

SMAP Block Pattern Soil Moisture Protocol

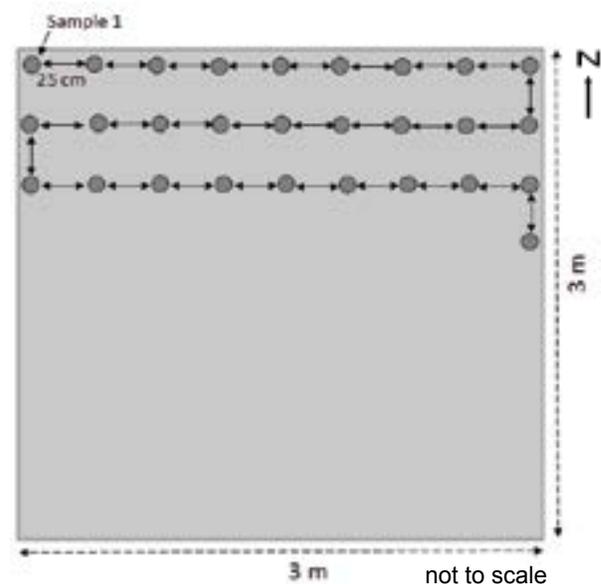
Field and Lab Guide

Task

Collect a soil moisture sample of the top 5 cm of soil for comparison with SMAP observations. Taking these samples in the early morning at approximately 9:00 A.M. local time will allow for optimal comparison with the SMAP data as this is closer to the SMAP time of acquisition.

What You Need

- [Site Definition Sheet](#)
- [Soil Moisture Data Sheet – SMAP Block Pattern](#)
- 500 mL graduated cylinder
- Balance or scale with 0.1 g sensitivity and at least 400 g capacity (600 g recommended)
- 1 soil moisture sample can
- 1 soil moisture sample can lid or plastic wrap for water tight covering of the can
- Permanent marker for writing on sample cans
- Soil drying oven or 250 Watt infrared heating lamps that reach temperatures of 65 – 90° C
- Thermometer capable of measuring to 110° C (if using a conventional drying oven)
- Hot pads or oven mitts for handling dried soil samples
- Meter stick
- Ruler marked in millimeters
- Trowel
- Clay or putty
- Hammer
- Nail
- Wood block
- zip lock bag(s)
- Pen or pencil
- flag
- Science Log



In the Classroom Before Sampling

1. Collect required equipment. You may wish to prepare sample cans for multiple measurement days at the same time.
2. Place small hole in bottom of can with hammer and nail.

3. Weigh sample can without the lid and record the weight.
4. Label the sample can with a permanent marker.
5. Calibrate the balance according to the manufacturer's directions. In your science log, record the standard mass used to calibrate the balance. If using an electronic balance, check that the balance is measuring in grams and is zeroed properly.

In the Field – Preparation of the Soil Moisture Site

1. Complete the *Site Definition Sheet*.
2. Lay out a 3 m x 3 m rectangular area that is flat, uniform in surface character, not under tree or shrub canopy, and relatively free of rocks.
3. Mark the four corners of this Block Pattern Sample area with permanent flags or other markers. The first sample will be at the Northwest corner of the 3 m x 3 m area. The second day, another sample will be collected 25 cm away along a row 25 cm from the previous, following the pattern as displayed in the image on the SMAP Block Pattern Soil Moisture Protocol Field and Lab Guide.

In the Field – Daily Measurement

1. Complete the top portion of the *Soil Moisture Data Sheet – SMAP*.
2. Locate your sampling point within the 3 x 3 meter block, 25 cm from the previous sample point, and cut or pull away any grass or ground cover.
3. Push the sample can into the soil all the way so that the bottom of the can is even with the ground surface (image 1); if necessary gently tap the can into the soil using the wood block and hammer (image 2). The wood block spreads the force of the hammer over the bottom of the sample can to minimize the chance of deforming the shape of the can.
4. Use the trowel to dig the filled sample can out of the soil (image 3); put the trowel underneath the sample can and lift it out without spilling any of the sample in the can.
5. Seal the sample using the lid or plastic wrap to ensure that it retains all its moisture content. If possible, place the sealed sample container in a sealable bag (e.g., zip lock bag) in order to further ensure that moisture is not lost.
6. Place a flag or other marker in the spot from which the sample was taken so that it is clear where to take future samples.



Image 1, pushing sample can into soil



Image 2, gently tap sample can with wood block and hammer



Image 3, use trowel to dig up sample can

In the Lab

1. As soon as possible after returning to the lab, remove the lid or moisture proof covering from the sample can.
2. Weigh the soil sample in the container without the lid (Image 4). Record the mass to the nearest 0.1 g as the *Wet Mass* on the *Soil Moisture Data Sheet – SMAP Block Pattern*.
3. Dry your sample in the soil drying oven for several hours (Image 5). If using a heating lamp dry under the lamp for at least 2 days.
4. When your sample is dry, record the drying time and oven (or heating lamp) used (including temperature range) on the *Data Sheet*.
5. Remove the sample from the oven or from under the heating lamp, being careful not to lose any of the soil.
6. Weigh the sample and record the mass as the *Dry Mass* on the *Data Sheet* (Image 6). You can confirm that your sample is dry by drying it some more, and weighing it again. If the mass doesn't change by more than 0.5 g, it is sufficiently dry.
7. Empty the soil from the container; carefully ensure no soil is sticking to the inner container wall, and save it in an air tight bag or other container for further measurements.
8. Clean and dry the container.
9. Every 10th sample, determine the volume of the container (steps 9-12): Use a small amount of clay to fill the nail hole in the bottom of the can. Clay should not squeeze up into the interior can space through the hole or create a bump on the bottom of the can, preventing it from sitting flat.
10. To measure the volume of the clean, dry container, fill the 500 mL graduated cylinder with water. Record the initial volume (V_i) of water in milliliters. Pour water from the cylinder into the container filling it to the brim (Image 7). Record the volume of water remaining in the graduated cylinder (V_f). To obtain the volume of the container, subtract the remaining volume of the water in the graduated cylinder (V_f) from the initial volume (V_i) of water. This calculation, $(V_i) - (V_f)$, will provide you with the volume of the container.
11. Thoroughly dry the sample container.
12. Repeat step 10 two more times.
13. Complete the *Soil Moisture Data Sheet – SMAP Block Pattern* and report your measurements to GLOBE.
14. After all measurements have been conducted, it's good practice to return the sample to the sample site. While it's not possible to replace the soil back to the sample site exactly as found, placing the soil back in the hole from which it was extracted is good soil conservation practice. This will also prevent gaping holes from collecting precipitation, adversely affecting moisture content in nearby areas. Remove the clay from the hole in the bottom of the can before collecting additional soil samples.



Image 4, weigh wet mass sample and can

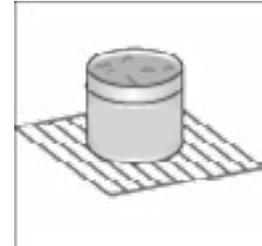


Image 5, dry sample without lid in oven



Image 6, weigh dry mass sample and can

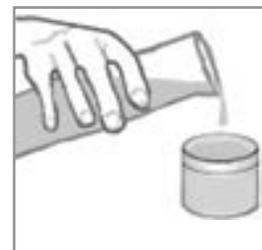


Image 7, measure volume of sample can