SMAPVEX08 In Situ Soil Moisture Data, Version 1

USER GUIDE

How to Cite These Data

As a condition of using these data, you must include a citation:

Cosh, M. and T. Jackson. 2015. *SMAPVEX08 In Situ Soil Moisture Data, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/C98E2L0ZTWO4. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT NSIDC@NSIDC.ORG

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/SV08SM

National Snow and Ice Data Center

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1 DETAILED DATA DESCRIPTION

This data set is comprised of several parameters from in situ measurements for the Soil Moisture Active Passive Validation Experiment 2008 (SMAPVEX2008). The study site was divided into regional squares, approximately .08 km by .08 km in size, with several sample point locations.

1.1 Format

Data are provided in Microsoft Excel and ASCII text files. An associated Extensible Markup Language (XML) metadata file is also provided for each data file. Table 1 describes the soil sampling data columns for the data file `SMAPVEX08_GVSM_Final.xls`. Blank fields indicate missing data.

Table 1. Data Fields and Descriptions

Column Heading	Description
Date	2-digit month/2-digit day/2-digit year
Site_ID	Field site: watershed sampling identification number
Sample	Sample location number within the field site
Start time	Start Time of sampling in Central Daylight Time
IRT_SG	Infrared Thermometer Reading, Shadowed Ground
IRT_EG	Infrared Thermometer Reading, Sun-Exposed Ground
IRT_SV	Infrared Thermometer Reading, Shadowed Vegetation
IRT_EV	Infrared Thermometer Reading, Sun-Exposed Vegetation
Temp_1cm	Soil Temperature at 1 cm depth
Temp_5cm	Soil Temperature at 5 cm depth
Temp_10cm	Soil Temperature at 10 cm depth
A_mv	Theta Probe millivolt reading in V, position A
B_mv	Theta Probe millivolt reading in V, position B
C_mv	Theta Probe millivolt reading in V, position C
A_VSM	Theta Probe Volumetric Soil Moisture (VSM) from general calibration in m3/m3, position A
B_VSM	Theta Probe VSM from general calibration in m3/m3, position B
C_VSM	Theta Probe VSM from general calibration in m3/m3, position C
A_VSM_SCC	Theta Probe VSM from site specific calibration in m3/m3, position A
B_VSM_SCC	Theta Probe VSM from site specific calibration in m3/m3, position B
C_VSM_SCC	Theta Probe VSM from site specific calibration in m3/m3, position C
CanID_0-6cm	Can identification number for 0-6 cm measure

Column Heading	Description
Can_Wgt_0-6cm	Weight of Can (g) for 0-6 cm measure
Wet_Wgt_0-6cm	Wet weight (g) for 0-6 cm measure
Dry_Wgt_0-6cm	Dry weight (g) for 0-6 cm measure
GSM	Gravimetric Soil Moisture in cm3/cm3 for 0-6 cm
GVSM	Volumetric Soil Moisture in m3/m3 for 0-6 cm

Table 2 describes the latitude and longitude columns in the data file `AllTeamGPS.txt`.

Table 2. Data Fields and Descriptions

Column Heading	Description
Point	Field site (Site ID) and sample location number; for example, A01 is A01-4 field site with sample location number 4).
Latitude	WGS84 Latitude
Longitude	WGS84 Longitude

1.2 File Naming Convention

`SV08SM_SMAPVEX08_GVSM_Final.xls` contains the soil moisture data from ground sampling.

`SV08SM_AllTeamGPS.txt` contains the latitude and longitude data for the sampling points.

1.3 File Size

The data file is approximately 595 KB.

1.4 Spatial Coverage

Southernmost Latitude: 38.93°N
Northernmost Latitude: 39.09°N
Westernmost Longitude: 76.25°W
Easternmost Longitude: 75.55°W

1.4.1 Spatial Resolution

Sampling was performed on sites approximately one quarter section (0.8 km by 0.8 km) in size. Eight points were sampled in each site.

1.4.2 Projection and Grid Description

Latitude and longitude (WGS84)

1.5 Temporal Coverage

29 September 2008 through 13 October 2008.

1.5.1 Temporal Resolution

Measurements were taken every two to three days.

1.6 Parameter or Variable

Parameters in this data set include gravimetric soil moisture, volumetric soil moisture, soil and surface temperature, electrical conductivity. The following table describes the units of measurement and sources of each parameter:

1.6.1 Parameter Description

Parameters in this data set include gravimetric soil moisture, volumetric soil moisture, soil and surface temperature, electrical conductivity. The following table describes the units of measurement and sources of each parameter.

Table 3. Parameter, Units, and Sensors

Parameter	Unit of Measurement	Sensor	Parameter
Gravimetric soil moisture	grams of water per grams of dry soil*100%	Manual soil collection	Gravimetric soil moisture
Surface and soil temperature	°C	OS643-LS Infrared Pyrometers and Temperature Probes	Surface and soil temperature
Volumetric Soil Moisture	Water Fraction Volume (m3/m3)*100%	Theta Probes and manual soil collection	Volumetric Soil Moisture
Electrical Conductivity	millivolts	Theta Probe	Electrical Conductivity
Parameter	Unit of Measurement	Sensor	Parameter

1.6.2 Parameter Ranges

Valid parameter values lie in the following ranges:

Gravimetric soil moisture: 0 - 60 %
Volumetric soil moisture: 0 - 60 %
Surface and soil temperature: 0 - 40°C
Electrical conductivity: 0 - 60 %

2 SOFTWARE AND TOOLS

No special tools are required to view these data. A spreadsheet program which recognizes tab-delimited text files, such as Microsoft Excel, is recommended. Any word-processing program or Web browser will also display the data.

3 DATA ACQUISITION AND PROCESSING

3.1 Theory of Measurements

Sampling for this SMAPVEX08 data set was performed on sites approximately one quarter section (0.8 km by 0.8 km) in size. Eight points were sampled in a field for Theta Probe volumetric soil moisture and voltage measurements.

3.2 Sensor or Instrument Description

Investigators used theta probes to measure surface volumetric soil moisture. The probes were Type ML2 manually-operated impedance instruments manufactured by Delta-T Devices, Ltd. The

theta probes have 4 separate 6-cm stainless steel rods inserted vertically into the soil. Each instrument was connected to a handheld reader, which delivers the electrical pulse, detects the return signal, and converts the period to a voltage between 0 V and about 1 V. Watershed surface soil moisture was sampled each morning (9:00AM-12:00AM) during the experiment.

3.3 Processing Steps

3.3.1 Gravimetric Processing

Researchers weighed the wet soil obtained in the field, heated the soil in an oven to dry it, and then weighed the dry soil.

3.3.2 Calibration of Probe Measurements

The software provided by the probe manufacturer calibrates the theta probes by calculating an estimate of volumetric soil moisture according to the following equation:

$$\text{Theta} = (1.07 + 6.4 \times V - 6.4 \times V2 + 4.7 \times V3 - a0) / a1 ,$$

where a0 and a1 are 1.6 and 8.4, respectively. These estimates are provided in the data files.

Researchers also performed field-specific calibrations for each sampled field. Soil moisture values obtained using the gravimetric sampling technique were compared with the theta probe readings of the corresponding locations. A regression relationship was developed, and revised volumetric soil moisture values were estimated for the theta probe measurements.

3.4 Error Sources

The field-specific calibration of the soil moisture values (using the soil core samples) ensures high accuracy and minimizes potential errors.

For various reasons, including severe weather restrictions and cultivation, some sites were not sampled on particular days. Most field locations have a geolocation error of approximately 15 m.

4 VERSION HISTORY

Version 1 (June 2015)

5 REFERENCES AND RELATED PUBLICATIONS

Cosh, M. H., T. J. Jackson, R. Bindlish, J. S. Famiglietti, and D. Ryu. 2005. A Comparison of Soil Moisture Impedance Probe Calibration Techniques. *Journal of Hydrology*. 31(1-4): 49-58.

6 CONTACTS AND ACKNOWLEDGMENTS

6.1 Investigators

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6.2 Acknowledgments

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7 DOCUMENT INFORMATION

7.1 Publication Date

June 2015

7.2 Date Last Updated

February 2025