SMAPVEX12 Probe-Based In Situ Soil Moisture Data for Forest Area, Version 1

USER GUIDE

How to Cite These Data

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

Moghaddam, M. and A. Berg. 2014*. SMAPVEX12 Probe-Based In Situ Soil Moisture Data for Forest Area, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/2ETTBINRTSKX. [Date Accessed].

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

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/SV12PSMF/

National Snow and Ice Data Center

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1 DATA DESCRIPTION

This data set contains in situ soil moisture data collected at several forested sites as a part of the Soil Moisture Active Passive Validation Experiment 2012 (SMAPVEX12).

1.1 Parameters

Parameters in this data set include volumetric soil moisture, and both the real and imaginary part of the dielectric constant. Table 1 describes the units of measurement and sources of each parameter.

Table 1. Parameter Units and Sensors

Parameter	Unit of Measurement	Sensor	Valid range
Volumetric soil moisture	Water Fraction Volume (m3/m3)	Hydra Probe II	0 - 0.6 m^3/m^3
Soil temperature	degrees Celsius	Thermometer	0 - 30°C
Dielectric constant (real and imaginary part)	Unitless	Hydra Probe II	0 - 110
Depth of the organic layer	Inch	Measuring Stick	0 - 30 in

1.2 File Information

1.2.1 Format and File Contents

Data are provided in a single Microsoft Excel file containing one worksheet per site: F1, F2, F3, F5. Table 2 describes the soil sampling data columns of the data file, `SV12PSMF_SMAPVEX_SoilDATA_final_03142013.xlsx`.

Table 2. Data Fields and Descriptions

Column Heading	Description
DATE	Date of the samples
SITE ID	ID of the forest site (F1, F2, F3 or F5)
LOC ID	ID of the sample location
LAT	Latitude of the sampling location
LON	Longitude of the sampling location
SOIL D1	Depth of the organic layer in inches: corner 1
SOIL D2	Depth of the organic layer: corner 2

Column Heading	Description
SOIL D3	Depth of the organic layer: corner 3
SOIL D4	Depth of the organic layer: corner 4
SM1	Volumetric soil moisture: sample 1
SM2	Volumetric soil moisture: sample 2
SM3	Volumetric soil moisture: sample 3
Probe Type	Type of the soil moisture probe (Hydra or Theta Probe)
T0	Surface temperature measurement in degrees Celsius
T5	Temperature measurement at 5 cm depth in degrees Celsius
T10	Temperature measurement at 10 cm depth in degrees Celsius
EPS REAL1	Real part of dielectric constant for the soil moisture sample 1
EPS IMAG1	Imaginary part of dielectric constant for the soil moisture sample 1
EPS REAL2	Real part of dielectric constant for the soil moisture sample 2
EPS IMAG2	Imaginary part of dielectric constant for the soil moisture sample 2
EPS REAL3	Real part of dielectric constant for the soil moisture sample 3
EPS IMAG3	Imaginary part of dielectric constant for the soil moisture sample 3

Missing data are represented by a blank [ ] or by `NaN`.

1.3 Spatial Information

1.3.1 Coverage

Southernmost Latitude: 49.44°N

Northernmost Latitude: 49.96°N

Westernmost Longitude: 98.51°W

Easternmost Longitude: 97.85°W

1.3.2 Resolution

For each site, sampling was performed on two orthogonal transects within a circle of approximately 100 m radius.

1.4 Temporal Information

1.4.1 Coverage

Measurements were taken every one to eight days from 07 June 2012 through 13 July 2012.

2 DATA ACQUISITION AND PROCESSING

2.1 Acquisition

2.1.1 Section Sampling

The soil and vegetation sampling approaches used for the agriculture cropland and forest sites was different, due to the inherent differences in the characteristics of these landscapes, the measurement strategies for forests and crops, and the ease of access to the sites.

One sample site was located in each of the four forest sites (Figure 1) and was chosen to be representative of the heterogeneity of the site. The observation area for both soil moisture and vegetation sampling within each site consisted of two orthogonal transects within a circle of 100 m radius (Figure 2). Each of the nine sampling points was spaced 50 m apart. Points were flagged and their GPS coordinates were determined at the beginning of the campaign to facilitate navigation back to each point. At each sampling point, organic soil thickness was determined at four corners of a 10 inch quadrant (Figure 3).

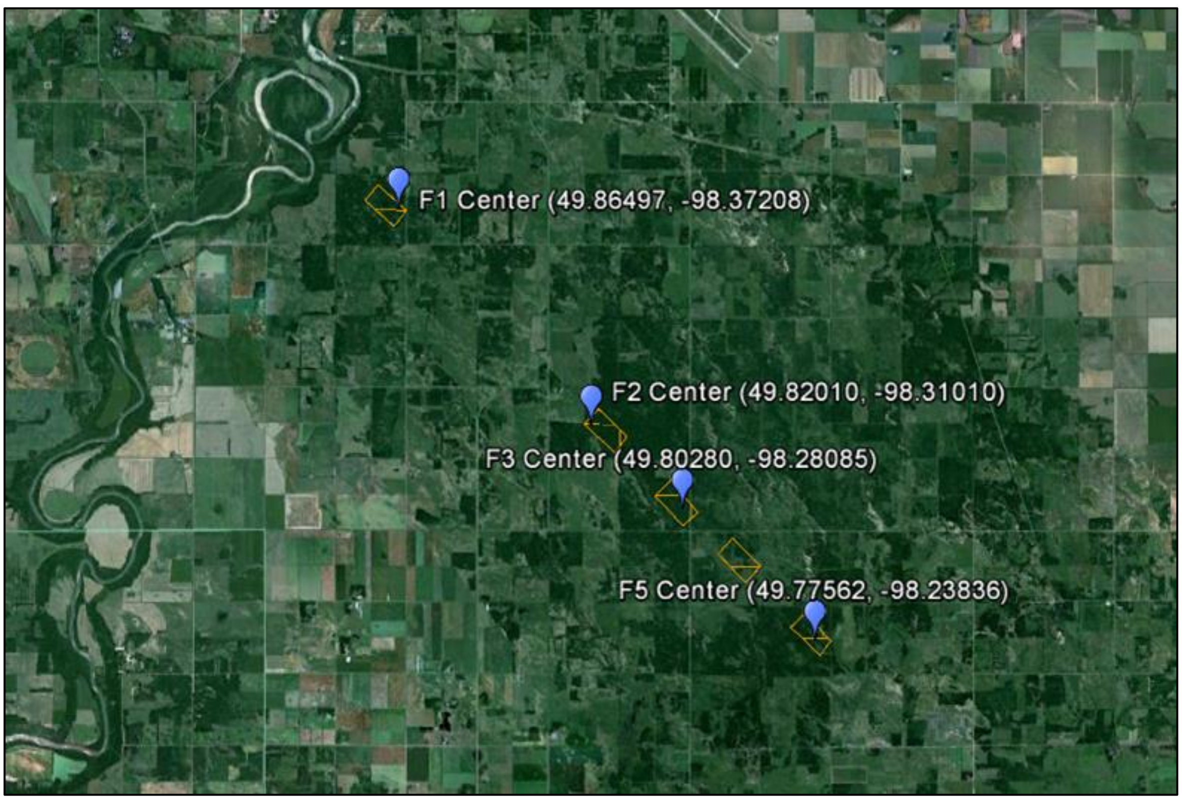

Figure 1. Map of Forest Study Sites (Site ID F1, F2, F3, F5)

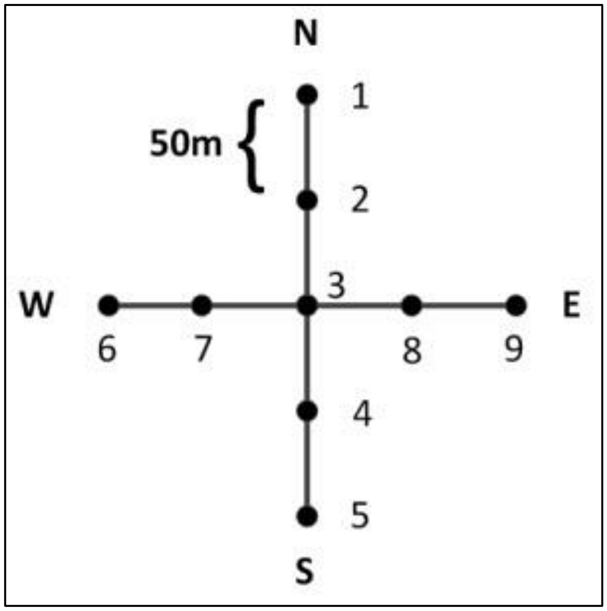

Figure 2. Schematic diagram of sample locations (Location ID) with the forest sites.

Figure 3. Organic soil thickness was determined at four corners of a 10 inch quadrant.

See more details in section 2.1.1 of the SMAPVEX12 Database Report, released 18 December 2012.

2.2 Processing

2.2.1 Calibration of the Probe Measurements

Similar to the agricultural fields a unique calibration curve (R2=.798, p<0.05, n=37) was developed between the volumetric cores obtained from the forest sites and the Steven's Hydra Probe soil moisture measurements obtained at the same location. Points which fell outside 1.5 times the standard deviation of the difference between the core and the probe measured soil moisture were determined to be outliers and removed from the data set. A leave-one-out validation was conducted (Rowlandson et al. 2013) and indicated that the calibration equation was robust. The RMSE of the developed equation was .058 m3m-3, a RMSE greater than that determined in agricultural fields. It is anticipated that the higher RMSE was due to the complications of obtaining soil samples (and probe readings) over these sites due the amount of litter material in the soils.

2.3 Quality, Errors, and Limitations

The RMSE of the developed calibration equation was .058 m^3m^{-3}, a RMSE greater than that determined in agricultural fields. It is anticipated that the higher RMSE was due to the complications of obtaining soil samples (and probe readings) over these sites due the amount of litter material in the soils.

2.4 Instrumentation

2.4.1 Description

Investigators used the Stevens Hydra Probe II to measure surface volumetric soil moisture.

2.4.1.1 Hydra Probes

Hydra Probes are based on coaxial impedance dielectric reflectometry. The probes were connected to a PDA. They use an oscillator to generate an electromagnetic signal at 50 MHz that is propagated through three metal tines into the soil. The part of the signal that is reflected back to the unit is measured in volts and is used to numerically solve Maxwell's equations, to calculate the impedance and the real and imaginary dielectric permittivity.

3 SOFTWARE AND TOOLS

No special tools are required to view these data. A spreadsheet program such as Microsoft Excel is recommended.

4 CONTACTS AND ACKNOWLEDGMENTS

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5 REFERENCES

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Rowlandson, T. L., A. A. Berg, P. R. Bullock, E. R. Ojo, H. McNairn, G. Wiseman, and M. H. Cosh. 2013, In Press. Evaluation of Several Calibration Procedures for a Portable Soil Moisture Sensor. *Journal of Hydrology.*

6 DOCUMENT INFORMATION

6.1 Publication Date

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6.2 Date Last Updated

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