GPM IMERG Data

Objective:

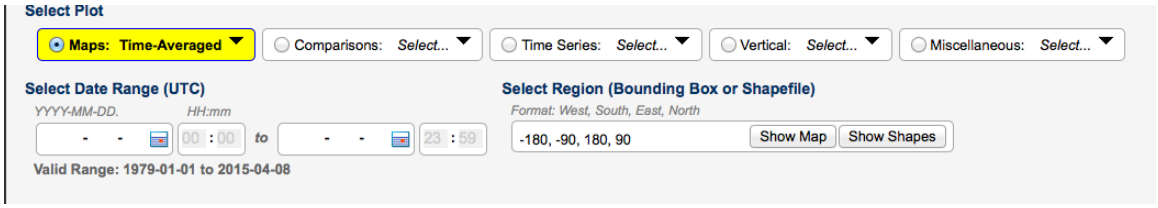
Analyze, visualize, and download GPM IMERG (Level-3 Gridded) near real-time precipitation data and import into QGIS.

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:



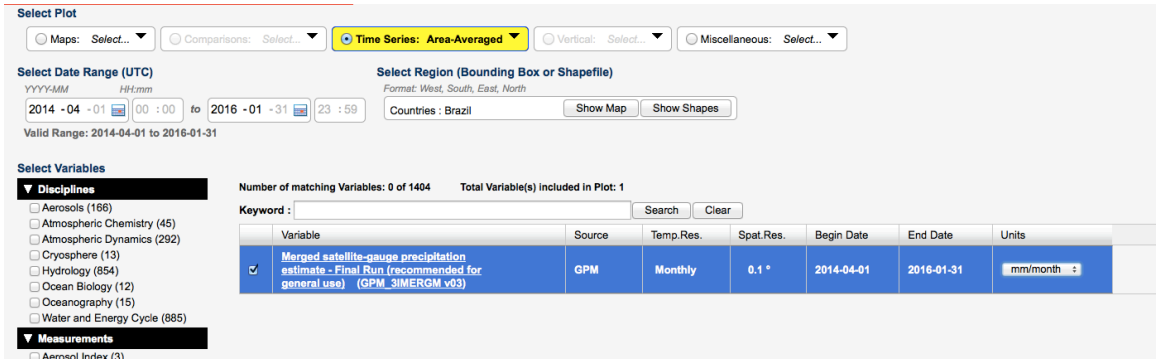
Select Plot	Allows selection of analysis options
Select Date Range	Allows selection of time period
Select Region (Bounding Box or Shapefile)	Allows selection of a geographic region (by latitude-longitude, by map, or by shapefiles)
Keyword	Search data parameter by keyword
Plot Data (bottom right – not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

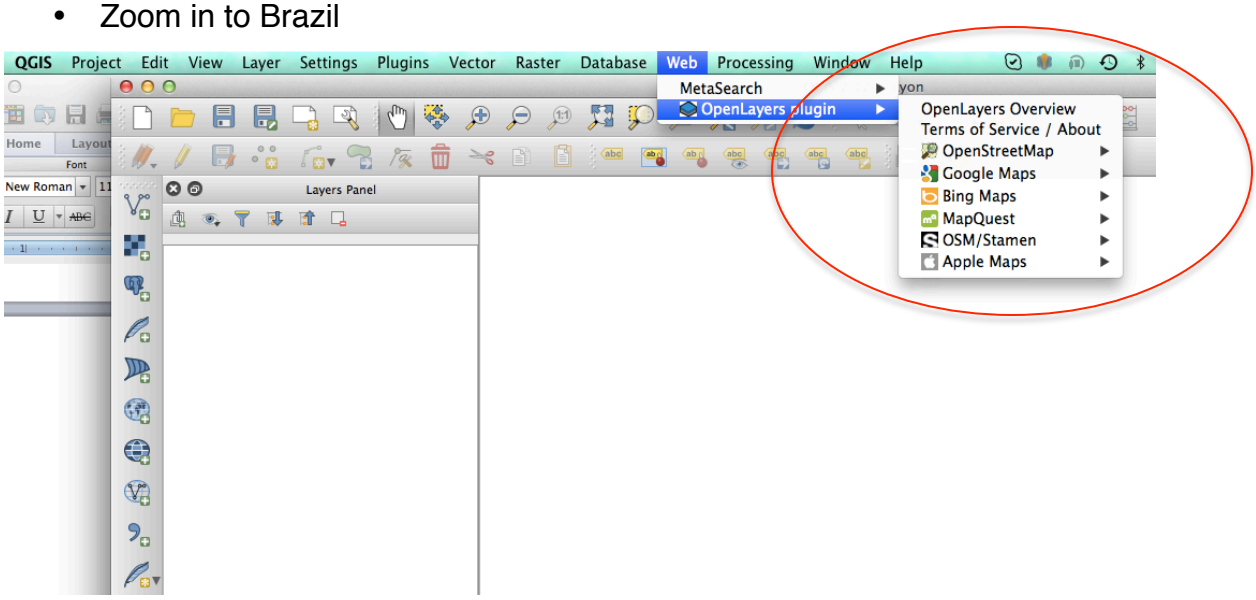
- Click on **Back to Data Selection** on the bottom right
- Enter 'IMERG' in the **Keyword** box and click **Search**
- You will see a list of IMERG products
- Select **Merged satellite-gauge precipitation estimate – Final Run (recommended for general use)** with Temp. Res.: Monthly. Also unselect the 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)



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

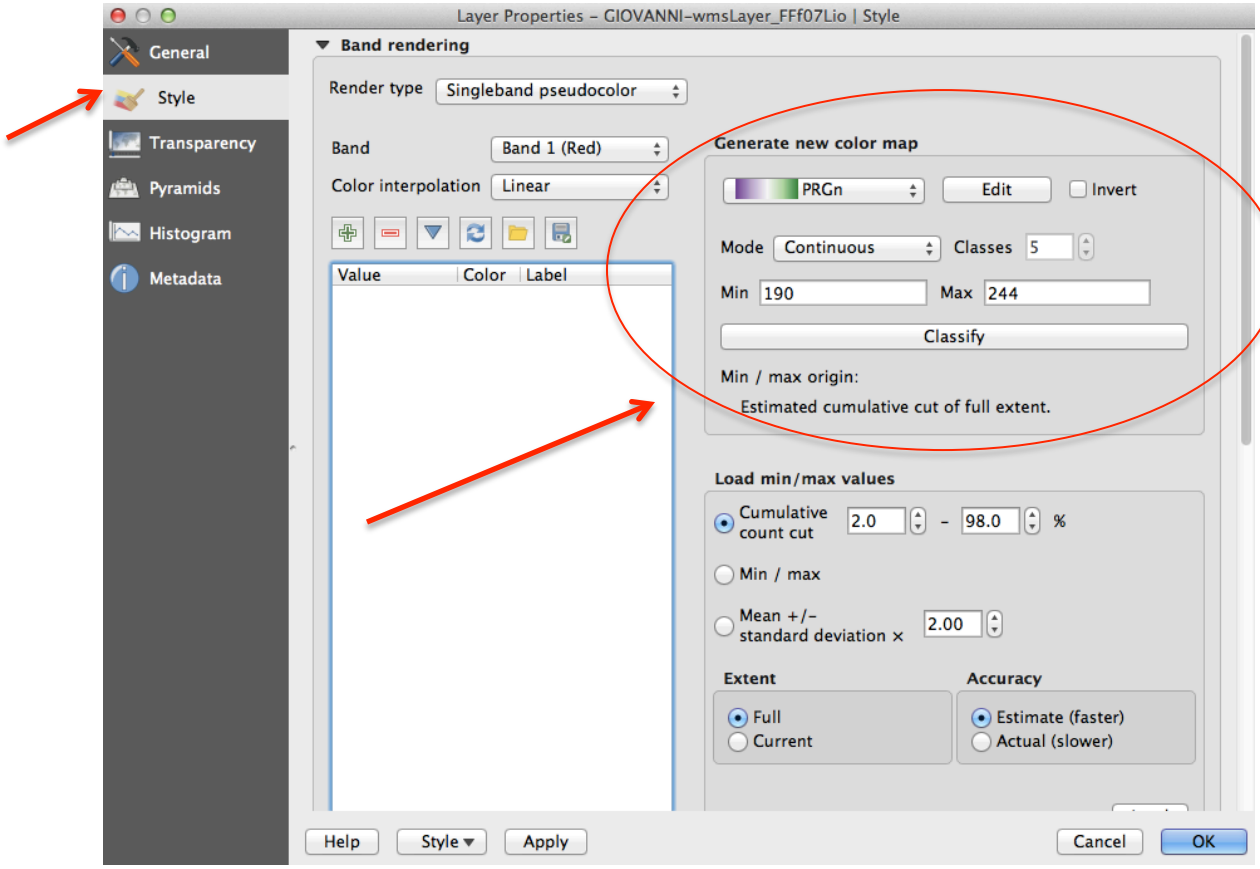
Part 3: Import IMERG Precipitation into QGIS

- 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

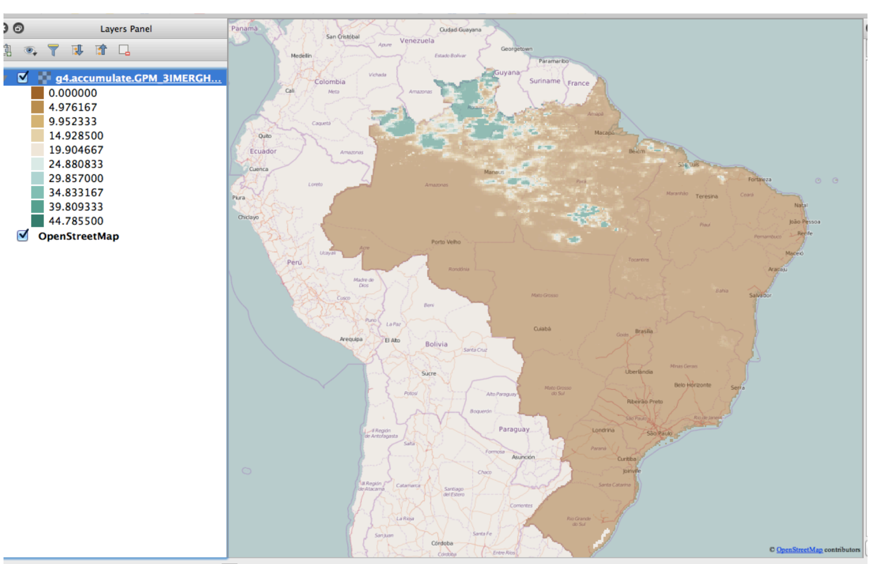


- Import the IMERG data using the **Add Raster Layer** button 
- Select the .nc file you saved on your computer in Part 1
  - If a 'Coordinate Reference System Selector' dialogue box pops up, click cancel
- Click on **Layer** on the top bar and select **Properties** to edit the map visualization and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


Layers Panel
g4.accumulate.GPM_3IMERGH...
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9.952333
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39.809333
44.785500
OpenStreetMap
Venezuela
Colombia
Ecuador
Peru
Bolivia
Paraguay
Guyana
Suriname
France
Brasília
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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?