Name- Date- Period-

GPM Student Capture Sheet

Guiding Questions

What is the purpose of the GPM Mission?
What are the components of the satellites and their functions?

Engage

Answer the following questions while watching the video "Our Wet Wide World."

1. How much of Earth's water is freshwater? How much of this freshwater is usable?

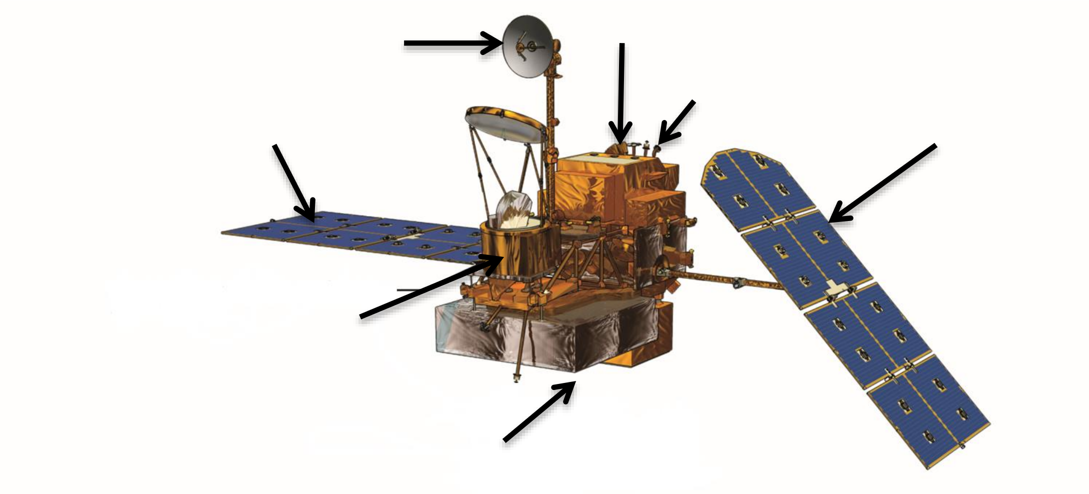
2. What are some issues we can learn more about using GPM?

3. What will GPM measure and how often?

4. How many other satellites will work with GPM?

Explore and Explain Label the parts of the satellite:

Star-field finder Control System Solar Panel High gain data-relay antenna
GPM Microwave Imager (GMI) Dual-frequency Precipitation Radar (DPR)



Explore and Explain Match the part of the satellite with its function.

Function Word Bank

power	type of precipitation
navigation	3-D information about particles
communication	

1. High gain data-relay antenna ______________________
2. Star-field finder ______________________
3. Solar Panels ______________________
4. GPM Microwave Imager (GMI) ______________________
5. Dual-frequency Precipitation Radar (DPR) ______________________

Evaluate

Write a short letter (1 or 2 paragraphs) about GPM to a 4th grade student. Be sure to explain what GPM is, what it will be used for, why it is important, and some of the parts of the satellite.

GPM: Global Precipitation Measurement

When is it going to rain? How much will it rain? We always want to know about precipitation to plan day-to-day events, but it also helps us make decisions about bigger issues, such as safety, transportation, and jobs. Precipitation significantly affects our food and water supply. Therefore, it is important to accurately measure rain and snowfall.

There are many ways to measure precipitation. Rain gauges can collect and measure rainfall in a location over a period of time. However that only measures rain in one specific spot. Radars can be set up on land and cover more ground. Radar sends out a signal and measures how much of the signal is scattered by rain or snow. However, they are only available in certain locations, and are only used on land, therefore missing rainfall data over our oceans. We can't cover the entire Earth with instruments to measure rain, so we look to the sky!

The Global Precipitation Measurement mission (GPM) is an international network of satellites (Figure 1) that are all looking down on Earth and measuring precipitation from above. The GPM concept centers on the deployment of a "core" satellite carrying an advanced radar/radiometer system to measure precipitation from space every three hours. Not only will this data give us a better picture of global precipitation, it will help advance our understanding of Earth's water and energy cycle and improve forecasting of extreme events that cause natural hazards and disasters.

Figure 1: Illustration of the GPM satellite constellation

The GPM Core Observatory (Figure 2) will carry two instruments that measure precipitation from space. The data from these two instruments serves as a reference standard to unify precipitation measurements made by an international network of partner satellites. The design and sampling technique of the Core Observatory builds on the concept of the Tropical Rainfall Measuring Mission (TRMM), which was launched in 1997.

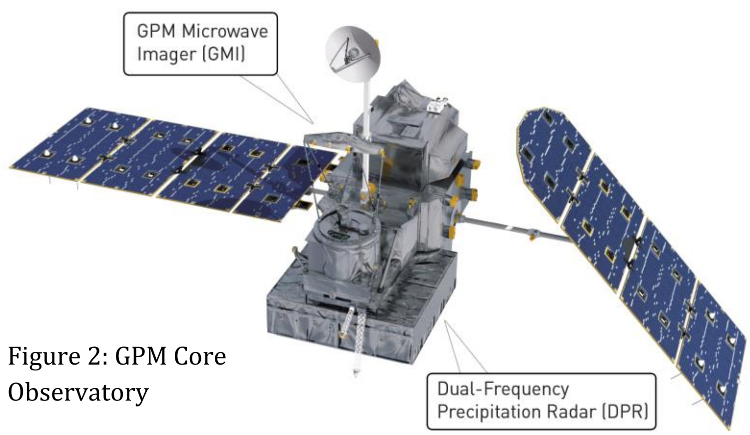


Figure 2: GPM Core Observatory

The two main instruments on the Core Observatory are the Dual-Frequency Precipitation Radar (DPR) and the GPM Microwave Imager (GMI). The DPR (Figure 3) provides three-dimensional information about precipitation particles in the different layers of clouds. It sends energy at two frequencies (Ku and Ka) into the cloud and observes the energy that is reflected from different heights in the cloud. It is an active radar instrument since it actually sends out energy. The GMI is a passive radiometer – it just observes and measures energy that is emitted by precipitation within clouds. Different types of precipitation, like heavy rain and light snow, emit different wavelengths of energy. The GMI measures these wavelengths which can tell us what kind of precipitation is in the cloud.

Other components of the satellite include the solar panels to provide power, a high gain data-relay antenna for communication, a star-field finder for navigation, and a control system to manage the satellite.

Figure 3: The Dual-Frequency Precipitation Radar (DPR) is the two boxes on the bottom of the Core Observatory – the small one is the Ka frequency radar and the larger flat box is the Ku frequency radar

Figure 4: GPM Microwave Imager (GMI) is a passive radiometer with an antenna above.

The GPM mission is co-led by NASA and the Japan Aerospace Exploration Agency (JAXA). The GPM Core Observatory is scheduled for launch in early 2014.

For more information visit http://pmm.nasa.gov/GPM and http://pmm.nasa.gov/education/