

# Activity 2: Analysis of ET and Soil Moisture from GLDAS/NLDAS

NASA Remote Sensing Training  
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**Objective:** Learn data access and analysis of ET and soil moisture from GLDAS and NLDAS. These multi-year data are available at hourly, 3-hourly and monthly time scales and can be used according to your application needs.

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**There are two parts to this exercise:**

- 1) make time mean maps of rainfall, soil moisture, and ET around the Red River basin
- 2) Analyze rainfall, soil moisture, and ET for May 2006 around Red River basin during a flooding event

Go to the home page for Giovanni: <http://giovanni.gsfc.nasa.gov>

## **Part 1a: Time Mean Rainfall Maps**

In the Portal Table select 'Hydrology Portal'

Select '[TRMM Online Visualization and Analysis System \(TOVAS\)](#)'

Go to the section 'TOVAS New Release (2008/09/12)':

Select '[Monthly products \(3B43\\_V6, 3A12\\_V7, and 3A25\\_V7\)](#)'

**Spatial:**

Area of Interest (southern Oklahoma): Enter West: -102 North: 35 South: 33 East: -94 (click on 'Update Map'). Also, click on the second map icon on the right side of the map window ('Display political and coastline as base map')

**Parameters:**

Display: Select 'Data Product Info' and 'Units'

Analysis Options: Select 'Parameter'

Select 'TRMM 3B43 V7(1998/01/01 - 2012/03/31)'

Select 'Accumulated Rain'

**Temporal: (winter season)**

Begin Date: Year 2000 Month 'Jan'

End Date: Year 2011 Month 'Dec'

**Select Visualization:**

Select 'Lat-Lon map, Time-averaged'

Select '**Generate Visualization**'

### **Download the Image on Google Earth**

Click the tab 'Download Data'

Click on the multi-colored icon in the bottom row labeled 'KMZ' (You will be taken to another page)

Click on the link given and open it (This will open the image in Google Maps)

To save images:

Go to 'File', Open the 'Save' tab, then click 'Save Image'

## **Part 1b: Time Mean Soil Moisture and ET Maps**

Go back to Giovanni: <http://giovanni.gsfc.nasa.gov>

Go to 'Hydrology Portal'

Select '[Global Land Data Assimilation System Monthly Data](#)'

### **Spatial:**

Same as in 1a

### **Parameters:**

Display: Select 'Data Product Info' and 'Units'

Under 'GLDAS Version 1' Scroll down to 'GLDAS-1 NOAH Model (1.0x1.0 degree) (1979/01/01 - 2012/04/01)'

Select 'Average layer 1 soil moisture'

Also Select 'Total Evapotranspiration'

### **Temporal: (winter season)**

Begin Date : Year 2000      Month 'Jan'

End Date:      Year 2011      Month 'Dec'

### **Select Visualization:**

Select 'Lat-Lon map, Time-averaged'

Select '**Generate Visualization**'

**Download Both the Images on Google Earth as in part 1a and save the images**

**Answer the following questions:**

Does the region of maximum time-mean soil moisture coincide with time-mean rainfall maximum? How about ET?

## **Part 2a: Rainfall Time Series and Map for a Flood Event**

In the Portal Table select 'Hydrology Portal'

select ['TRMM Online Visualization and Analysis System \(TOVAS\)'](#)

You will see several options for rainfall products

Go to the section 'TOVAS New Release (2008/09/12)':

Select ['Daily TRMM and Other Rainfall Estimates \(3B42 V6 derived\)'](#)

### **Spatial:**

Same as in 1a

### **Parameters:**

Display: Check 'Data Product Info' and 'Units'

Select 'Precipitation'

### **Temporal:**

Begin Date : Year 2006      Month 'May'      Day 1  
End Date:    Year 2006      Month 'May'      Day 31

### **Select Visualization:**

Select 'Time series'

Select '**Generate Visualization**'

**Drag the image on your computer and save**

Note down the days with heavy rainfall

**Click on 'Home' tab at the top left to go back to the Daily TRMM page**

### **Temporal:**

Begin Date : Year 2006      Month 'May'      Day 18  
End Date:    Year 2006      Month 'May'      Day 25

### **Select Visualization:**

Select 'Lat-Lon Map, Time-averaged'

Select '**Generate Visualization**'

Select '**Generate Visualization**'

Select 'Edit Plot Preferences'

Select Mode 'Custom' in the 'Color Bar'

Min Value= 0

Max value=20

Select 'Submit Refinements'

**Download the Image on Google Earth as in part 1a and save the images**

## **Part 2b: Soil Moisture and ET Time Series and Maps for the Flood Event**

Go back to Giovanni: <http://giovanni.gsfc.nasa.gov>

In the Portal Table select 'Hydrology Portal'

select '[North American Land Data Assimilation System \(Hourly Data\)](#)'

### **Spatial:**

Area of Interest: Same as in Part 1a

### **Parameters:**

Display: Select 'Units'

Go down to 'NLDAS-2 NOAH Model (.125x.125 degree) (1979/01/02 – 2012/06/07)'

Select 'Evapotranspiration (Total)'

Select 'Soil moisture content (Top 1 meter, 0-100 cm)'

### **Temporal:**

Begin Date: Year 2006 Month 'May' Day 18 Hour 00

End Date: Year 2006 Month 'May' Day 25 Hour 23

### **Select Visualization:**

Select 'Time series'

Select '**Generate Visualization**'

**Drag the images on your computer and save**

**Answer the following questions:**

1) How does soil moisture over the Red River Basin respond to heavy rainfall? Does ET respond to rainfall in the same way?

2) Why does ET show strong diurnal variations?

**Click on 'Home' tab at the top left to go back to NLDAS page**

**Select Visualization:**

Select 'Lat-Lon Map, Time-averaged'

**Download Both the Images on Google Earth as in part 1a and save the images**

**Answer the following questions:**

Compare the values and patterns of rain, soil moisture, and ET maps for the flood period over the Red River Basin with the time-mean maps obtained in Part 1a.