

Global Precipitation Measurement Mission

How Does Your Precipitation Data Measure Up?



Have you ever wondered how your measurements compare to those taken by Earth observing satellites? Did you know that NASA has satellites that are able to observe rain and snow all over the world? By following some easy directions, you can access NASA data to see how much precipitation was observed by satellites for your location any time from June 2000 to the present time!

NASA's [Global Precipitation Measurement \(GPM\) mission](#) is an international satellite mission in collaboration with the Japan Aerospace Exploration Agency (JAXA) that uses multiple satellites orbiting Earth to collect rain, snow and other precipitation data worldwide every thirty minutes. The GPM Core Observatory was launched from Japan in 2014. GPM is a follow up mission to the [Tropical Rainfall Measurement Mission](#) (TRMM) which launched in 1998. Thus, we have a detailed dataset of global precipitation observations that span almost two decades. These observations are available for most of the world.



In this activity, we will be comparing monthly precipitation data. This data is the easiest to work with using the *Giovanni* tool and it helps smooth out the errors that will occur due to variances in the time period during which your precipitation data is collected. This occurs because with GLOBE precipitation data, it is being measured every day at solar noon, whereas the GPM data is measured at the beginning of each day using [UTC](#) time. These changes should not be too noticeable when increasing the number of days over which we are gathering the precipitation data.

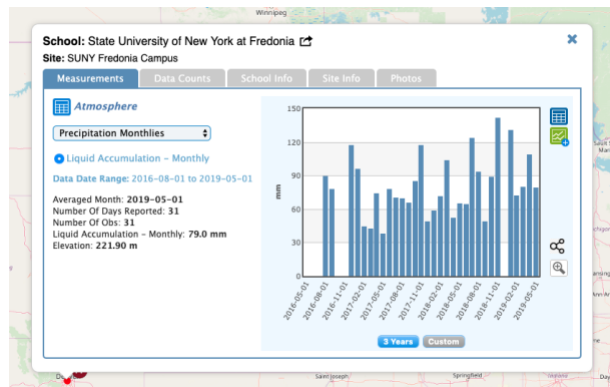
[Giovanni](#) is a powerful web application for viewing, analyzing, and downloading multiple Earth science data sets. It is a free site, and it is a good idea to create a free account. If you do not have an account, you can only look at 4 years of data at a time and cannot download and save the data.


Getting the GLOBE Data

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We will begin by collecting the GLOBE data. I will use a sample case to demonstrate how to gather and analyze your data. For this sample case, we will use precipitation monthly data from the State University of New York (SUNY) in Fredonia, NY.

1. Go to the [GLOBE visualization system](#).
2. In the blue box, click on the first icon to select the protocol data. 
3. Click "Atmosphere", and then scroll down and click "Precipitation Monthlies" and click in the box for "Liquid Accumulation-Monthly".
4. Up at the top of this box, you will see a green "SUBMIT" button to click on.
5. Go back up to the next icon in the dark blue box and click on the "Filters" icon. 
6. Click "Find a Site" and then click on "Site by School". Type in the following "State University of New York at Fredonia "
7. Under "Select Site" click on "SUNY Fredonia Campus"
8. A green button will come up that says "Submit" - click this.
9. From the dropdown box under "Atmosphere", select "Precipitation Monthlies"
10. A box will pop up that has the monthly precipitation data.



11. Click on the table icon to show the data in an Excel sheet. 
12. Go down to the bottom left of the screen and click on the red "Export .csv" icon
13. Open this file, and save it as "*PrecipMonthlySUNY_GLOBE*" and then close it for now.
14. Before you close the GLOBE Visualization site, there is one more important step! We will use the longitude and latitude (using the decimal coordinates) to find the GPM data for this location. You find the longitude and latitude by clicking on the "Site info" tab in the data. (We want to list the coordinates by **longitude first** and **then latitude**, as that is the format we will use to enter the coordinates into the Giovanni system.) Under site information, we find the longitude is -79.3343133° and the latitude is 42.453826° . (You will see

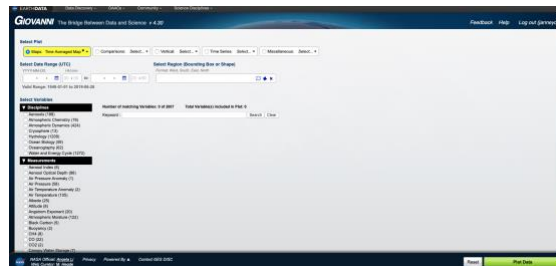
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that the program will show these numbers twice once you input them as in this case, we are selecting a specific point rather than a larger region.)

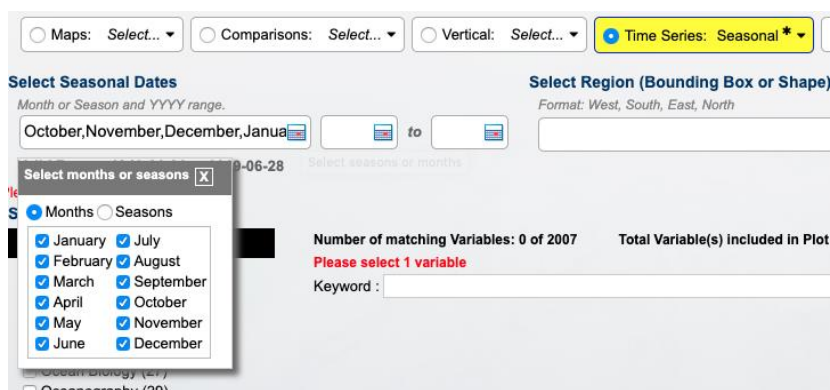
Getting the GPM data

The data from the GPM mission comes in many formats, depending on what the end-user (in this case, you!) is doing with the data. We are going to be working with the Integrated Multi-satellite Retrievals for GPM (IMERG) data. The global IMERG dataset provides precipitation rates for the entire world every 30 minutes. To see an animation showing the last week of IMERG data, click [here](#).

1. To begin, click [here](#) to open the Giovanni tool. It is a free website, and it is a good idea to create a user account, as it allows you to visualize larger datasets. Be sure to register for your free Earthdata account so you can access and save this data. You will be prompted to register the first time you open Giovanni.



2. At the top of the page, under the "Select Plot" option, click on "Time Series"
3. Scroll down and click on "Seasonal" under the options.
4. Go into the "Select Seasonal Dates" and this will open a smaller box with months that you can click. For this example, I will click on all of the all of the months



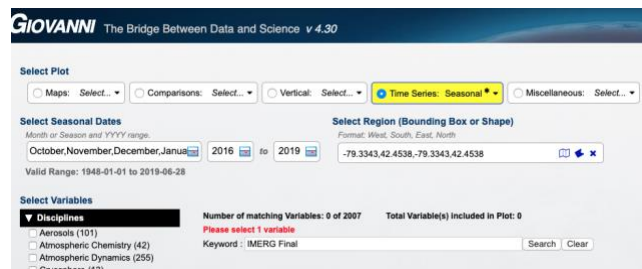
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- Next, we will add the years that we want to see the GPM data for. As we have GLOBE data that begins in 08/2016 and ends in 05/2019, we will select that time frame. The IMERG data that we are using has a lag time of about 2.5 months, which means that it takes about that long for the data to be processed and added to this site. You may need to hand enter the years as this particular box area can jump around. I entered "2016" to "2019".
- In the "Select Region" box, we will add the longitude first and put a comma, and then add the latitude. It will look like this "-79.3343, 42.4538" (You only need to add four digits after the decimal point for this data).
- In the box that says in red "Please select 1 variable"- place "IMERG Final" in the "Keyword" box.



- Another box will open up below this box that has several options. Click on "Merged satellite-gauge precipitation estimate- Final Run (GPM_3IMERGM_v6)" and be sure to go to the box that says "units" and select "mm/month".

| Number of matching Variables: 4 of 2007 | | Total Variable(s) included in Plot: 1 | |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------|--|
| Keyword : IMERG Final | | Search Clear | |
| Variable | | Units | |
| <input checked="" type="checkbox"/> | Merged satellite-gauge precipitation estimate - Final Run (recommended for general use) (GPM_3IMERGM v06) | mm/month | |
| <input type="checkbox"/> | Random error for merged satellite-gauge precipitation - Final Run (GPM_3IMERGM v06) | mm/hr | |
| <input type="checkbox"/> | Random error for merged satellite-gauge precipitation - Final Run (GPM_3IMERGM v05) | mm/hr | |
| <input type="checkbox"/> | Merged satellite-gauge precipitation estimate - Final Run (recommended for general use) (GPM_3IMERGM v05) | mm/hr | |

- Go down to the bottom right of the screen and click on the green box that says "Plot Data".
- As you wait for your data request to be processed, you should see a box that says "launching workflow" and other information will come up telling you the status of your request.

If you have done everything correctly, you will now see a line graph with lots of different colored lines. Take a look at this, although we will be collecting the data in spreadsheet form. You might want to save the graph by clicking on the three lines to the right near the top of the box and download the image to use later in a report or poster.

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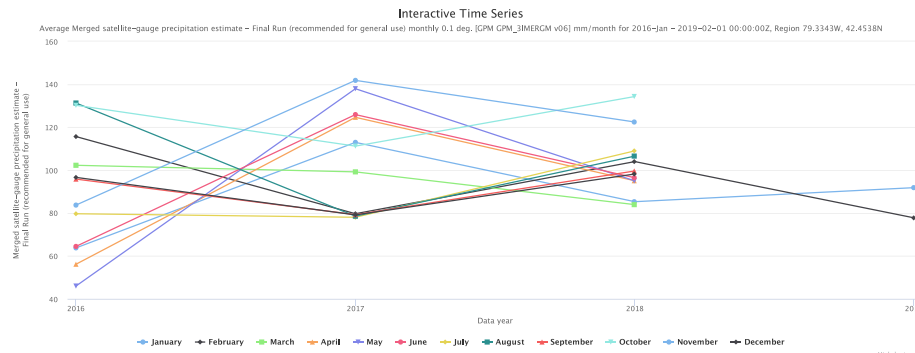


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As you look over this data, you will see that each month has a different color line. You can see how the amount of precipitation changes over time and compare and contrast the amount of rain between months and over years.

11. To save this data into a spreadsheet, click on the far-left menu bar option that says "Downloads" and then select the bottom choice that is titled "Combined ASCII". (You will have to create a free EarthData account to download and save your data.)

Comparing and Contrasting the Data Sets

Now we have GLOBE and GPM satellite data for the same period of time in the same location to compare and contrast. We have two different spreadsheets that we need to merge together first. It is probably easier to use the GLOBE spreadsheet as it has the data arranged in an easier to read format.

We will be rounding to the nearest whole number, so as we take the data from the GPM spreadsheet to place into the GLOBE spreadsheet, we need only put the rounded whole number in the graph. Be sure to take care when adding the data, as we are missing some months in the GLOBE spreadsheet.



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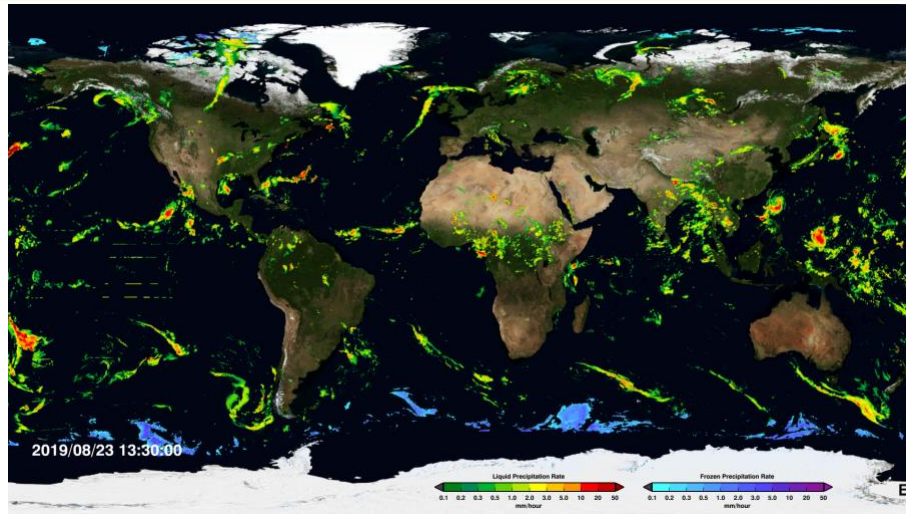


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GPM's IMERG Fall 2019 Campaign

We are celebrating the fact that we have released our latest version of the IMERG data this fall. If you create a line graph or spreadsheet with the GPM data for your location, please send it to me at dorian.w.janney@nasa.gov and I will send you a digital certificate of appreciation from the GPM mission.

Additional Resources

In case you want to learn more, here are some great resources:

- Find out how to access TRMM and GPM Precipitation data sets [here](#).
- Watch "[Getting the Big Picture](#)" video (2:39) to learn about the uses and advantages of remote sensing
- Read "[Understanding Earth: What's Up with Precipitation?](#)" to learn how and why NASA satellites observe global precipitation.
- See the wide array of education and outreach resources on the "[Precipitation Education](#)" website.
- Watch "[The Data Downpour](#)" video (4:17) to learn how IMERG data is gathered and processed.

