

CIE5401

# Getting Started on Assignment 2

Susan Steele-Dunne

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You're going to download Level 3 data from the GPM mission:

The screenshot shows a web browser window with the URL <https://pmm.nasa.gov/data-access/downloads/gpm>. The page is titled "PRECIPITATION MEASUREMENT MISSIONS". The navigation bar includes links for Home, GPM (which is highlighted), TRMM, Science, Applications, Meetings, Data Access, Resources, and Education. On the left, there's a sidebar for "Data Access" with sections for Training, Data Tutorials, Extreme Weather News, Data Downloads & Documentation (with GPM selected), Data Visualization (with Global Viewer selected), Data Sources, Using the PPS FTP, Data News, and Data FAQ. A "Connect With Us" section is also present. The main content area is titled "GPM Data Downloads" and contains a note about registering for email. It features tabs for Level 3, Level 2, Level 1, and Related Datasets. A description of Level 3 data is provided, along with a callout for the IMERG dataset. A detailed explanation of the IMERG algorithm is given, mentioning its purpose of intercalibrating, merging, and interpolating satellite microwave precipitation estimates.

Secure | <https://pmm.nasa.gov/data-access/downloads/gpm>

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# PRECIPITATION MEASUREMENT MISSIONS

Home GPM TRMM Science Applications Meetings Data Access Resources Education

## Data Access

- Training
- Data Tutorials
- Extreme Weather News
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  - GPM
  - TRMM
  - Ground Validation
- ▼ Data Visualization
  - Global Viewer
  - Precipitation and Applications Viewer
  - NASA Worldview
- Data Sources
- Using the PPS FTP
- Data News
- Data FAQ

## GPM Data Downloads

\* Use of the PPS FTP and STORM requires you to first register your email address. [Click here to register.](#)

**Level 3    Level 2    Level 1    Related Datasets**

Geophysical parameters that have been spatially and/or temporally resampled from Level 1 or Level 2 data.

IMERG: Rainfall estimates combining data from all passive-microwave instruments in the GPM Constellation

This [algorithm](#) is intended to intercalibrate, merge, and interpolate “all” satellite microwave [precipitation](#) estimates, together with microwave-calibrated infrared ([IR](#)) satellite estimates, precipitation gauge analyses, and potentially other precipitation estimators at fine time and space scales for the [TRMM](#) and GPM eras over the entire globe. The system is run several times for each observation time, first giving a quick estimate and successively providing better estimates as more data arrive. The final step uses monthly gauge data to create research-level products.

To download the data, you first need to register:  
(you just need an email address!)

The screenshot shows a web browser window with the following details:

- Address Bar:** Secure | <https://pmm.nasa.gov/data-access/data-sources#register>
- Header:** National Aeronautics and Space Administration | GODDARD SPACE FLIGHT CENTER
- Title:** PRECIPITATION MEASUREMENT MISSIONS
- Navigation Bar:** Home, GPM, TRMM (highlighted), Science, Applications, Meetings, Data Access, Resources, Education
- Left Sidebar (Data Access):**
  - Training
  - Data Tutorials
  - Extreme Weather News
  - Data Downloads & Documentation**
    - GPM
    - TRMM
    - Ground Validation
  - Data Visualization**
    - Global Viewer
    - Precipitation and Applications Viewer
    - NASA Worldview
  - Data Sources**
    - Using the PPS FTP
    - Data News
    - Data FAQ
- Main Content (Data Sources):**

This section outlines the primary sources for downloading GPM and TRMM precipitation data from archive sites at Goddard Space Flight Center, including basic instructions for using each source.

**NOTE: Use of the PPS FTP and STORM requires you to first register your email address. Click here to register.**

  - FTP (PPS)
  - STORM
  - Mirador
  - Giovanni (GES DISC)
  - OPeNDAP
  - FTP (GES DISC)
  - GrADS Data Server (GDS)
  - GPM Ground Validation Data Portal
- Right Sidebar (QUICK DATA LINKS):**
  - TRMM Downloads
  - GPM Downloads
  - Precipitation Processing System (PPS) Home
  - GES DISC Home
  - Giovanni TOVAS Data Viewer
- Right Sidebar (KEYWORDS):**
  - [data](#)
  - [GPM](#)
  - [TRMM](#)
  - [downloads](#)
  - [PMM Science Team](#)
- Bottom Navigation:** Connect With Us, Precipitation Processing System (PPS) FTP, [pmm.nasa.gov](https://pmm.nasa.gov), SHARE THIS ARTICLE



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# PRECIPITATION MEASUREMENT

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GPM

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## Data Access

Extreme Weather News

▼ Data Downloads &  
Documentation

TRMM

GPM

Ground Validation

Data Sources

Data Recipes

Data News

Google Earth

NASA Worldview

**Using the PPS FTP**

Training

Data FAQ

## Connect With Us



Twitter

## Using the PPS FTP

Use of the PPS FTP to download GPM and TRMM data is free, but **you are required to first register your email address**. This allows the PPS to track usage statistics and send useful messages about the satellite and data availability. Once you have registered and verified your email address, return to this page to continue to the FTP to download data.

**Click Here To Register**

I Have Already Registered -  
Continue to the PPS FTP

Now you can  
continue to the data



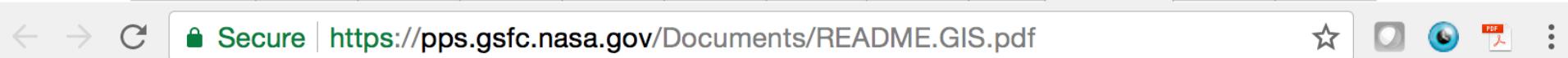
Check this box if you have already registered  
and don't want to see this page again (requires cookies, this will only be used  
to remember your choice on this page)

### Important Notes:

- Once registered, **your email address will serve as both your username AND password for logging into the FTP site**. Email addresses



**Make sure to download the .tif file *AND* the .tfw file!**



## **The IMERG multi-satellite precipitation estimates reformatted as 2-byte TIFF files for display in a Geographic Information System (GIS)**

The Precipitation Processing System at NASA Goddard, <http://pps.gsfc.nasa.gov>

Written by Owen.Kelley@nasa.gov

Updated on 20 June 2017



### **2.2. The importance of downloading WorldFiles**

Each IMERG GIS grid is stored in a separate TIFF file. A TIFF file has a \*.tif file extension. For GIS software to properly display the TIFF file, download from PPS the \*.tfw WorldFile metadata file whose basename matches the TIFF file. The basename is the portion of the filename that appears before the \*.tif or \*.tfw filename extension. A WorldFile is a small ASCII text file that contains geographic metadata (Wikipedia 2015). The \*.zip compressed files on the PPS FTP contains pairs of TIFF and WorldFile files.

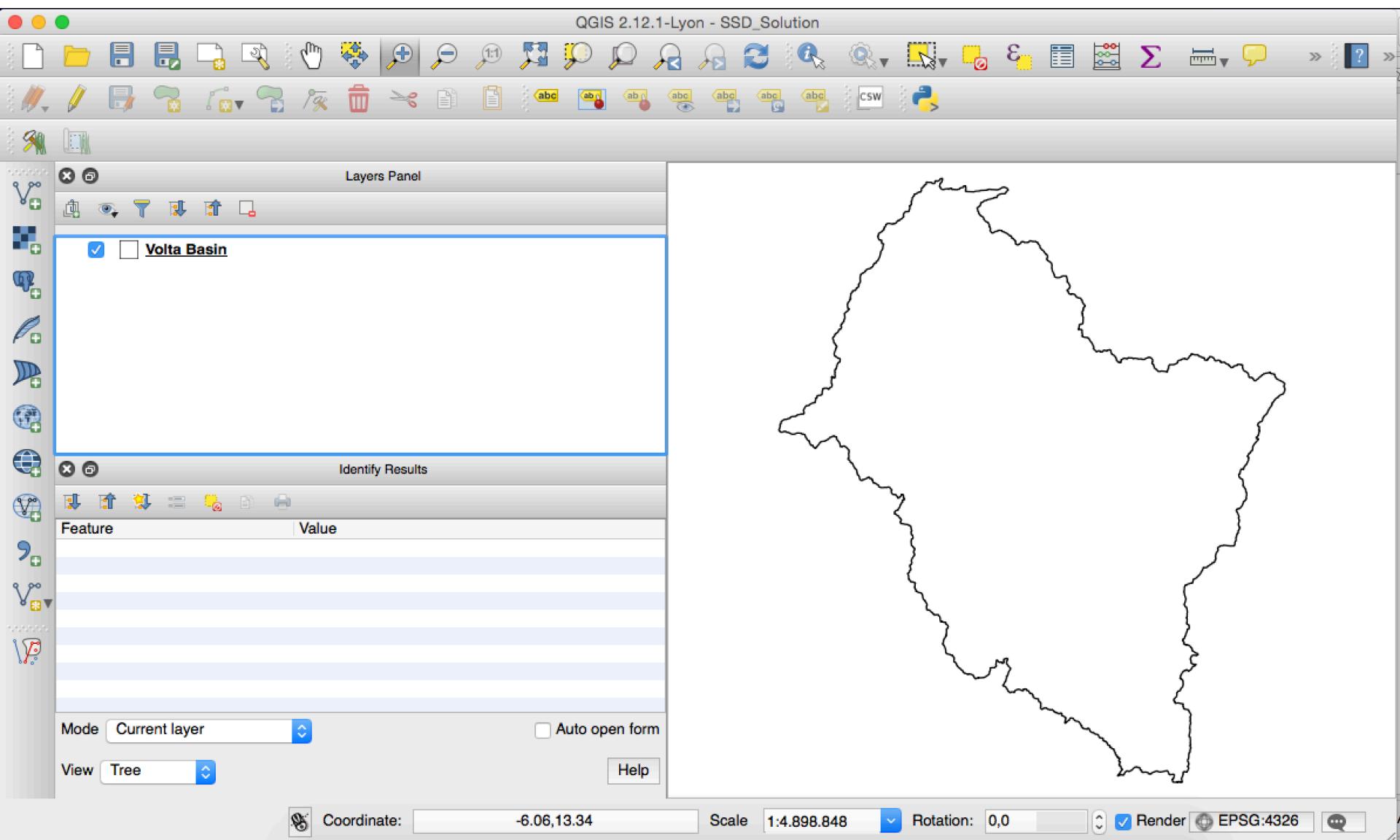


I had a huge number of problems registering and accessing the data in the last few days, so I have put a zip file on brightspace.

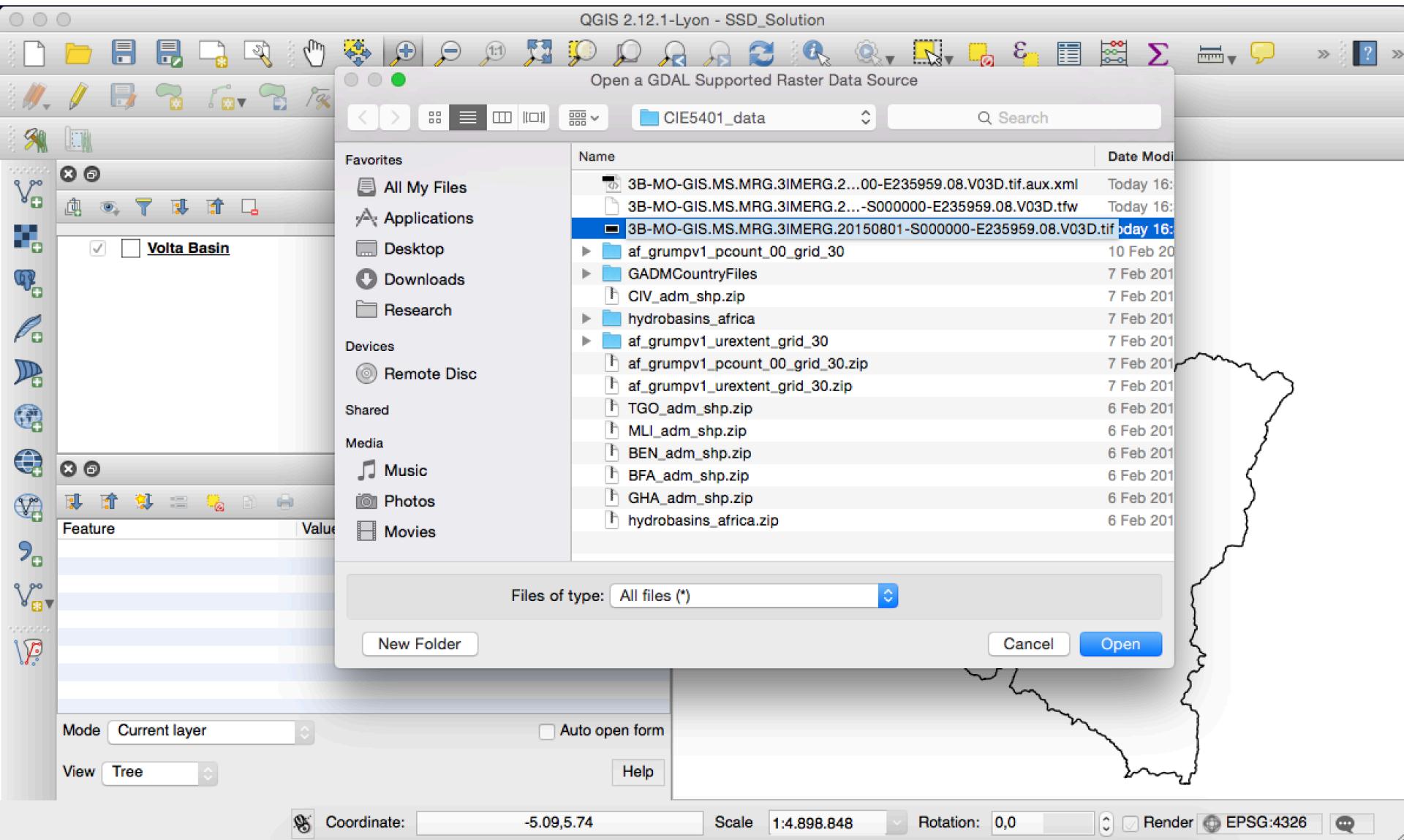
It is called GPM\_data.zip.

At the end of this document, there is a

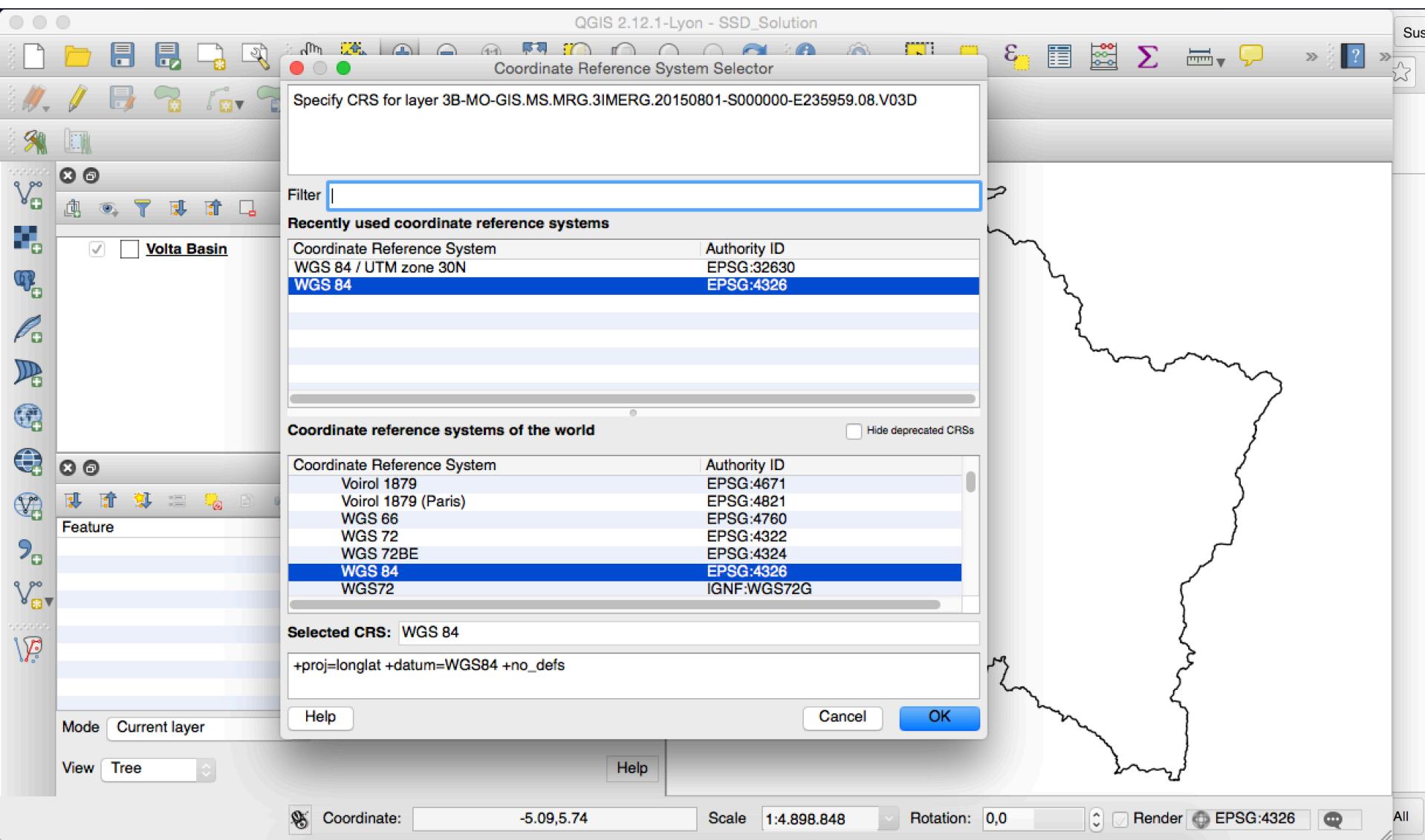
Start a new project in EPSG 4326 (i.e. degrees)  
Add your Volta basin outline from Assignment 1



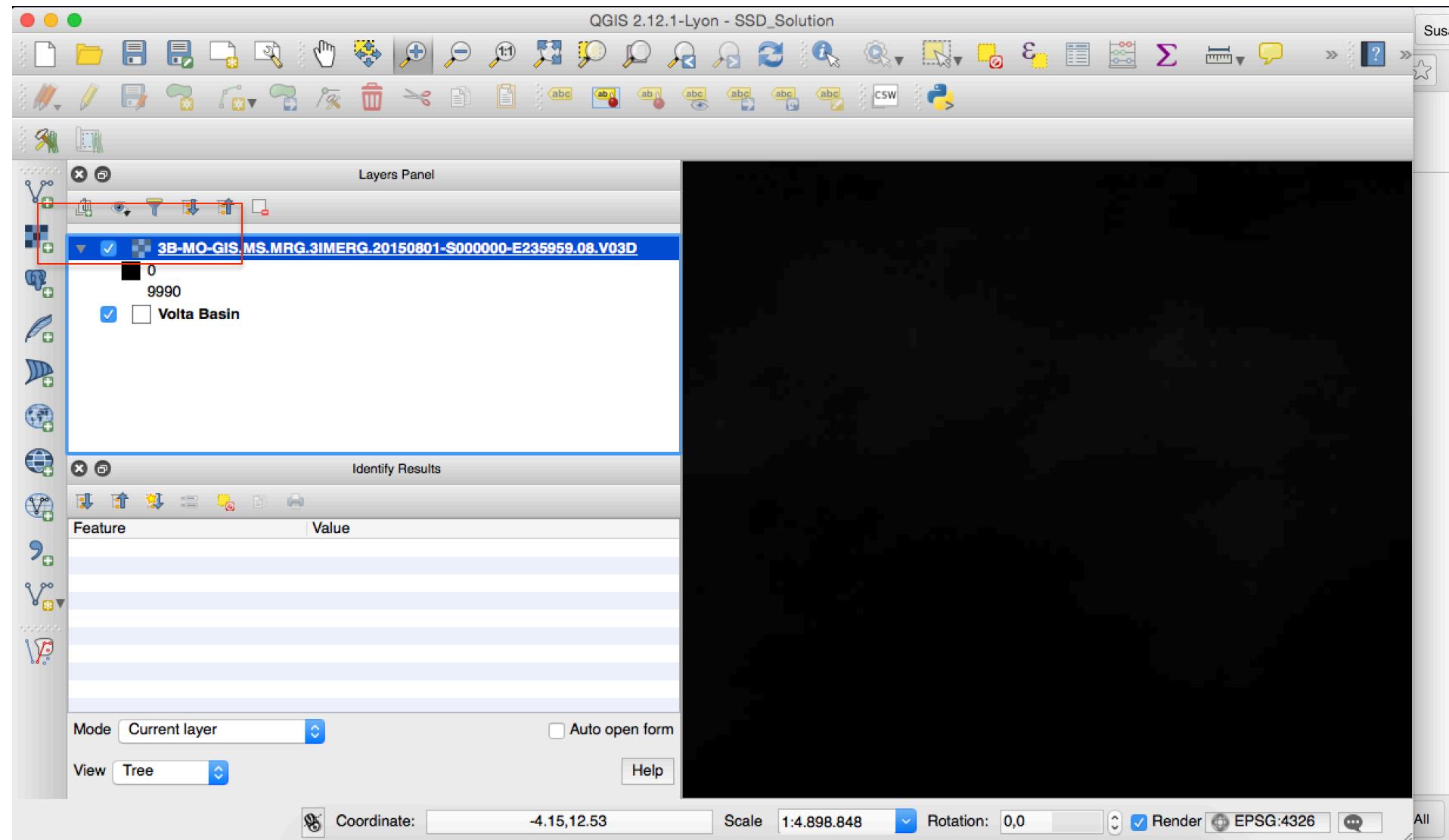
# Add your monthly precipitation raster for August 2015:



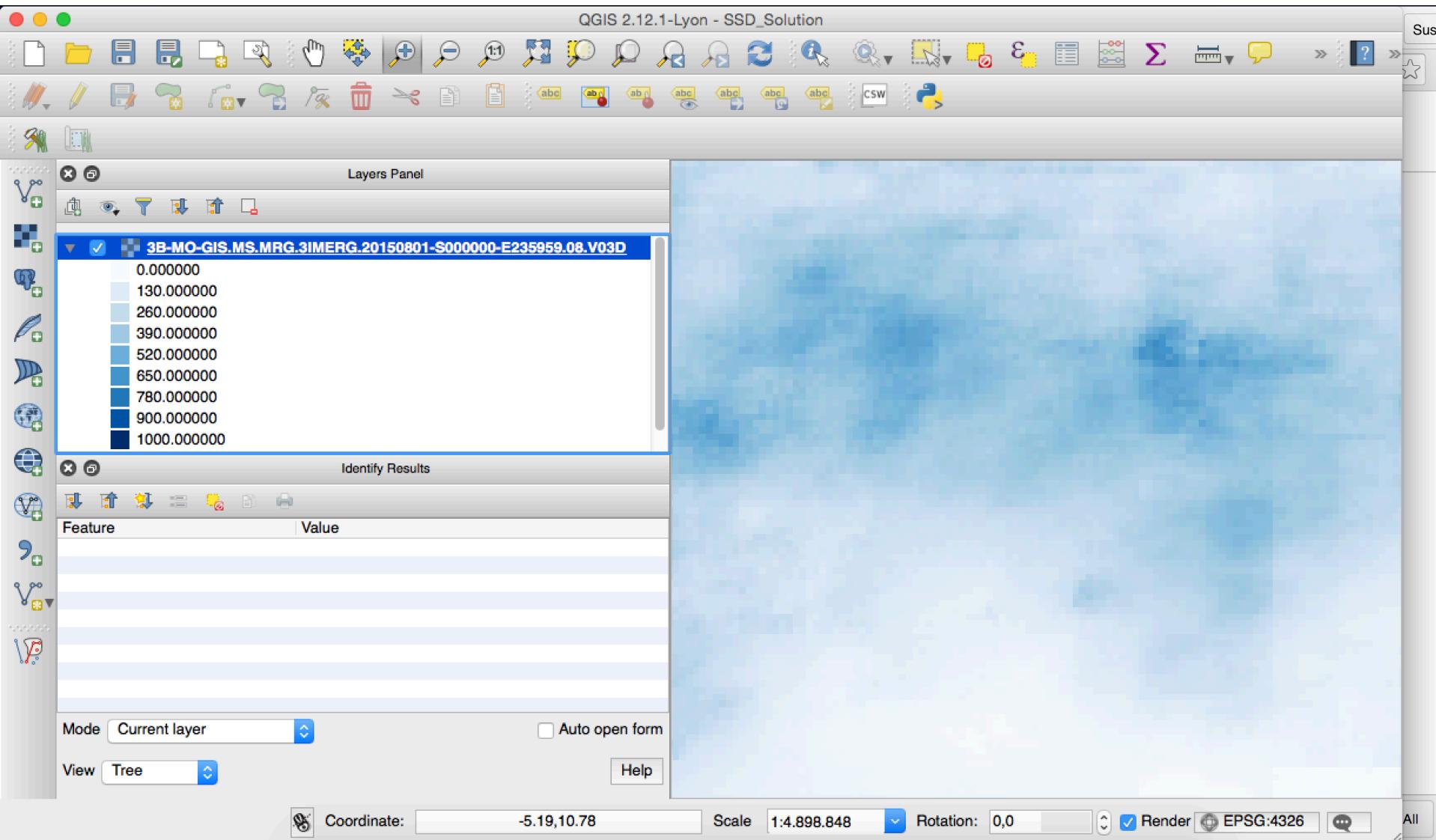
# The default CRS (EPSG 4326) is correct.



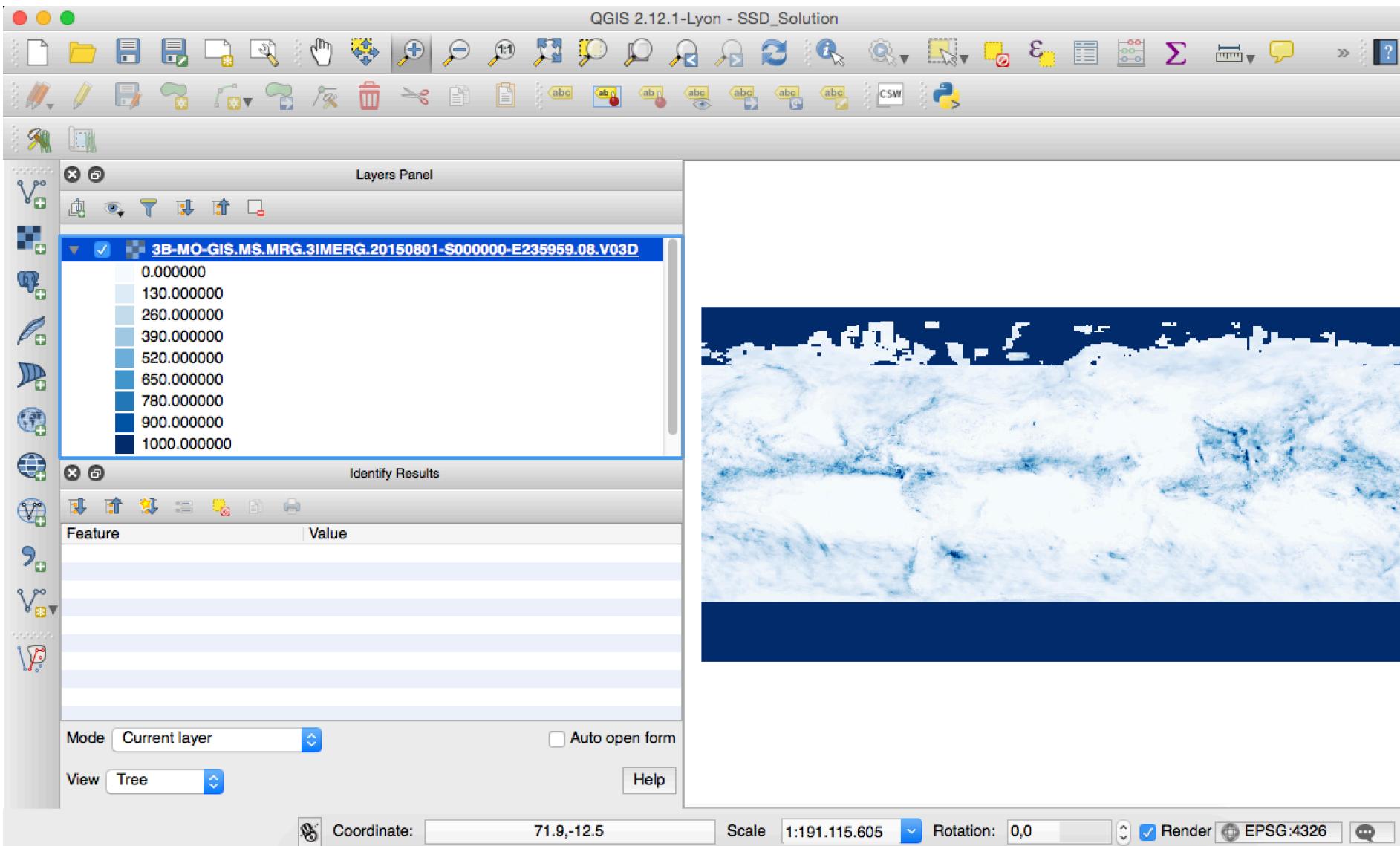
It will look like this:



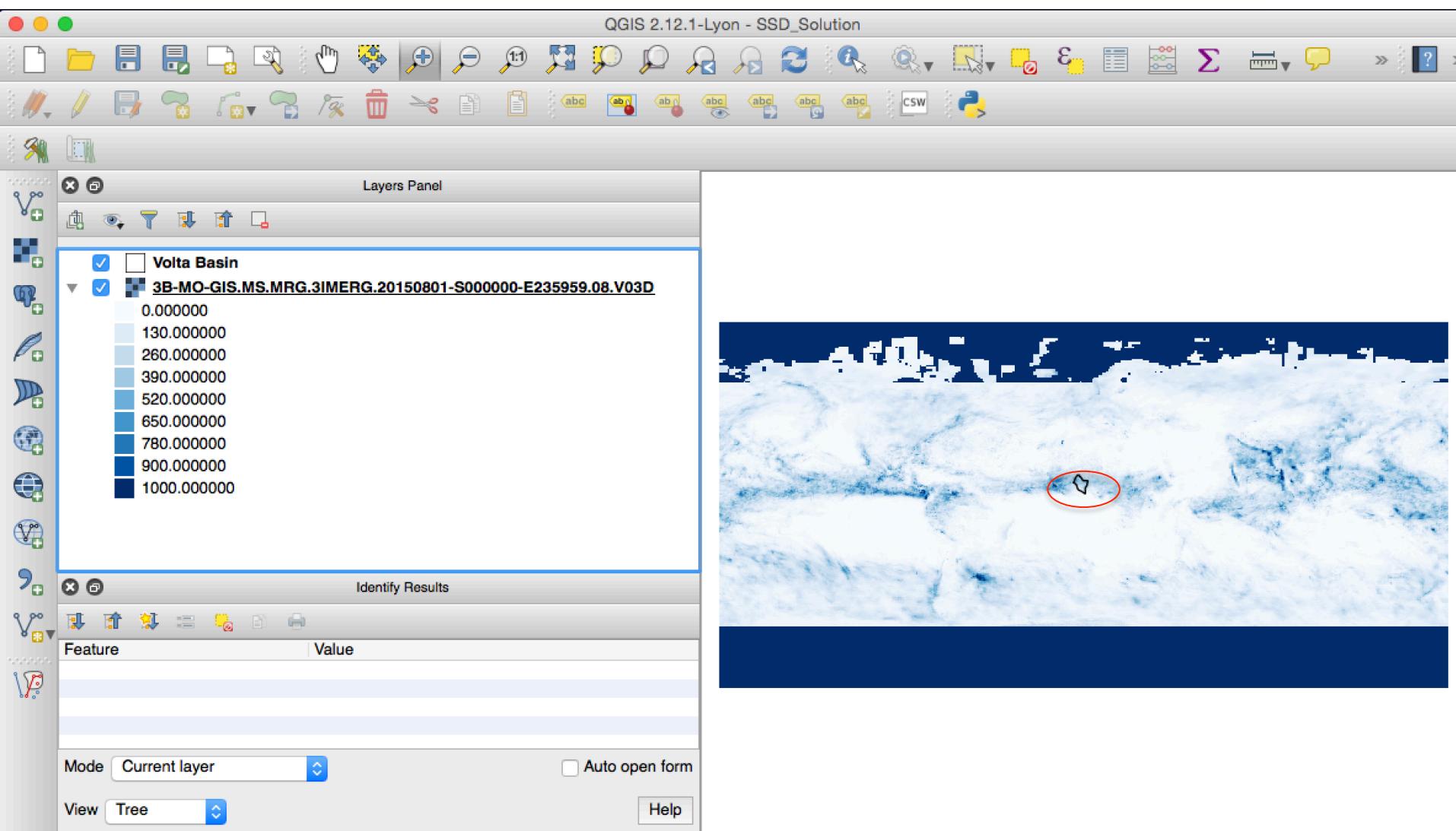
Edit the raster symbology to make it look more like a precipitation dataset:



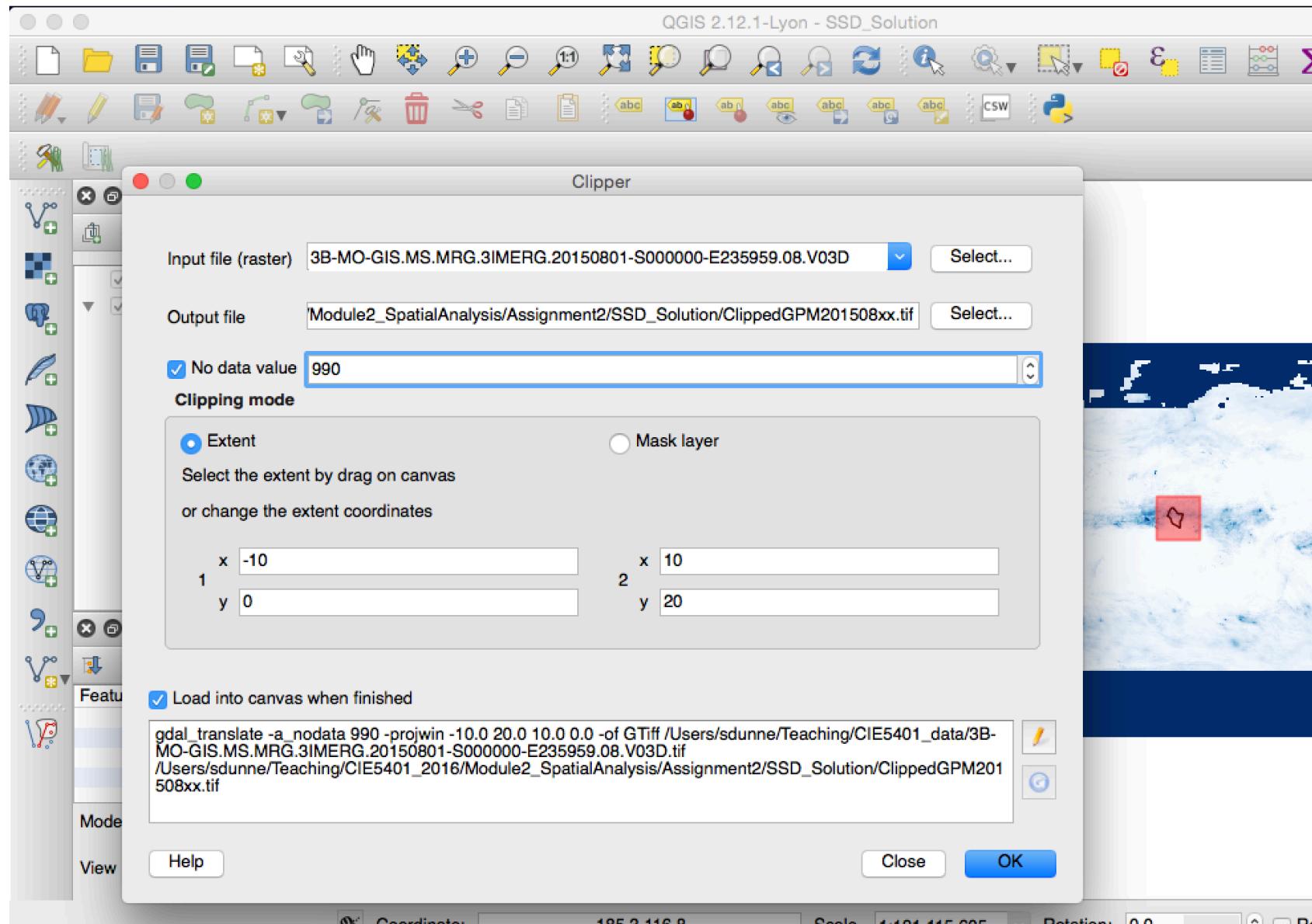
Zoom out to look at the whole earth. You can see lots of 999 (i.e. no data) values at the poles.



Move your Volta outline layer to the top so you can see it!

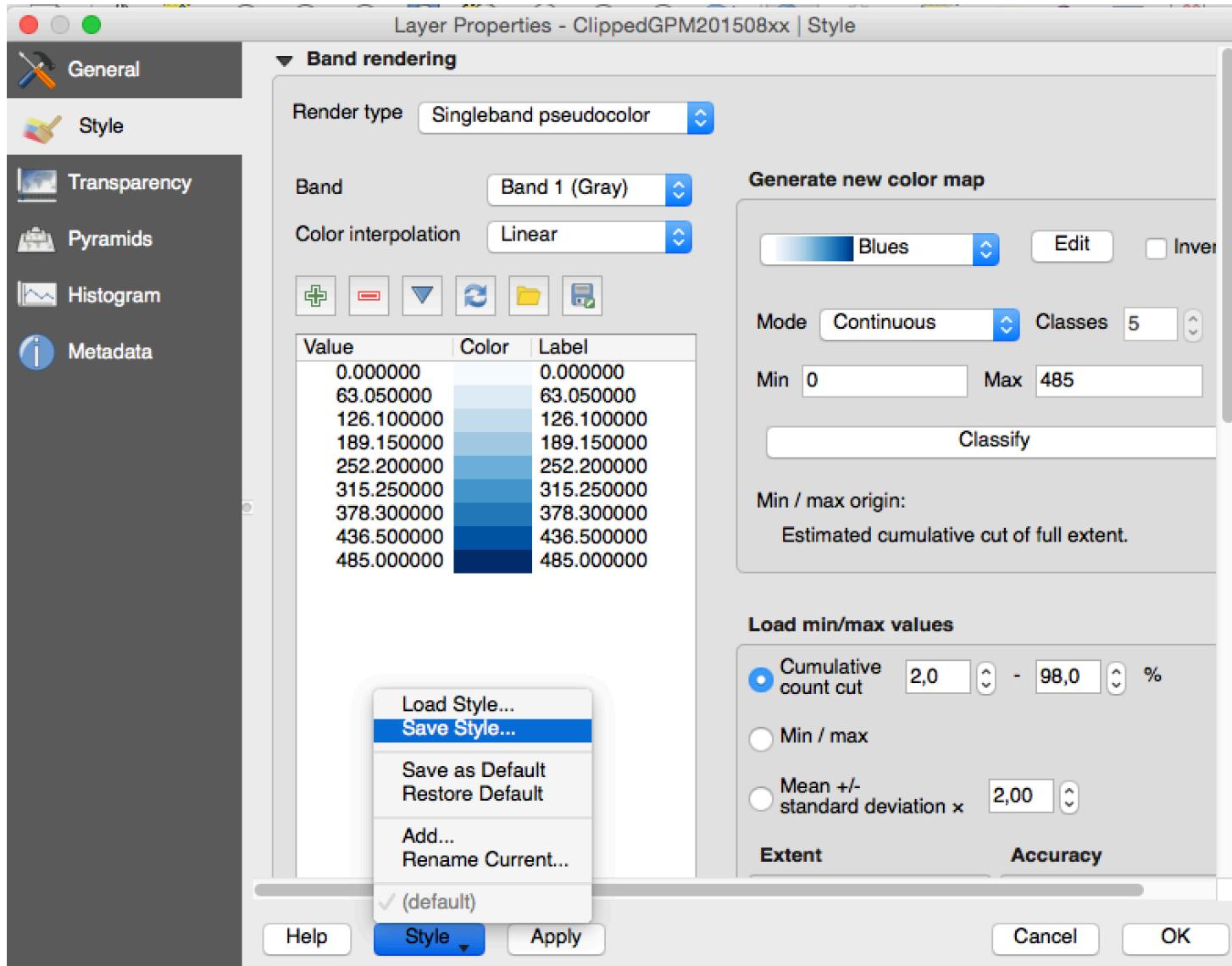


Use Clipper to reduce the raster size for all your calculations:

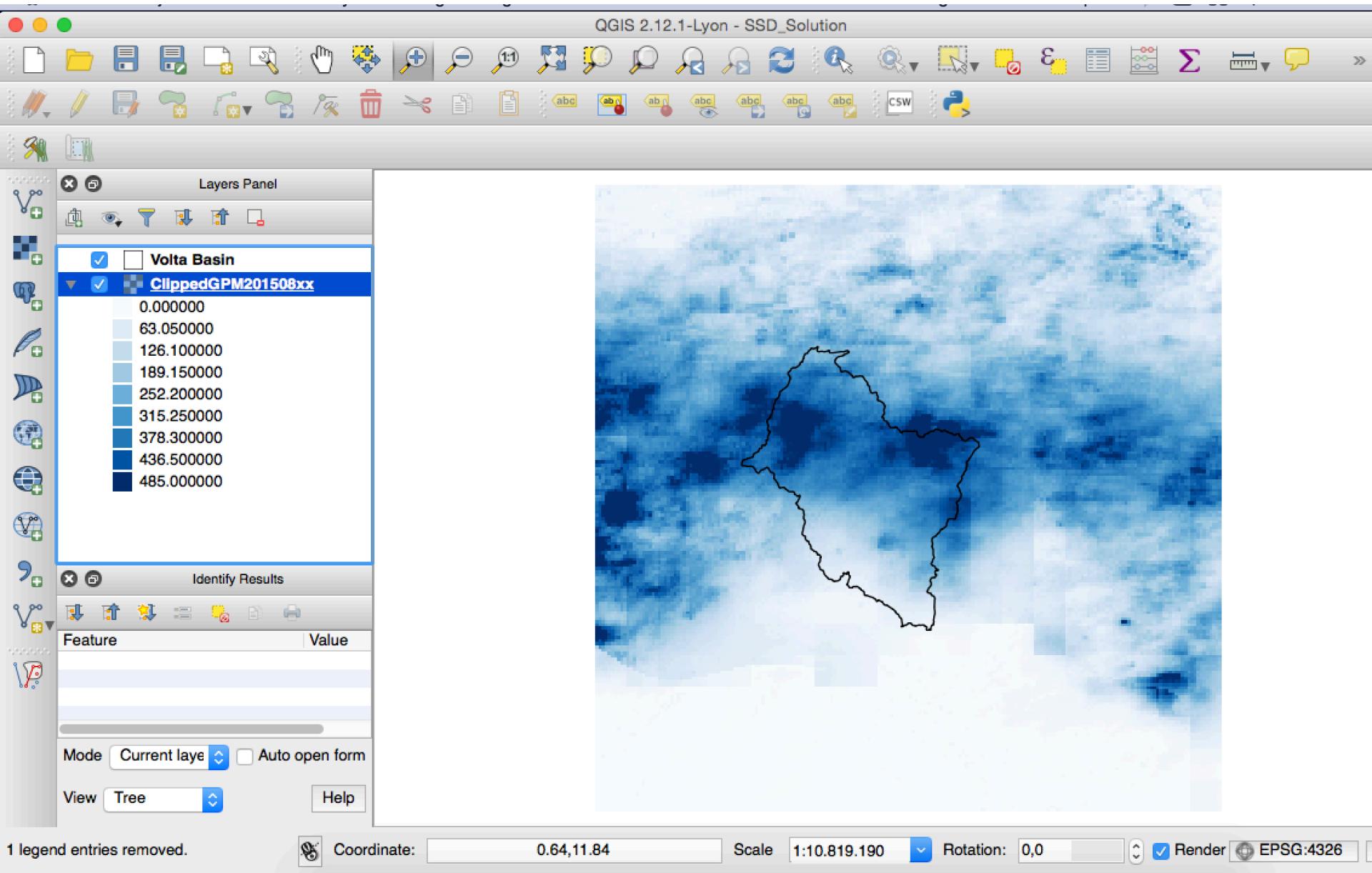


Edit its symbology so that the values are limited to the min and max of the clipped data, and use a blue colormap.

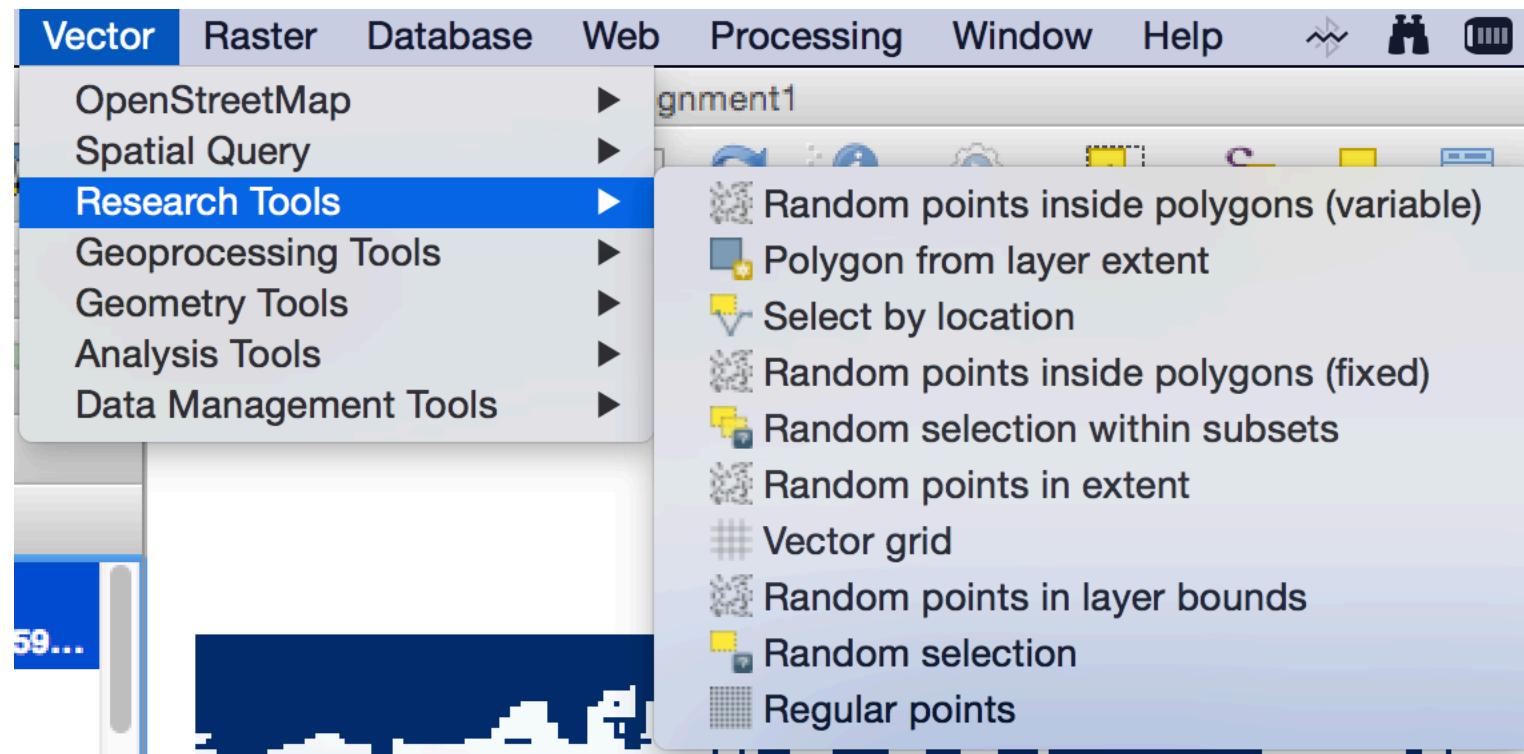
Save this style so that you can load it again for raster products later



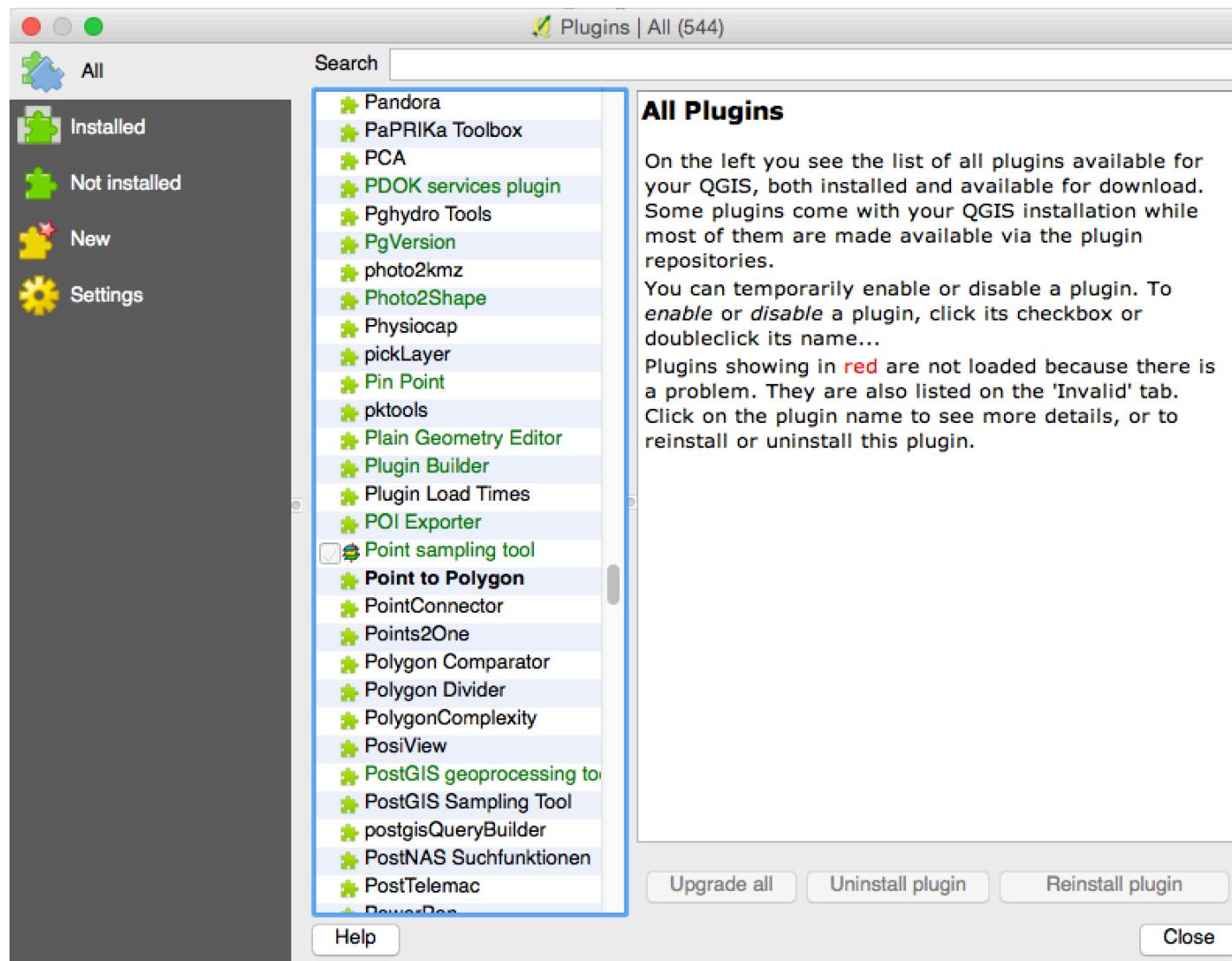
You can remove the global raster because you don't need it anymore.



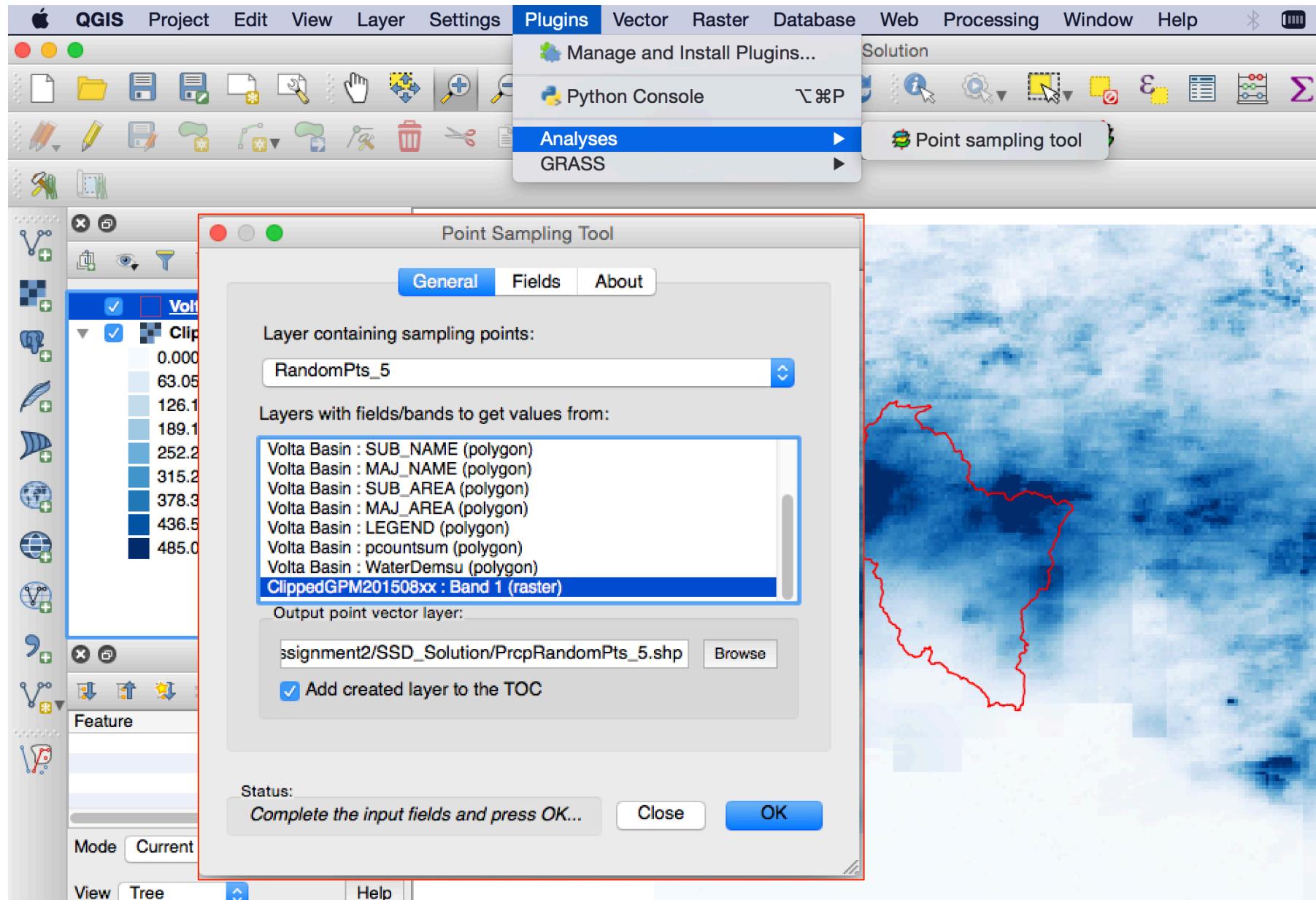
Use “Random Points” to install some rain gauges in the Volta Basin



You're going to use the Point Sampling tool to find the values of your GPM data at the 10 points. First, you need to install it and make sure it's "on" in your plug-in manager:



It will appear in the Plugins menu. Use it to get the values from the GPM raster at your five sampling points:



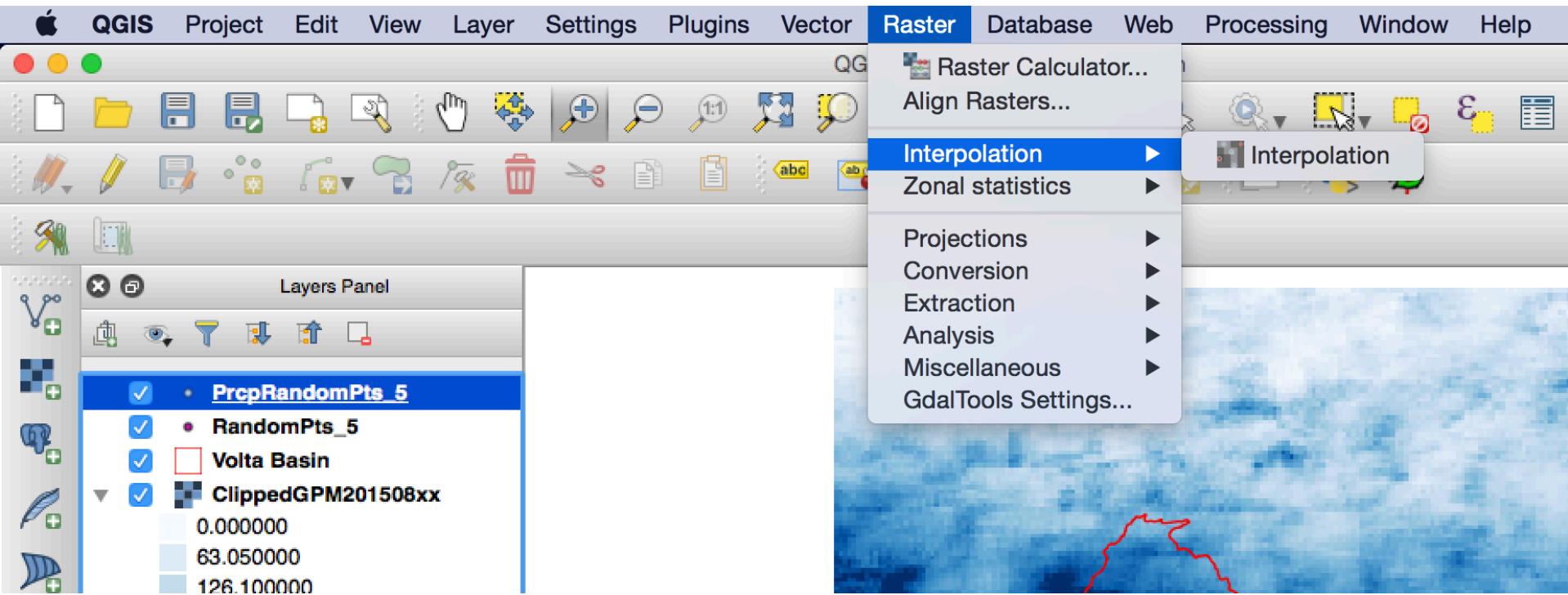
The sampled values at your sampling points can be seen in the attribute table of your new point layer (here is an example with five random points):

The screenshot shows the QGIS interface with the title bar "QGIS 2.12.1-Lyon - SSD\_Solution". The toolbar at the top contains various icons for file operations, selection, and analysis. The "Layers Panel" on the left lists four layers: "PrcpRandomPts\_5" (selected), "RandomPts\_5", "Volta Basin", and "ClippedGPM201508xx". The "Attribute table" window in the center displays the following data:

Feature	Value
0	229.00000
1	337.00000
2	36.00000
3	471.00000
4	383.00000

The "Coordinate" field at the bottom is set to "-15.35,17.39". The "Scale" field is set to "1:10.819.190". The "Rotation" field is set to "0,0". The "Render" field is set to "EPSG:4326".

Next, interpolate the precipitation everywhere based on those 10 “weather stations”. Use Inverse Distance Weighting.



**Don't forget:**

The data is scaled by 1000, so the values in the map have units of 0.001mm/hour!!

Use raster calculator to divide the raster values by 1000 to get it into mm/hr.

Also, use raster calculator to convert from mm/hour to total mm in the month.

If you have the patience to download the data yourself, copy and paste this URL into your browser to take you to the data directory:

ftp://arthurhou.pps.eosdis.nasa.gov/pub/gpmdata/2015/08/01/gis/		
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S193000-E195959.1170.V03D.tif</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S193000-E195959.1170.V03D.zip</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S200000-E202959.1200.V03D.tif</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S200000-E202959.1200.V03D.zip</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S203000-E205959.1230.V03D.tif</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S203000-E205959.1230.V03D.zip</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S203000-E205959.1230.V03D.tifw</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S210000-E212959.1260.V03D.tif</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S210000-E212959.1260.V03D.zip</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S210000-E212959.1260.V03D.tifw</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S213000-E215959.1290.V03D.tif</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S213000-E215959.1290.V03D.zip</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S213000-E215959.1290.V03D.tifw</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S213000-E215959.1290.V03D.zip</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S220000-E222959.1320.V03D.tif</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S220000-E222959.1320.V03D.zip</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S223000-E225959.1350.V03D.tifw</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S230000-E232959.1380.V03D.tif</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S230000-E232959.1380.V03D.zip</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S230000-E235959.1410.V03D.tifw</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S230000-E235959.1410.V03D.tif</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-HHR-GIS.MS.MRG.3IMERG.20150801-S230000-E235959.1410.V03D.zip</a>	0 B	2/16, 11:00:00 PM
<a href="#">3B-MO-GIS.MS.MRG.3IMERG.20150801-S000000-E235959.08.V03D.tifw</a>	0 B	2/16, 7:58:00 PM
<a href="#">3B-MO-GIS.MS.MRG.3IMERG.20150801-S000000-E235959.08.V03D.tif</a>	0 B	2/16, 7:58:00 PM
<a href="#">3B-MO-GIS.MS.MRG.3IMERG.20150801-S000000-E235959.08.V03D.zip</a>	0 B	2/16, 7:58:00 PM

Download the monthly data.

Don't forget to download both the tif and the tfw files