# **GLOBE Schools and Satellite Missions**



Monitoring Earth's environment is one of the primary activities of The GLOBE Program. Students from all over the world have been involved in hands-on in situ (in place or on location) data collection since the program began on Earth Day 1995. NASA scientists need these student data, combined with remotely sensed satellite data, to validate and calibrate satellite instruments. Four NASA satellite missions currently collaborate with GLOBE students: CALIPSO, CloudSat, GPM, and SMAP.



### **CALIPSO**

CALIPSO (Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations) is a joint NASA and CNES (Centre National d'Etudes Spatiales, France) satellite mission to help scientists better understand Earth's weather, climate, and air quality. One of the instruments on board CALIPSO is a two-wavelength lidar that provides vertical profiles of aerosols and clouds. Lidar is similar to radar but uses pulses of light from a laser. These pulses of light are sent from the satellite toward Earth's surface. The amount of light that is reflected, or scattered, back to the satellite provides information on the vertical structure of clouds and aerosols.

GLOBE students provide valuable aerosol, cloud and contrail data to assist CALIPSO mission scientists.

### CloudSat

CloudSat uses a cloud penetrating millimeter wavelength radar to permit even small cloud droplets to be detected. This allows scientists to view the structure and life cycle of clouds of all types. CloudSat transmits short pulses of microwave energy down into Earth's atmosphere and measures the time delay and magnitude of reflected signals. CloudSat data have shown that it rains three times more often than previously reported, primarily because CloudSat detects the low-level precipitation previously missed.

GLOBE students provide valuable cloud and contrail data (as well as other atmospheric data) and cloud photos to assist CloudSat scientists.

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## THE GLOBE PROGRAM





### GPM

GPM (Global Precipitation Measurement) mission is a joint NASA and JAXA (Japan Aerospace Exploration Agency) mission building on the legacy of the TRMM (Tropical Rainfall Measuring Mission) with improved instruments and spatial coverage that includes higher latitudes. The Microwave Imager has 13 channels, providing data on precipitation, ranging from light to heavy rain to falling snow. Two radar frequencies view precipitation in 3-D throughout the atmospheric column. This allows scientists the ability to see the sizes of precipitation and how they are distributed from the clouds to the ground, giving a view of the structure of storms.

GLOBE students provide valuable precipitation data to assist GPM scientists.

#### **SMAP**

The SMAP (Soil Moisture Active Passive) mission provides high-resolution global mapping of soil moisture and freeze/ thaw state of soil. SMAP observations of soil moisture and freeze/thaw state will aid in the accuracy of models used in weather prediction and climate projections, flood assessment and drought monitoring, and in identifying unknown values in global carbon calculations.

GLOBE students can provide valuable gravimetric and volumetric data to assist SMAP scientists.

