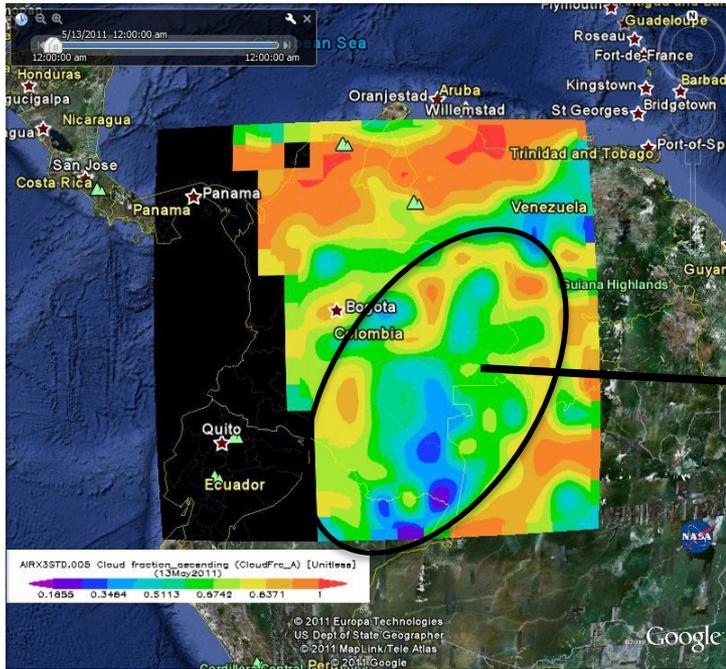


MAI1NXINT.5.2.0 Total Q vapor (Total precipitable water) [kg/m2]
(00:00Z 14 May 2011)



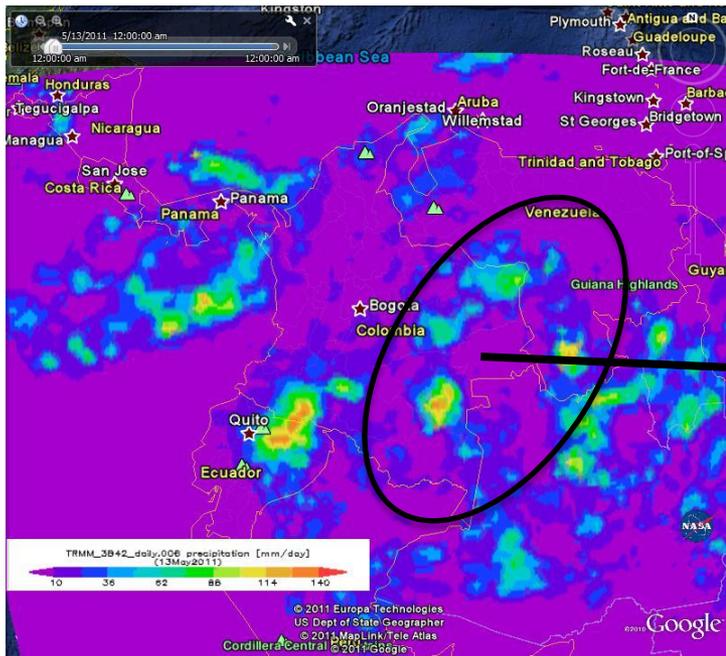
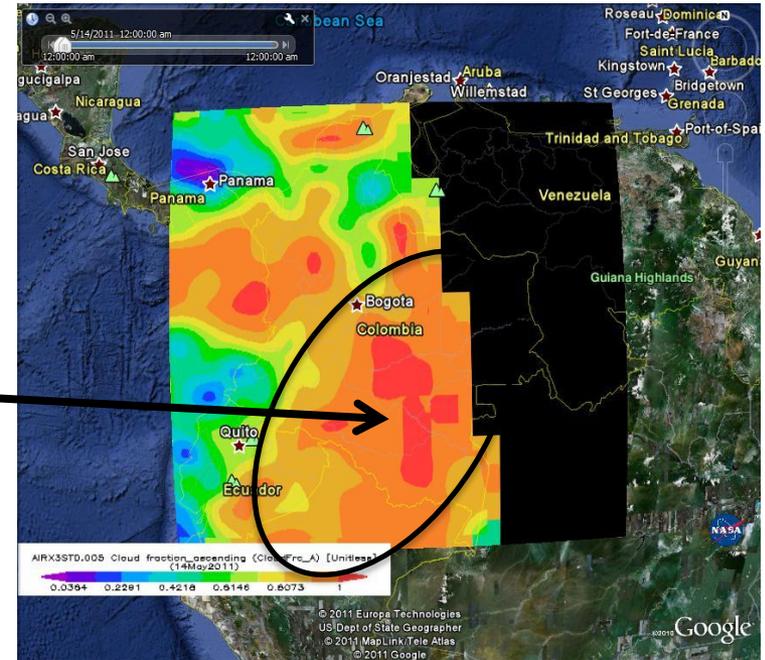
Increase in amount of moisture

May 13th , 2011

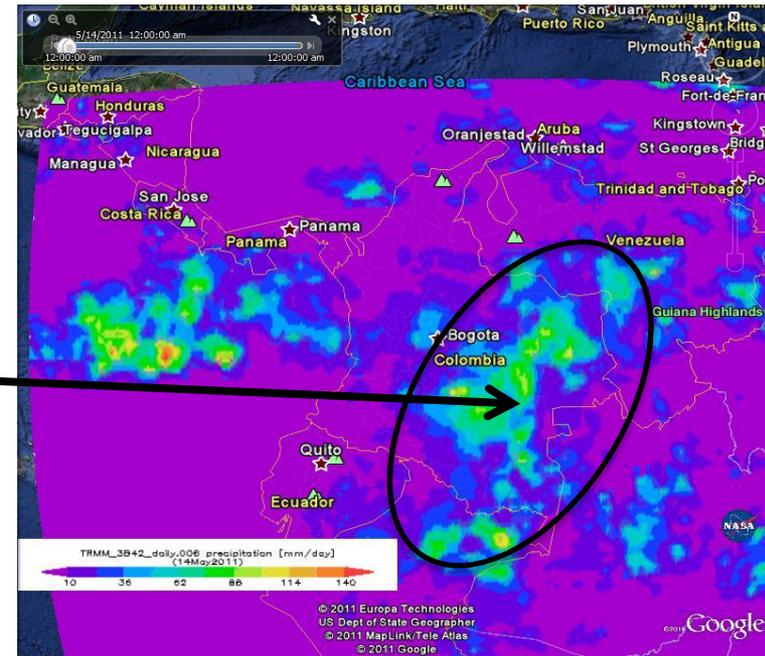


Increase in
cloud cover
as observed
by AIRS

May 14th , 2011

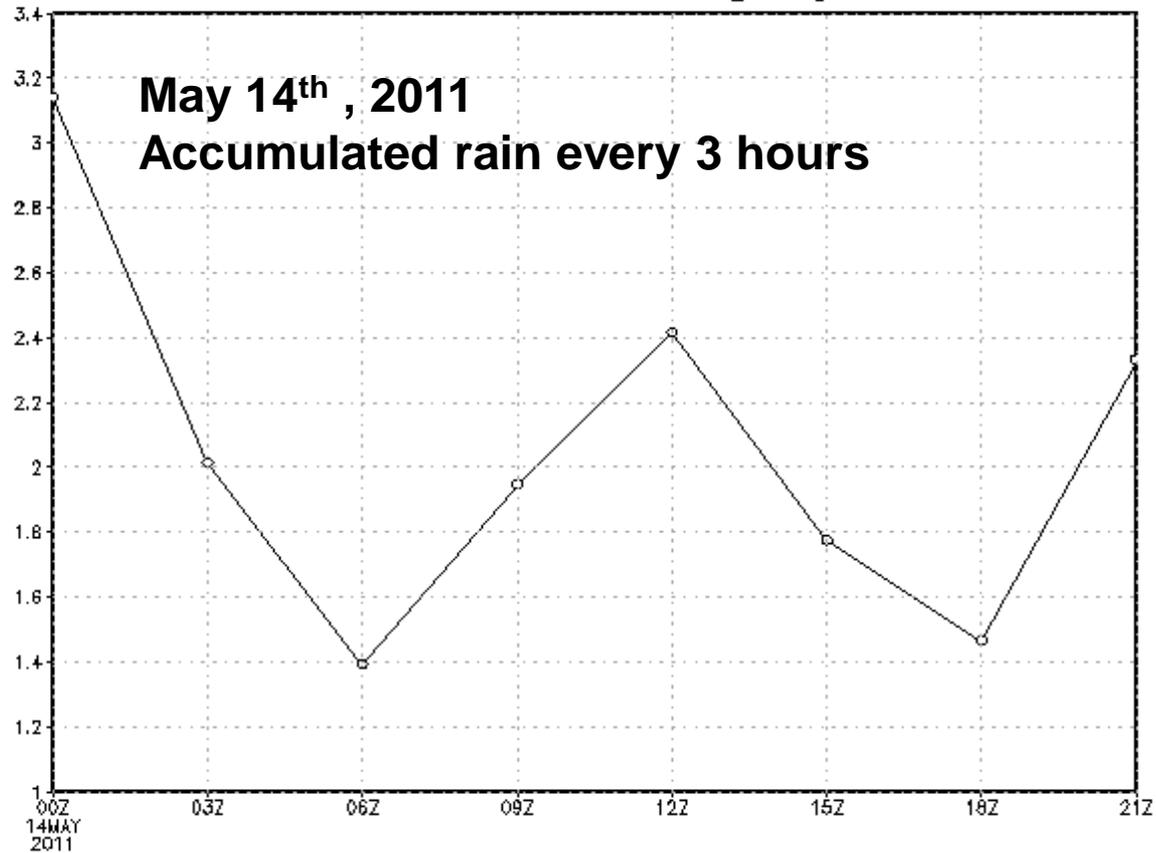


Increase in
Precipitation
amount as
observed by
TRMM



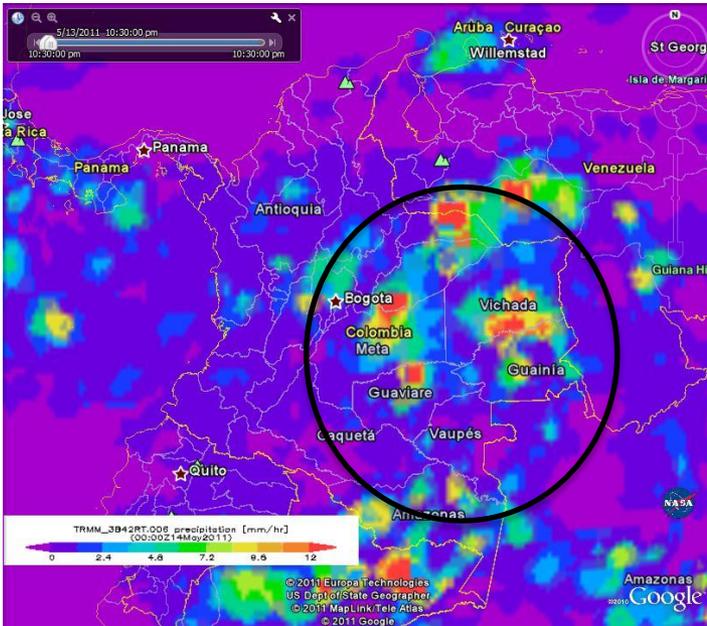
Diurnal Variability of Rainfall

3-hourly TRMM 3B42(V6) (Lat: 5S-15N, Lon: 80W-65W)
Accumulated Rainfall [mm]

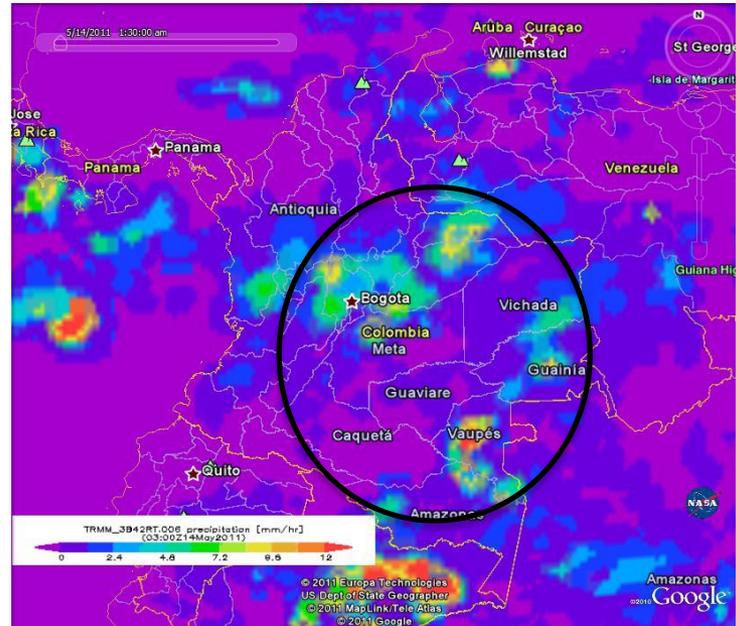


2011-10-27-16:33

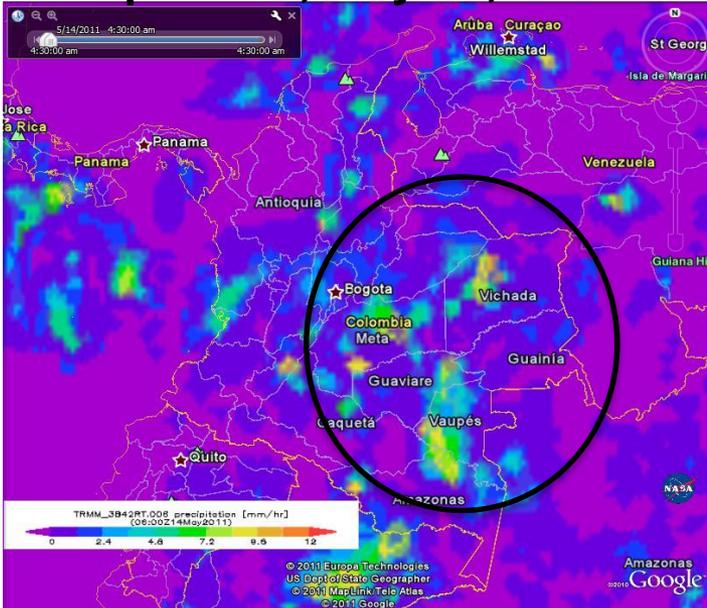
Precipitation, May 14, 00 hours



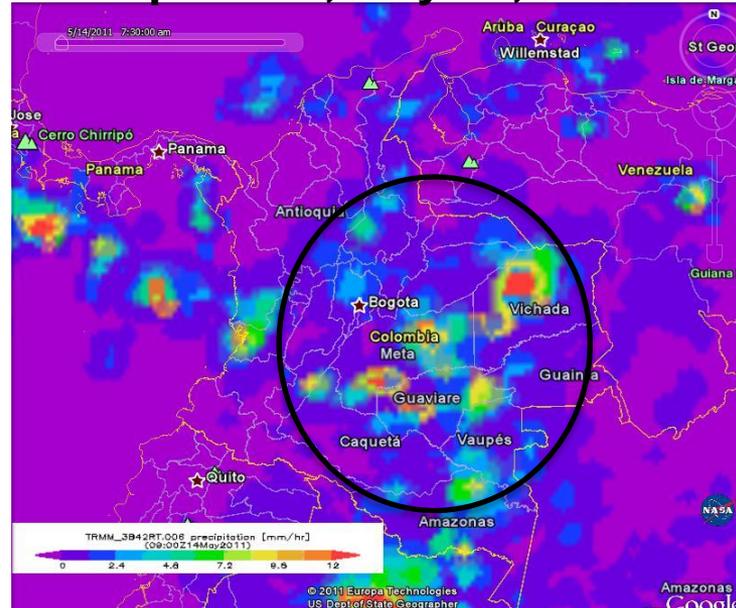
Precipitation, May 14, 03 hours



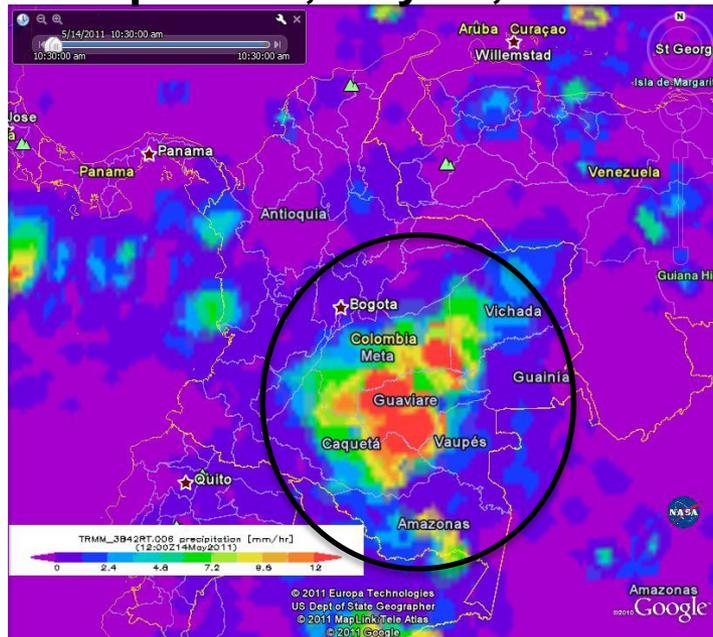
Precipitation, May 14, 06 hours



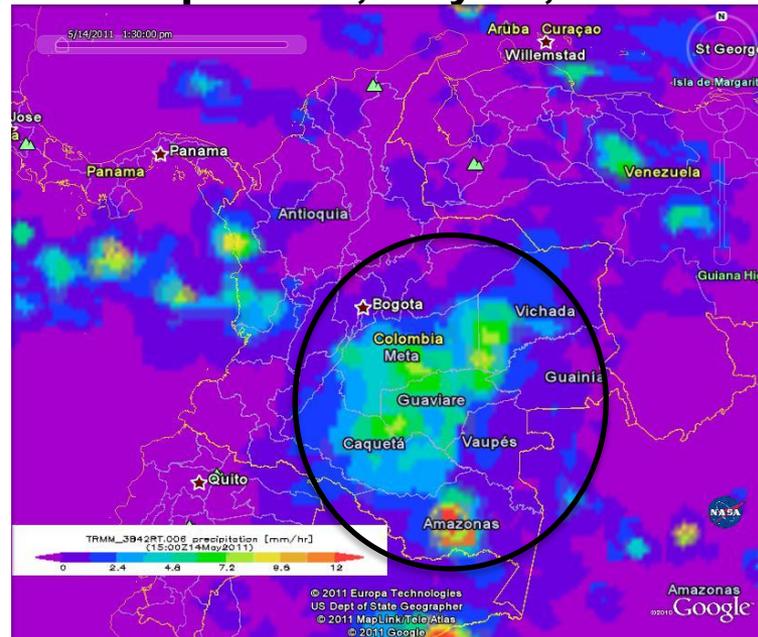
Precipitation, May 14, 09 hours



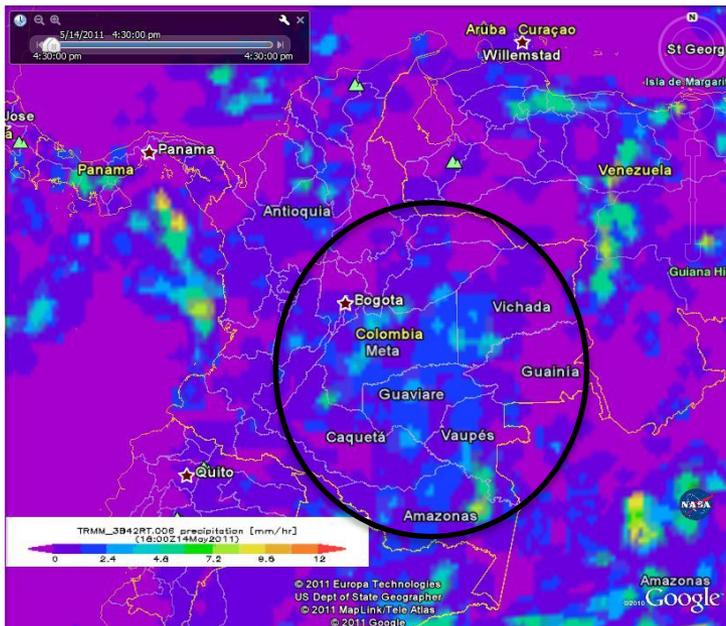
Precipitation, May 14, 12 hours



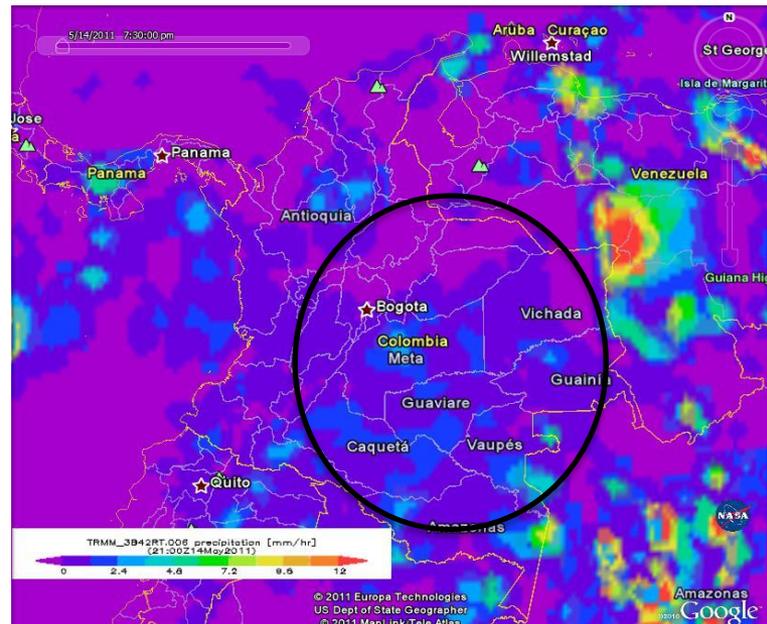
Precipitation, May 14, 15 hours

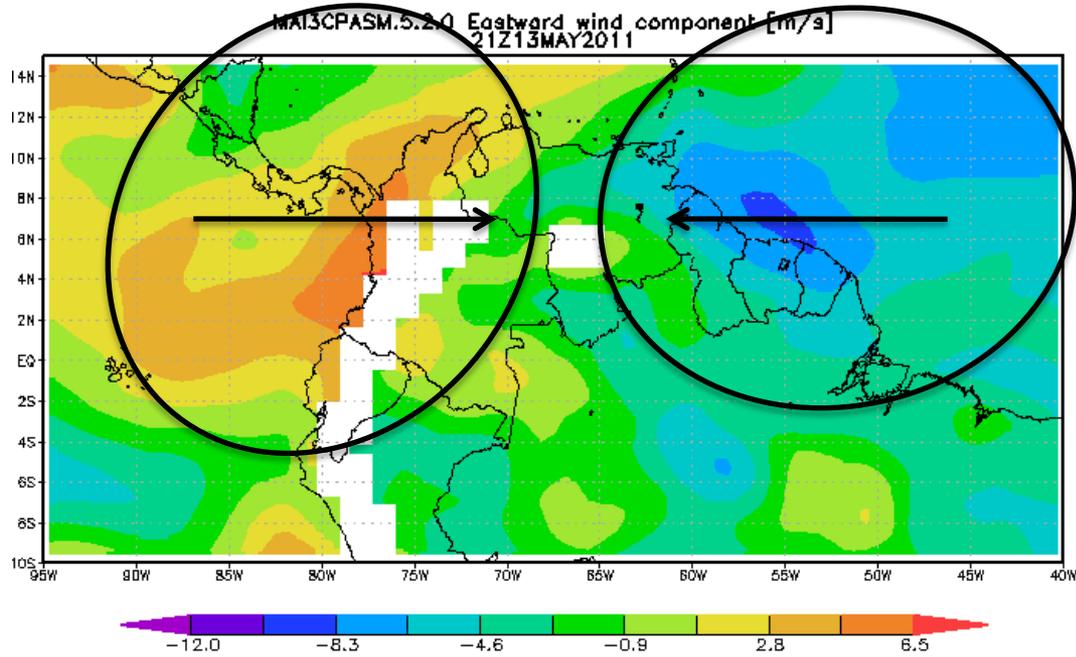


Precipitation, May 14, 18 hours

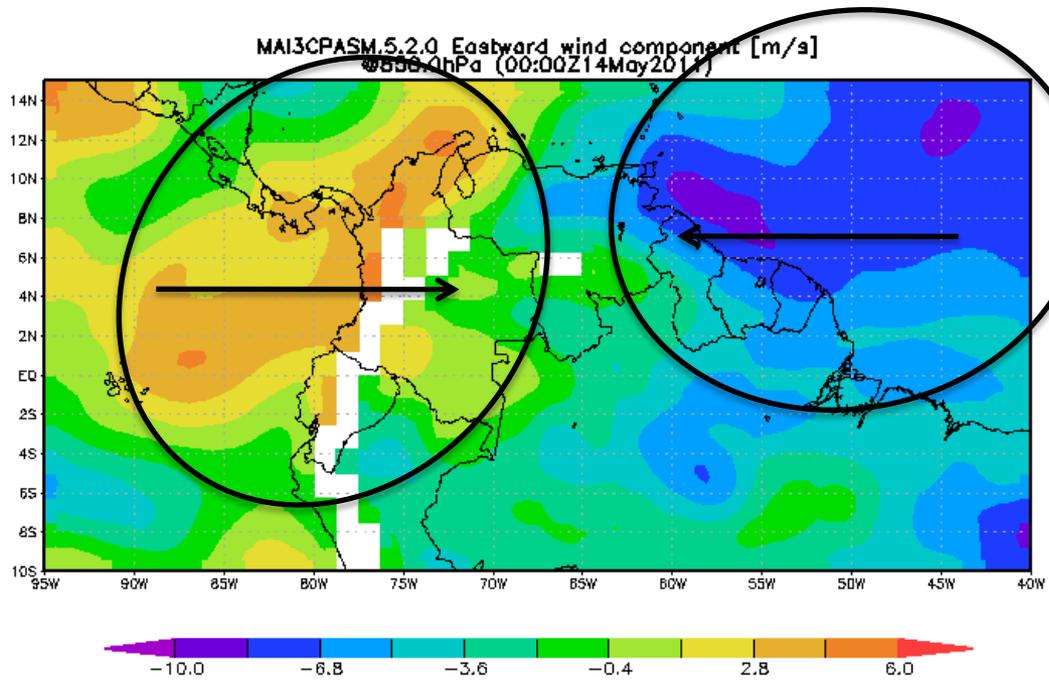


Precipitation, May 14, 21 hours





East-west wind from MERRA at 850 hPa



East-west winds converging over Colombia increase between 21Z on 13 May to 0Z 14 Z likely bringing more moisture that results in heavy rain at 0Z on 14 May

Summary

- Giovanni has helped us in training end-users – where they can visually look at various parameters associated with heavy rainfall events
- An advantage is that end-users can view larger area and in many cases can track a developing event and associated parameters such as clouds, winds etc.
- A student, Allison Joy, from UMD College Parke is helping us in making a catalog of extreme rain events over the US and making pictorial history of surface pressure, winds, moisture, and cloud (fraction and height)
- **A question for the Giovanni Team:** Is it possible to have pixel data in Giovanni at some point in future? For regional applications these data are in more demand than relatively low-resolution gridded data!

Thank You!