

From Satellites to your Backyard- GPM Precipitation Data

Background Information

Did you know that NASA currently has over two dozen Earth-observing satellites that provide information on various environmental parameters, and precipitation is one of those? Accessing this satellite data aids in our mosquito work because precipitation impacts mosquito populations. Any time it rains, there is an increased chance that mosquitoes will lay their eggs. Even if rain leaves puddles and dries up, some mosquito species will have laid their eggs, awaiting additional rainfall to begin the cycle again. Research suggests that anomalies in precipitation, such as flooding and drought, affect the potential of mosquito outbreaks and subsequently, mosquito-transmitted diseases.

One NASA satellite mission gathering this data is the [Global Precipitation Measurement \(GPM\) mission](#). It is an international satellite mission in collaboration with the [Japan Aerospace Exploration Agency \(JAXA\)](#). Through this collaborative effort, detailed datasets of global precipitation observations are available spanning over two decades- beginning in 1998 with the launch of the [Tropical Rainfall Measuring Mission \(TRMM\)](#) to the 2014 launch (from Japan) of the GPM Core Observatory. All the data is available to download for free and covers most of the world.

This activity will show you how to access NASA precipitation data for your specific location. The timeframe for available data ranges from June 2000 up to three months prior to today's date. It takes roughly three months to process and analyze the data for the public to download. (Although some levels of GPM data are available immediately, this activity does not include instructions for accessing that data.)

In this activity, you will be working with the **Integrated Multi-satellite Retrievals for GPM (IMERG)** data. The spatial resolution (the area covered by each data point) for IMERG data is an approximately 10-kilometer/~6 mile square region.

You will download and use IMERG data for your location. It is important to note that the amount of precipitation recorded from the satellite may differ from exactly how much fell at your specific location. As you know, rain intensity can vary considerably within a small distance - it may rain heavily within one city block while right down the street, the ground is still dry. Also, challenges inherent in processing satellite observations can result in differences.

IMERG data is downloaded using a web application called NASA Giovanni. [Giovanni](#) is a free, powerful web application for viewing, analyzing, and downloading multiple Earth science data sets. The first time you use Giovanni, you will be prompted to **register** for a free EarthData account. We recommend that you register for an account as it allows you to access and save your data. To register, simply click on the **login** on the

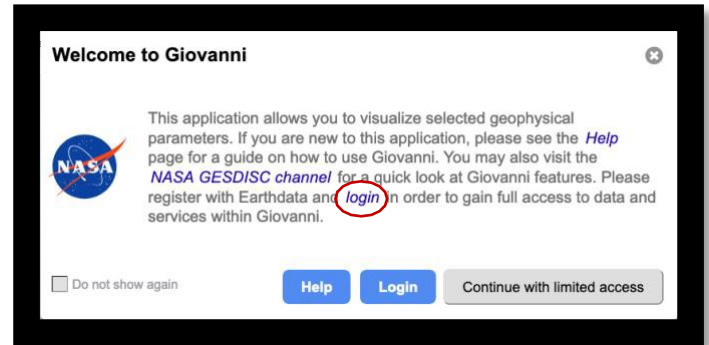
homepage and complete the registration information on the next page (step 1 below). Also, Giovanni will require you to enter the longitude and latitude of the location you are researching. We recommend that you obtain this information before beginning the accessing process. You can find the longitude and latitude of any site [here](#).

If you want to learn a little more about how IMERG data is gathered and processed, view [The Data Downpour](#). NASA's [Goddard Science Visualization Studio \(SVS\)](#) has an animation showing IMERG data [here](#).

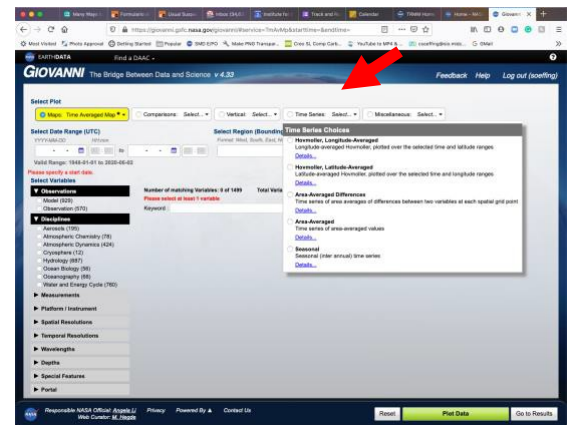
Giovanni and GPM data

A guide to getting started

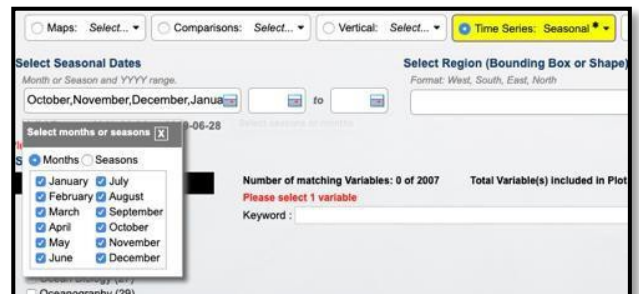
1. To begin, click [here](#) to open the Giovanni tool. First-time users need to **Register** with EarthData and then **log in** to Giovanni.



2. Locate **Select Plot**, click on **Time Series**. Scroll down and click on **Seasonal** under the options.

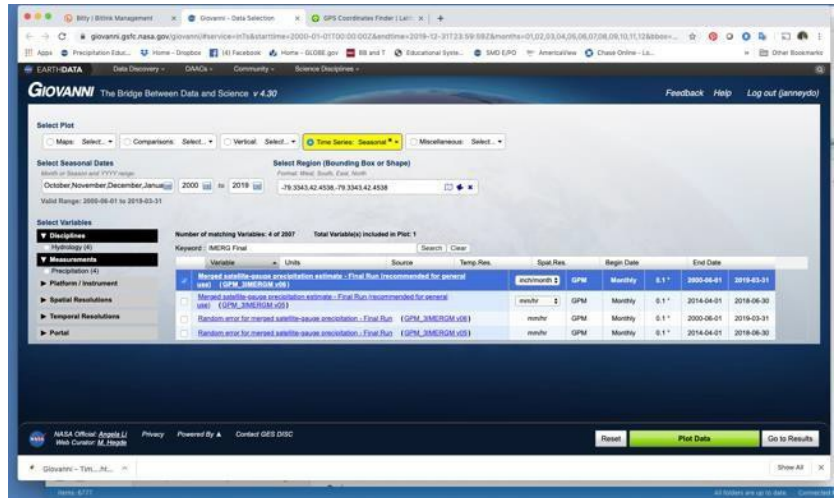


3. Go into the **Select Seasonal Dates**, and this will open a smaller box to select months of interest. For this example, click on all of the months between 2017 and 2018.



- Next, select the years that you want the data to cover. You may need to type in the years as this particular box area can jump around. For this example, we selected 2017 and 2018 to compare the monthly precipitation totals.
- In the **Select Region** box, select the location of your observation. Enter longitude first and put a comma and then add the latitude. Giovanni uses decimal coordinates. You can find the longitude and latitude of any location [here](#). Be sure to use the DD (decimal degrees) and **input the longitude first and then the latitude** (note – these values are the inverse order shown on the Geolocation site).
- Enter the coordinates in the **Select Region** box. The values will repeat showing one specific location. (Giovanni also lets you measure across larger regions defined by a **bounding box**). Remember, precipitation is quite variable. Each IMERG data point covers a ~10km square area.

This example uses Fredonia, NY. The decimal longitude and latitude data will look like this **-79.3343, 42.4538** (Only add the four digits after the decimal point).



In the box labeled in red, **Please select 1 variable-** place **IMERG Final** in the **Keyword** box and press **Search**.

- A new box will open up below this that has several options. Click **Merged satellite-gauge precipitation estimate- Final Run (GPM_3IMERGM_v06)**.

In the box labeled **units**, select either **inch/month** or **mm/month** based on your preference.



- Scroll down the screen and click on the green box that is labeled **Plot Data**.
- It may take several minutes for your data request to be processed. Look for a box labeled **launching workflow** along with other information on the status of your request.

A line graph of different colored lines should appear. Save the output by clicking on the three lines in the upper right of the box and download the image.

Interpreting the graph

Precipitation data for each month is a line of different color and/or symbol (key at bottom). Placing the cursor on the beginning and endpoint of each line will display the average for that month and year. Look for trends in monthly precipitation values between the two years. What additional questions can you think of?



On the graph, hover over May 2017. The exact measurement will be displayed, as seen in the example above. The data can be downloaded in a spreadsheet and viewed by year and month (see directions below).

Saving the data

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**. (Please note that you will need to be logged into your Earthdata account to use this feature). Download the **.csv** file to your computer, and then view it using Microsoft Excel or any other spreadsheet software.

Acknowledgments

This resource has been adapted by the GLOBE Mission Mosquito team from one created by the GPM team. The original resource is at: <https://gpm.nasa.gov/education/interactive/from-satellites-to-your-backyard-using-imerg>

Additional Resources

Learn more by checking out other great resources:

- Find out how to access TRMM and additional 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.



GLOBE Mission Mosquito engages teachers and students, informal science education providers, citizen scientists, and scientists to use the Mosquito Habitat Mapper tool in NASA's GLOBE Observer app to collect data on mosquito larvae - an immature form of mosquitoes that do not bite or spread disease – and eliminate standing water in containers, thereby helping to make their communities a safer place. The campaign is part of the international GLOBE Program (www.globe.gov) and is co-led by NASA Goddard Space Flight Center and the Institute for Global Environmental Strategies.