

Global Precipitation Measurement Mission

Ground Validation and OLYMPEX – Data Analysis Exercise Instructions

Once scientists have collected their ground and satellite data, they need to do the mathematics to compare and see how well they match in order to make adjustments to the computer data processing algorithm as needed. You are going to do that process yourself, using citizen science rain gauge data and satellite data from NASA.

First, we'll get the rain gauge data. Go to <http://bit.ly/1iSfgNd> to see a map of data from the Community Collaborative Rain, Hail and Snow (CoCoRaHS) network in Washington State. The default is today's date, which shows precipitation reported in the morning from the previous 24 hours. Make sure you change to metric units using the drop-down menu at the top. Zoom in to a place that looks interesting (having some data besides zeros to look at is a good idea – you may need to adjust the date back a few days to find a period that had precipitation reported.) Use the date dropdown to move through about ten days of data, and look for a station that seems to have consistent data entry (they make a report almost every day). Click on a station to see their name, number, report date and time, and precise data value. You can also look in the data table below the map, but that shows all the reports for Washington State for a chosen date, so even if you've zoomed in, you will still have to scroll through the whole list to find a particular station.

If you are stuck, your teacher can provide you with locations and date ranges that will work well. **Write down the number of the station you chose on your data sheet. Using the date dropdown, move through seven to ten days of data and record the information in the first three columns of the table on your data sheet.**

Now you need to get the latitude and longitude so that we can look up the satellite data. Go to <http://bit.ly/1Pgon6Q>, which will give a precipitation summary for all stations reporting on a particular day. From the dropdowns, choose Washington State and the proper county (second two letters in the station name you recorded previously), and adjust the date range to match yours. **Find your chosen station number in the list and record the latitude and longitude on your data sheet.** NOTE: Although not labelled, for Washington State, the latitude will be north (N) and the longitude will be west (W), which can also be noted with a negative. Example: 48.098 N, 123.42 W is the same as 48.098, -123.42.

To get satellite data, we're going to use an online NASA service called Giovanni. Go to this link to start: <http://go.nasa.gov/1LfGvMi>. The correct type of plot (time series, area averaged) is already selected for you, as is the data set (what they call the variable). We are using data from an algorithm called TRMM 3B42RT (named after GPM's predecessor, the Tropical Rainfall Measuring Mission) because it currently has near real-time data (that's what RT stands for) and has a daily accumulation value. Eventually, data from the new, more advanced satellite will be available in this format, but right now you can only get it in monthly or half-hourly values, and we want daily.

You will not need to change most of the options. The two you will change:

- (1) *Select Date Range:* For start date, choose one calendar day before the first date on your data table above – remember that CoCoRaHS gauges are collecting the precipitation from the 24 hours previous, while the satellite data is more real-time.
- (2) *Select Region:* Enter the latitude and longitude you looked up before and recorded on your data sheet. Since we want to look up a single point, rather than a bounding box, you will enter each number twice. (Note the format – you will type *longitude, latitude, longitude, latitude* in the box.)

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Click the green “plot data” button. You will see a graph of the data, but of course we want to be able to compare, so we’re going to put both data sets on one graph. To actually see the individual values, click on downloads in the menu to the far right, and then the link under ASCII CSV. This will allow you to open a spreadsheet with the values. **REMEMBER: The rain gauge data showed the previous day’s accumulation, this data shows the accumulation on the day it occurred, so your dates will be offset. For example, data reported on 8/30 from CoCoRaHS corresponds to the data for 8/29 in the satellite observations spreadsheet. Record the satellite observations in the fourth column of the data table.**

Graph the data, either by using a spreadsheet program, on graph paper, or by using the template provided. Since these are daily accumulations, meaning there is no data in between the values you recorded, you should create a bar graph with the satellite and ground data next to each other, rather than a line graph that implies continuous data. Make sure you look at the highest precipitation recorded in your chart, for both ground and satellite data, and number the y-axis scale appropriately before you start graphing.

Look at the patterns in the data and make observations. Here are some questions to get you started:

- Does the general pattern of the two data sets match?
- Are there any large storm events (high amounts of precipitation) that show up in one data set but not the other?
- Are there any days of zero precipitation that show up in one data set but not the other?
- Calculate the difference between the ground and satellite data for each day in the fifth column of the data table. Note that you may get negative numbers. Do you notice any patterns in the differences? Is one data set consistently higher than the other, or does it vary?
- Calculate the average difference between the data sets by adding together the absolute value of all the differences and dividing by the number of values. What does this tell you about how the data sets compare?
- Find someone else who used a different location that you did and compare your results. Describe any differences or similarities in your findings.

Think about any reasons you can think of that the data from the two sources may or may not match perfectly, and add it to your description.

After you finish your analysis, take some time to explore the OLYMPEX website, <http://olympex.atmos.washington.edu/>, to learn more about the most recent observations the scientists have made. You can view the daily precipitation map with today’s gauge data, look at the latest satellite and ground radar, view flight summaries of the aircraft involved, and read science summaries of the latest findings.

