

ARSET

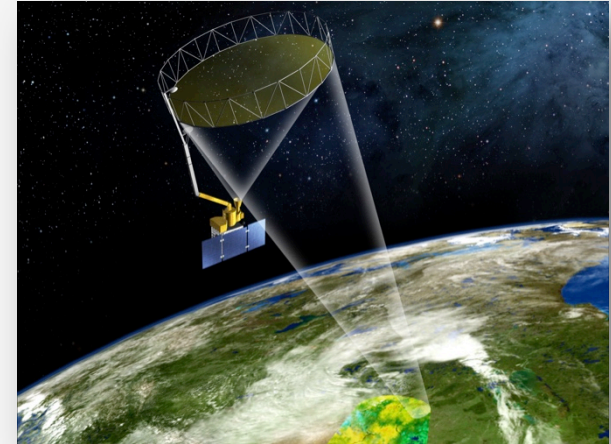
Applied Remote Sensing Training

<http://arset.gsfc.nasa.gov>

 @NASAARSET

SMAP and the GLOBE Program

Jul. 20, 2016



The GLOBE Program

The screenshot shows the homepage of The GLOBE Program website. At the top, there's a header with the logo and navigation links. Below the header, there's a large banner featuring a globe and the text '20th Anniversary - 1995 - 2015'. To the right of the banner, there's a 'Featured' section with a video thumbnail and text about the 20th anniversary. Below the banner, there's a navigation bar with links like 'About', 'Join', 'Get Trained', 'Do GLOBE', 'GLOBE Data', 'Community', 'News & Events', and 'Support'. The main content area is divided into several sections: 'RECENT MEASUREMENTS' with a map and data entry fields, 'Latest News and Events' with a list of news items, 'GLOBE ON SOCIAL' with social media links, 'GLOBE Stats' with a list of statistics, and 'Member Highlights' with a list of featured student research reports. A vertical 'Welcome' banner is on the left side of the page.

THE GLOBE PROGRAM
A Worldwide Science and Education Program

20th Anniversary - 1995 - 2015

Featured
Anniversary Video Celebrates 20 Years of The GLOBE Program
NASA Administrator Charles Bolden and others discuss the impact of The GLOBE Program.

RECENT MEASUREMENTS
Pompano Beach High School, United States, Weatherbug, Measured on: 2015-06-03

Latest News and Events
NEWS EVENTS CAMPAIGNS

NASA's Soil Moisture Active Passive (SMAP) Mission Begins Science Operations
22 May 2015

GLOBE Europe and Eurasia Host Student Video Campaign
20 May 2015

2016 GLOBE International Virtual Science Fair
11 May 2015

GLOBE Stats
114 Countries
28,279 Schools
22,010 Teachers
127,241,141 Measurements
56,272 Measurements this month
View GLOBE Countries

Member Highlights
Featured Student Research Reports
TREATMENT OF DEVICE DYING WASTEWATER BY PHOTOCATALYST WITH THE ABSORBENT
See All Student Research Reports

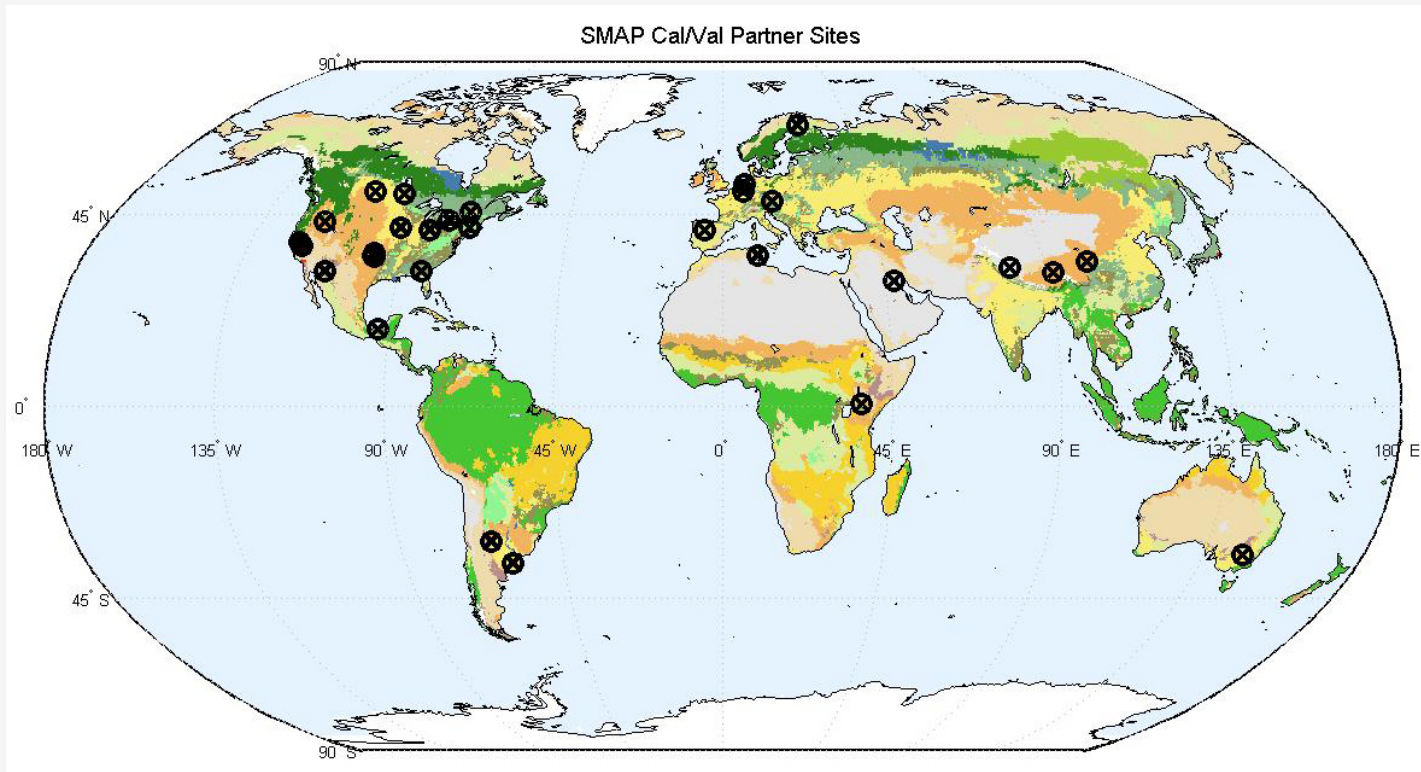
- **Objective:** to encourage students, teachers and citizen scientists to develop interest and skills in STEM through interactive learning activities.
- **Statistics:** 114 countries; 28,279 schools; 127 million measurements; 20 years of operation.
- **Sponsors:** NASA, NSF, NOAA, U.S. State Department.

SMAP and GLOBE

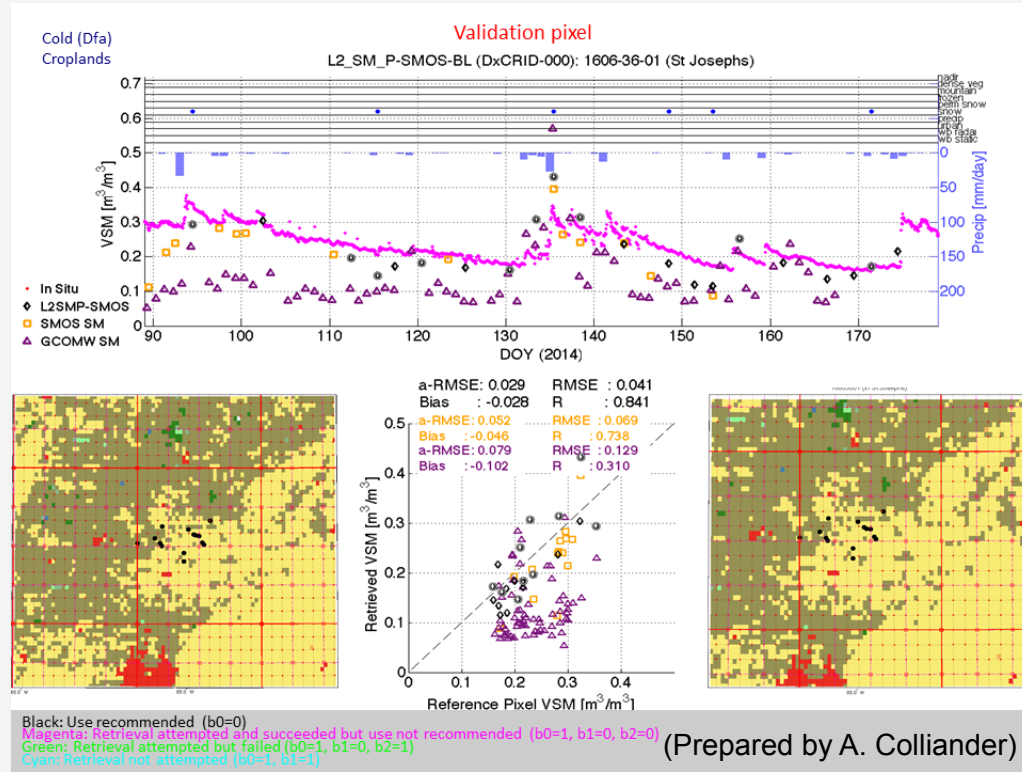


- SMAP has partnered with the GLOBE program to implement a volumetric soil moisture protocol.
- The objective is to create awareness and interest in schools around the world about the importance of soil moisture and SMAP and to potentially use the measurements collected to help validate SMAP.

SMAP Calibration/Validation Partner Sites



Comparison Between SMAP and an In Situ Station



GLOBE Schools Collecting Soil Moisture



SMAP Soil Moisture Protocol

- There are two ways of measuring soil moisture:
 1. Gravimetric: the ratio between the weight of the water and the weight of the soil.
 2. **Volumetric: the ratio between the volume of water and the volume of soil.**
SMAP measures volumetric soil moisture
- To calculate volumetric soil moisture you need to:
 1. Calculate gravimetric soil moisture by collecting a sample of soil, weighing, drying, and weighing it again. The difference in weight is the weight of the water.
 2. Calculate the bulk density of the soil, which is the ratio between the dry weight of a soil sample to its volume. It is determined by calculating the dry weight of the sample and the volume of the can.
 3. Calculate volumetric soil moisture by multiplying gravimetric soil moisture by bulk density. The values should range from 0.02 to 0.8

Formulas for Calculating Volumetric Soil Moisture

- Gravimetric soil moisture

$$= \frac{(\text{wet mass}) - (\text{dry mass})}{(\text{dry mass}) - (\text{container mass})} = \text{g/g}$$

- Soil bulk density

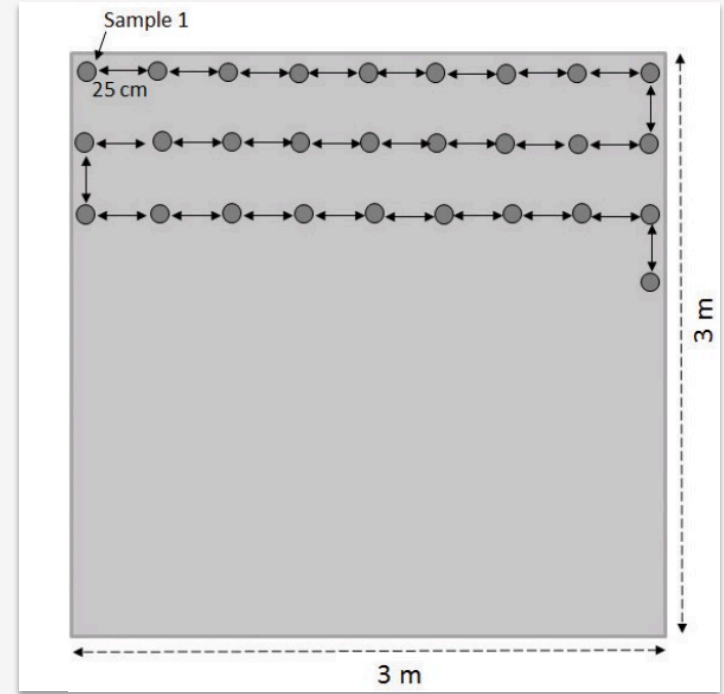
$$= \frac{(\text{dry mass})}{(\text{container volume})} = \text{g/ml}$$

- Volumetric soil moisture:

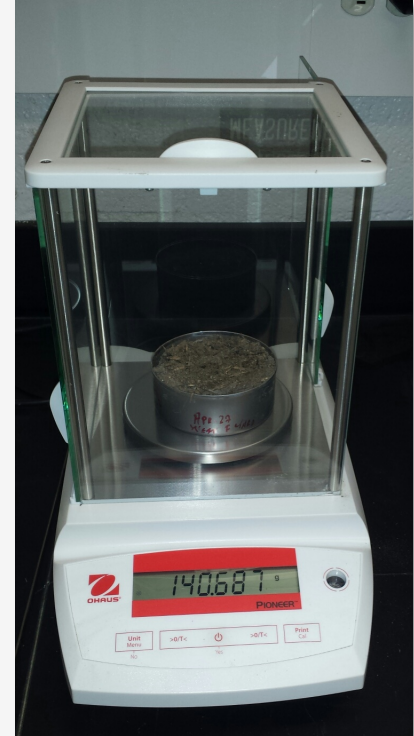
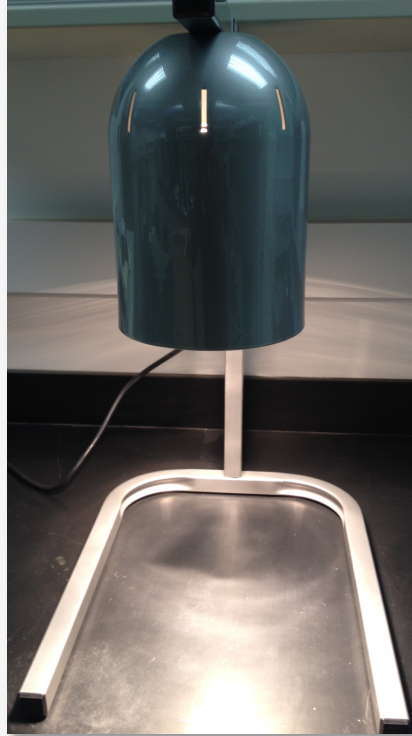
$$= (\text{bulk density}) \times (\text{gravimetric soil moisture/water density}) \\ = \text{cm}^3/\text{cm}^3$$

Where and How to Collect Soil Samples

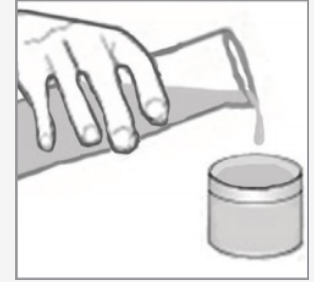
1. Select a site that:
 - Is not artificially irrigated
 - Is not under a tree
 - Represents the natural conditions of the area
 - Does not have tall grasses
 - Is relatively flat
2. Determine when SMAP flies overhead:
http://smap_op.apps.nsidc.org
3. Define the soil sampling site by marking a 3x3 meter box and collecting one soil sample every time SMAP flies overhead. Never sample the same spot. Each sample should be collected 25 cm from the last one.



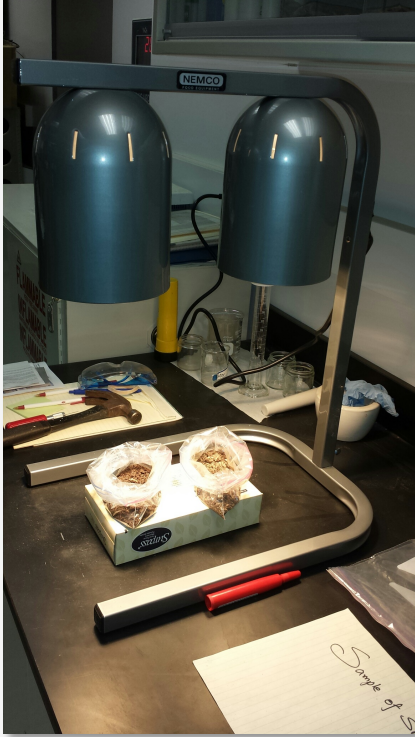
Equipment Necessary to Calculate Soil Moisture



Collecting Soil Samples and Measuring Soil Moisture



Drying the Samples

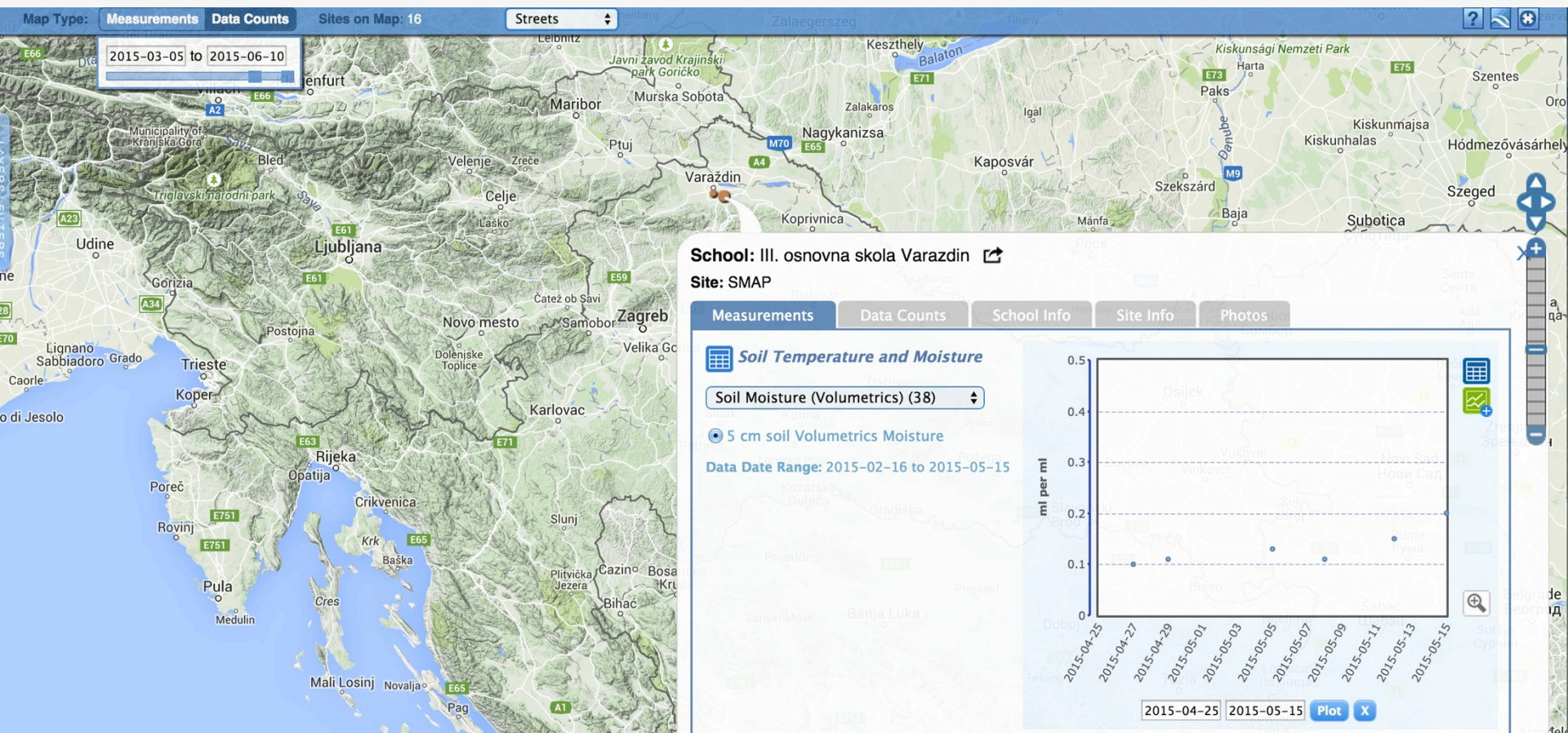


- Use a lab drying oven or a kitchen heating lamp. The lamp should have infrared bulbs that can raise the temperature underneath 65-75°C
- The sample in the plastic bag should be dried under the heating lamp for ~72 hours or more.
- The weight of the sample is measured before and after drying using a weighing scale.
- The bulk density of the soil should be calculated every 10 time that a sample is collected.
- The soil sample should be collected at approximately the same time and as close as possible to the SMAP overpass. Ideally at approximately 9:00 am local time.

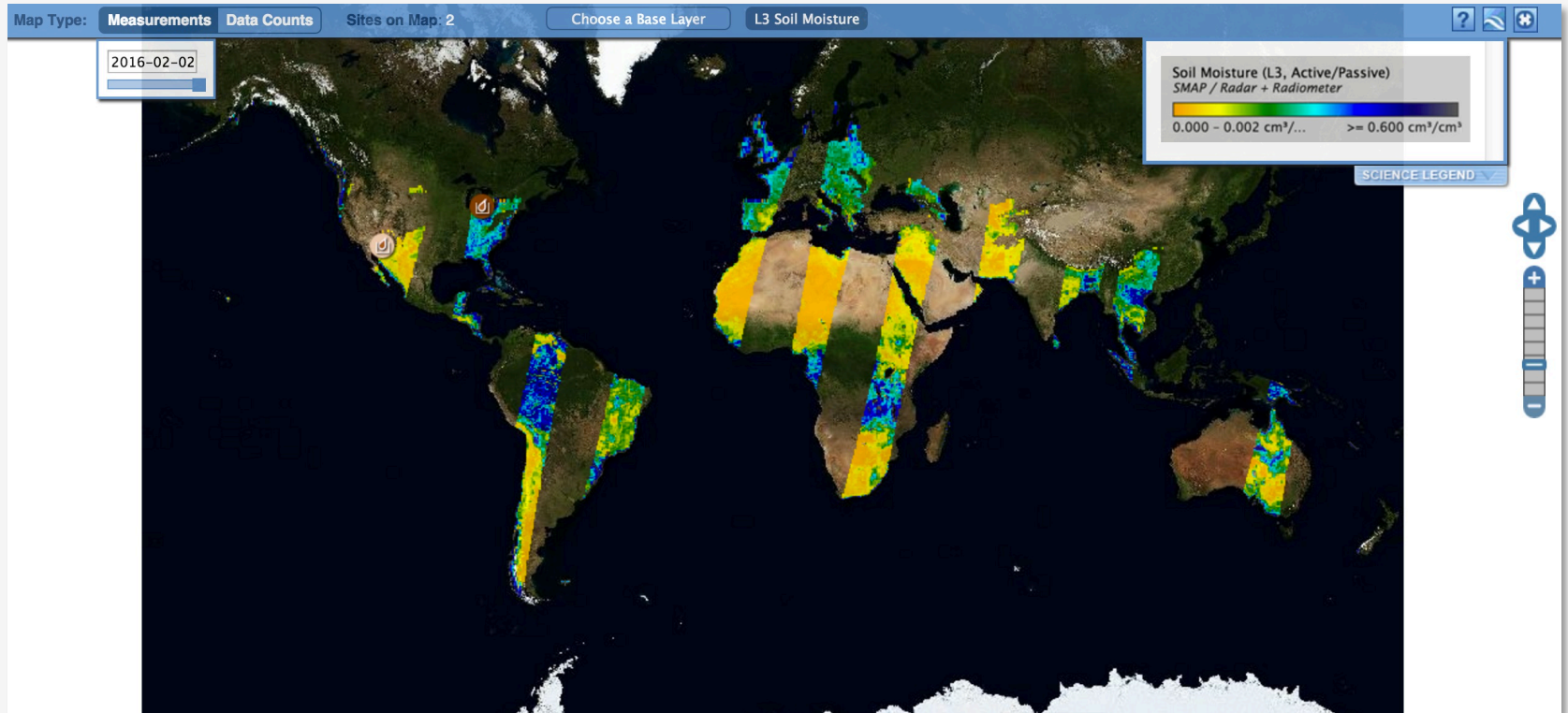
Instructional Video on How to do the Soil Moisture Measurement



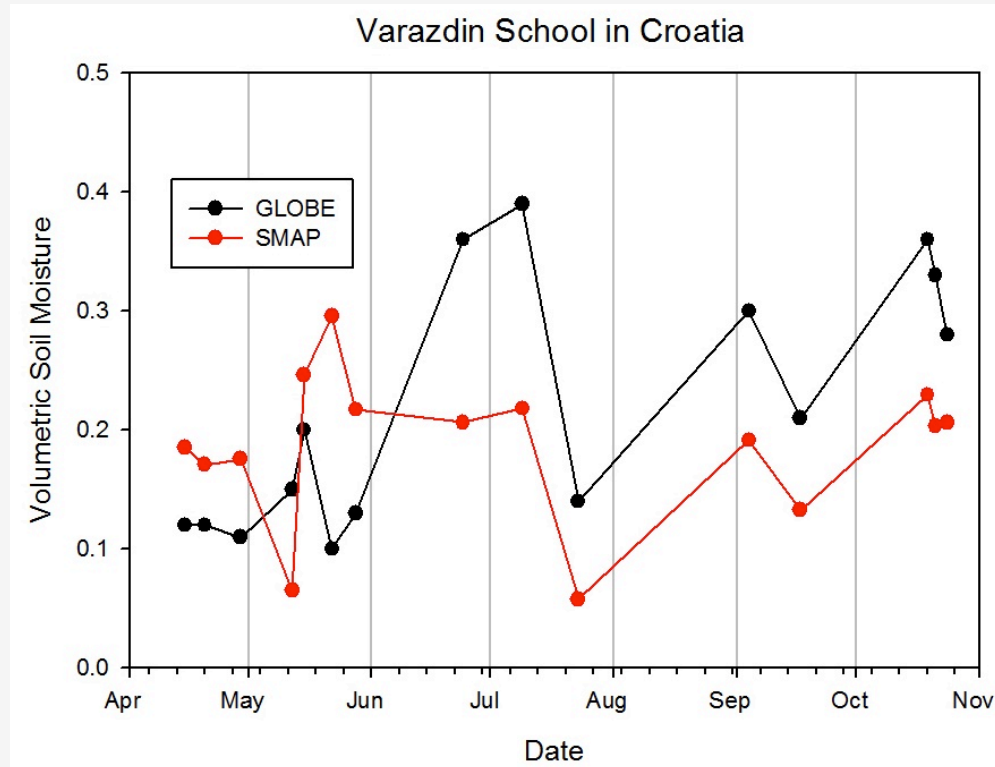
Uploading Soil Moisture Measurements to GLOBE



Visualizing SMAP Data



Comparison Between SMAP and GLOBE



How to Join the GLOBE Program and Participate in SMAP

<http://www.globe.gov/web/smap/overview/how-to-participate/>



smap.jpl.nasa.gov

