

## GPM IMERG Data

### Objective:

Analyze, visualize, and download GPM IMERG (Level-3 Gridded) near real-time precipitation data and import into QGIS.

There are three parts to this exercise:

1. Subset and download near real-time GPM IMERG data
2. Analyze time series of IMERG monthly data
3. Import IMERG near real-time data into QGIS.

### Part 1: Subset and Download Near Real-Time GPM IMERG Data

- Download IMERG early data using Giovanni
- Go to: <http://giovanni.gsfc.nasa.gov/giovanni>
- On the Giovanni page you'll see the following options:

The screenshot shows the 'Select Plot' section of the Giovanni interface. It includes several dropdown menus and radio buttons for selecting analysis options. The 'Maps: Time-Averaged' option is selected. Below this, there are sections for 'Select Date Range (UTC)' and 'Select Region (Bounding Box or Shapefile)'. The date range is set from 00:00 to 23:59. The region is set to a bounding box of -180, -90, 180, 90. There are also buttons for 'Show Map' and 'Show Shapes'.

The screenshot shows the variable selection section of the Giovanni interface. It displays 'Number of matching Variables: 0 of 331' and 'Total Variable(s) included in Plot: 0'. There is a 'Keyword' search box with 'Search' and 'Clear' buttons.

<b>Select Plot</b>	Allows selection of analysis options
<b>Select Date Range</b>	Allows selection of time period
<b>Select Region (Bounding Box or Shapefile)</b>	Allows selection of a geographic region (by latitude-longitude, by map, or by shapefiles)
<b>Keyword</b>	Search data parameter by keyword
<b>Plot Data (bottom right – not pictured above)</b>	Make desired plot

- Enter the following options:
- **Select Plot:** Maps: Accumulated
- **Select Region (Bounding Box or Shapefile):** Click on **Show Shapes** and select **Countries**, 'Brazil'

- Scroll down to **Keyword** (center of the page)
  - Type 'IMERG Early' (for more data options type 'GPM' or 'IMERG'). Click **Search**
- Under **Variable** select the box for 'Multi-satellite precipitation with climatological gauge calibrated – Early Run' data
- **Select Date Range (UTC)**: Using the calendar select the most current day or any time of your interest. This example shows data for 12 June 2016.
- Click on **Plot Data** (on the bottom right)
  - You will get a plot of accumulated rain for the selected day/period
- Explore **Options** (on the top right of the map) to change colors, and **Re-Plot** if you wish
- Choose **Downloads** from **History** on the right-most side of the window
- You will see IMERG data files for the region and time you selected in
  1. NetCDF format (.nc)
  2. Geotiff
  3. .png image
- These files can be downloaded and saved by clicking on them
- Click and save GeoTIFF and NetCDF files on your computer to import into QGIS

## Part 2: Explore Time Series Analysis Options Using IMERG Monthly Data

- Click on **Back to Data Selection** on the bottom right
- Enter 'IMERG' in the **Keyword** box and click **Search**
- You will see a list of IMERG products
- Select **Merged satellite-gauge precipitation estimate – Final Run (recommended for general use)** with Temp. Res.: Monthly. Also unselect the near real-time data selected in Part 1.
- Select **Units** to be **mm/month**
- In the **Select Plot** section at the top, go to **Time Series** and choose **Area-Averaged**
- Set the **Select Date Range** from 2014-04 to 2016-01 (April 2014 to January 2016)

Select Plot

Maps: Select... Comparisons: Select... Time Series: Area-Averaged Vertical: Select... Miscellaneous: Select...

Select Date Range (UTC) Select Region (Bounding Box or Shapefile)

YYYY-MM HH:mm Format: West, South, East, North

2014 -04 -01 00 :00 to 2016 -01 -31 23 :59 Countries : Brazil Show Map Show Shapes

Valid Range: 2014-04-01 to 2016-01-31

Select Variables

Number of matching Variables: 0 of 1404 Total Variable(s) Included in Plot: 1

Keyword :  Search Clear

Variable	Source	Temp. Res.	Spat. Res.	Begin Date	End Date	Units
<input checked="" type="checkbox"/> Merged satellite-gauge precipitation estimate - Final Run (recommended for general use) (GPM_3IMERGM_v03)	GPM	Monthly	0.1 °	2014-04-01	2016-01-31	mm/month

- Click on **Plot Data** on the bottom right
- You will get the time series of monthly precipitation averaged over Brazil

### Part 3: Import IMERG Precipitation into QGIS


- Open QGIS on your computer
- From the top bar click on **Web**, select **OpenLayers plugin**, and select a background map (this exercise uses **OpenStreetMap**)
- Zoom in to Brazil

QGIS Project Edit View Layer Settings Plugins Vector Raster Database Web Processing Window Help

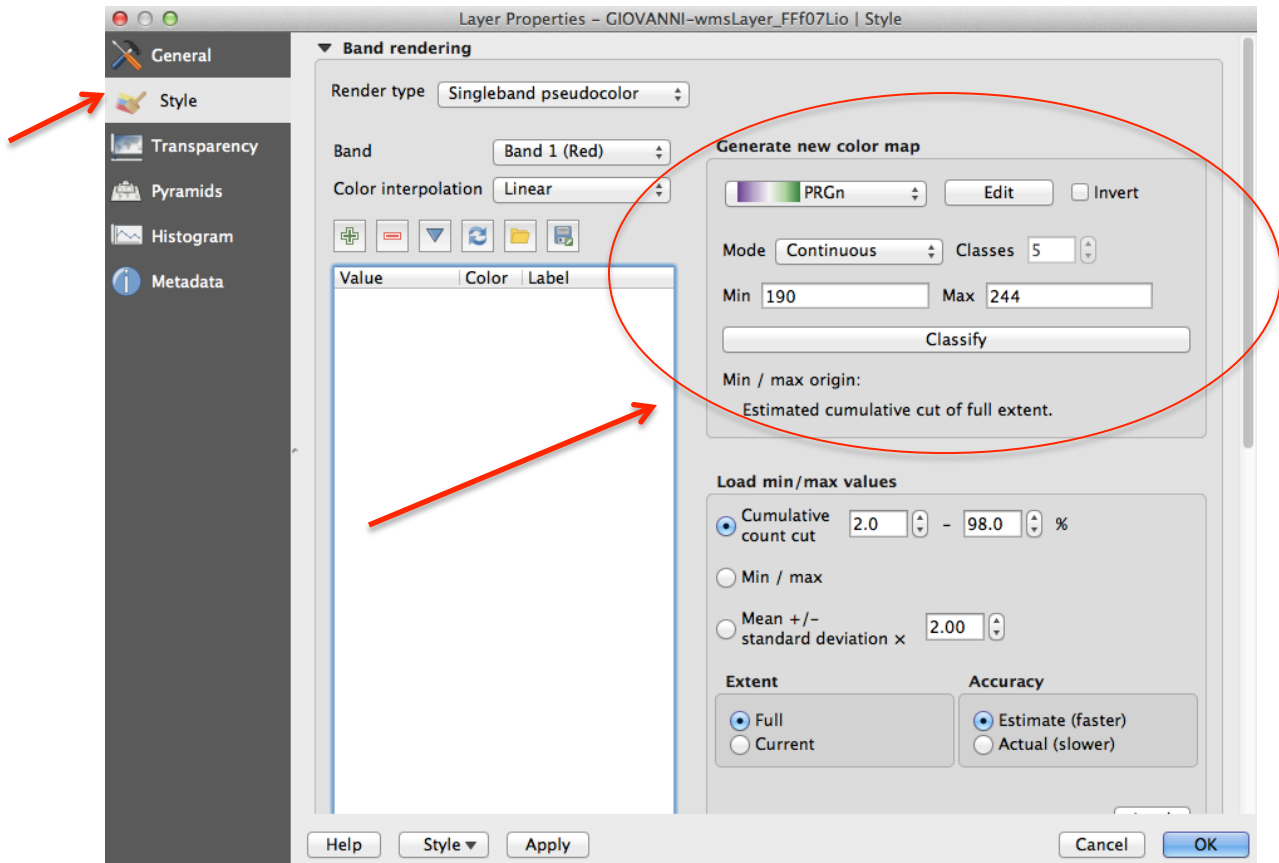
MetaSearch yon

OpenLayers plugin

- OpenLayers Overview
- Terms of Service / About
- OpenStreetMap
- Google Maps
- Bing Maps
- MapQuest
- OSM/Stamen
- Apple Maps

- Import the IMERG data using the **Add Raster Layer** button 
- Select the .nc file you saved on your computer in Part 1
  - If a 'Coordinate Reference System Selector' dialogue box pops up, click cancel
- Click on **Layer** on the top bar and select **Properties** to edit the map visualization and analyze
- From the left side of the menu, select **Style**

- In **Render Type** select **Singleband pseudocolor**
- Choose color table from **Generate new color map**
- Choose **Mode** as **Continuous** or **Equal Interval**
- Click on **Apply** and **OK**



- Finally, from the left side menu select **Transparency** and choose the appropriate % value of transparency to see the OpenStreetMap under the precipitation layer
- You will get the precipitation map as shown below
- Repeat the same steps to import Geotiff into QGIS



**Questions: Based on Above Exercise**

1. From the rainfall map, which part of Brazil has the maximum rain for the day you selected (approximate latitude-longitude or region name)? What is the amount of maximum rain observed?
2. From the time series map:
  - a. Of the past three years, which year/month received the most amount of rain? How much?
  - b. Generally, which season received the most rain every year?