SMAPVEX12 In Situ Vegetation 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. 2014. *SMAPVEX12 In Situ Vegetation 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/ZOBW4CNJZAW1. [Date Accessed].

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FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/SV12VF

National Snow and Ice Data Center

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1 DATA DESCRIPTION

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

1.1 Parameters

The parameters included in this data are described in Table 1.

Table 1. Parameter units and valid ranges

Parameter	Description	Unit	Valid range
Tree height	Total height of a tree	m	0 - 30
Trunk height	Height of the trunk	m	0 - 30
Canopy height	Height of the canopy measured from the first live branch	m	0 - 30
Understory height	Height of the forest understory	m	0 - 2
Diameter at breast height (DBH)	Trunk diameter at the height of 1.3 m	inch or m	0 - 20 or 0 - 0.5
Number of branches	Count of primary, secondary or tertiary branches	n/a	0 - 100
Angle of branches	Angle of branches with respect to trunk or primary branch	deg	0 - 180
Length of branches		inch	0 - 300
Weight	Weight of leaves or trunk wafers, before or after drying, with or without sample-holding bag	kg	0 - 5
Thickness	Trunk wafer thickness	cm or m	0 - 10 or 0 - 0.1
Volume	Trunk wafer volume	m^3	0 - 0.01

1.2 File Information

1.2.1 Format and File Contents

Data are provided in five Microsoft Excel (.xlsx) file and their associated Extensible Markup Language (.MET.xml) metadata files, plus one geolocation ASCII (.txt) file.

The data files and their contents are as follows:

- `SV12VF_SMAPVEX_Forest_VegDATA_final_8Jan.xlsx` contains site survey information.

- SV12VF_SMAPVEX_Forest_F(X)_intensive sampling_final_8Jan.xlsx contains intensive sampling of one tree per site (F1, F2, F3, and F5).
- SV12VF_Field_Sites_ver4_coords.txt contains location coordinates of the sampling sites.

Measurements gathered in north-south and east-west transects of each site (F1, F2, F3, and F5) are provided in separate worksheets within the SV12VF_SMAPVEX_Forest_VegDATA_final_8Jan.xlsx file. Column descriptions are provided in Table 2 below.

Table 2. Data Column Descriptions for SV12VF_SMAPVEX_Forest_VegDATA_final_8Jan.xlsx

Column Heading	Description
SITE ID	ID of the site
TREE #	Number of the tree along the transect
10M BIN	Distance of the tree to the starting point of the transect
NOTE TO TREE	Notes regarding the trees
DBH (IN) PREV	Diameter at breast height ("previous" measure)
DBH (IN) UPD	Diameter at breast height ("updated" - and preferred - measure)
HEIGHT (M)	Height of the tree
SPECIES	Species of the tree (where "TA" stands for Trembling Aspen)
TYPE FLAG	Flag indicating the type of the tree
TRUNK HEIGHT (M)	Height of the trunk of the tree
# OF PRIMARY BRANCHES	Number of primary branches in the tree
ANGLE OF PRIMARY BRANCHES	Average angle of primary branches in the tree
FRACTIONAL GROUND COVER (%)	Description of the ground cover as a fraction of total area
UNDERSTORY HEIGHT (M)	Height of the understory vegetation

Note: The value NaN ("Not a Number") indicates missing data.

The measurements of the representative tree of each site are stored in their own files named as follows:

- SV12VF_SMAPVEX_Forest_F1_intensive sampling_final_8Jan.xlsx
- SV12VF_SMAPVEX_Forest_F2_intensive sampling_final_8Jan.xlsx
- SV12VF_SMAPVEX_Forest_F3_intensive sampling_final_8Jan.xlsx
- SV12VF_SMAPVEX_Forest_F5_intensive sampling_final_8Jan.xlsx

Most of the files contain worksheets for (1) general information regarding the tree, (2) the diameter and water content of the tree, (3) primary branch information, (4) secondary branch information, and (5) leaf water content information. Tables 3-7 describe the general contents of each worksheets columns; data field and worksheet titles may vary across site files.

Table 3. Sheet 1: General Information

Data Field	Description
Date	Date of the sample
Site ID	ID of the site
DBH	Diameter at breast height of the tree
Estimated tree trunk	Height of the trunk of the tree
Canopy height	Height of the canopy from the first live branch
Lat	Latitude coordinate of the tree
Lon	Longitude coordinate of the tree

Table 4. Sheet 2: Diameter and Water Content of the Trunk

Data Field	Description
Point ID	ID of the sampling (cutting) location (starting from the DBH measurement location)
Trunk Height (m)	Height of the sampling (cutting) location
Trunk Diameter (inch)	Diameter at the sampling (cutting) location in inches
Trunk Diameter (m)	Diameter at the sampling (cutting) location in meters
Cookie Wet Mass with Bag (kg)	Total mass of the about 3 cm thick wafer (cookie)
Cookie Dry Mass (kg)	Dry mass of the sample wafer
Cookie Water Mass (kg)	Water content of the sample wafer
Cookie Dim1 (cm)	Thickness of the sample wafer
Cookie Dim2 (cm)	Thickness of the sample wafer
Cookie Dim3 (cm)	Thickness of the sample wafer
Cookie Dim4 (cm)	Thickness of the sample wafer
Average Cookie Height (m, mm)	Average thickness of the sample wafer
Cookie Volume (m^3)	Volume of the sample wafer

Table 5. Sheet 3: Primary Branch Information

Data Field	Description
Primary Branches	ID of the primary branch
Length (inch)	Length of the primary branch
Diameter (inch)	Diameter of the primary branch
Angle off trunk (deg)	Angle of the primary branch with respect to the trunk
# of second order	Number of second order branches in the primary branch
# of third order	Number of third order branches in the primary branch

Table 6. Sheet 4: Secondary Branch Information

Data Field	Description
Secondary branch	ID of the secondary branch in the primary branch
Length (inch)	Length of the secondary branch
Diameter (inch)	Diameter of the secondary branch
Angle off Primary	Angle of the secondary branch with respect to the primary branch

Table 7. Sheet 5: Leaf Water Content Information

Data Field	Description
Site ID	ID of the site
Sample ID	ID of the sample
Description	Description of the sample
Wet Weight with Bag (kg)	Total mass of the leaves (including the bag)
Dry Weight plus Bag (kg)	Dry weight of the leaves (including the bag)
Bag Weight (kg)	Weight of the bag
Dry Weight (kg)	Dry weight of the leaves
Water Mass (kg)	Water content of the leaves

Column descriptions for the geolocation file are provided in Table 8.

Table 8. Column descriptions for SV12VF_Field_Sites_ver4_coords.txt

OBJECTID	ID of the data record
Site_ID	ID of the field and the sample point within the field
X	UTM easting coordinate (meters)
Y	UTM northing coordinate (meters)

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

In situ measurements were sampled every 10 m.

1.3.3 Geolocation

Data are provided in Universal Transverse Mercator (UTM), Zone 14 N, World Geodetic System 1984 (WGS84) coordinates.

1.4 Temporal Information

1.4.1 Coverage and Resolution

In situ samples and measurements were collected periodically from 07 June through 17 July 2012.

2 DATA ACQUISITION AND PROCESSING

SMAPVEX12 forest vegetation sampling was divided into three parts: (1) spatial sampling, (2) destructive sampling, and (3) dielectric constant measurements. The spatial sampling took place 07 June to 28 June, and the destructive sampling and dielectric measurements occurred 29 June to 17 July.

Spatial sampling involved recording and flagging every tree with a diameter at breast height (DBH) of more than 1 inch (2.54 cm) within +/- 1 meter of the transect line. This was done for both transects within an observation area. For each tree, the following parameters were measured:

- DBH in inches;
- Height in meters; and
- Species

The DBH was measured with a DBH tape at breast height. The height was recorded with a hypsometer. While standing more than 10 meters away from the tree, two measurements were

taken with the hypsometer: distance to base of tree and distance to top of tree. The hypsometer then displays the total height. This is a standard technique to measure tree heights, but posed a challenge in denser forests such as F2, F3 and F5 since there was a dense understory preventing line of sight measurements. The tree species was recorded by consulting a standard tree field guide, in this case "Trees in Canada" by John L. Farrar.

The spatial sampling measurements allowed better understanding of the denser forest sites covered in this campaign. Measurements such as forest density, tree height, DBH, tree species, as well as detailed information about branches and understory, are essential to successfully parameterize radar backscattering models. At every 10 meters along the transect the GPS coordinates and more detailed parameters were recorded, including:

- Trunk height in meters;
- Number of primary branches;
- Angle of primary branches;
- Fractional ground cover in percent; and
- Understory height in meters.

These measurements were generally taken on the tree at the 10 m point closest to the transect line. Trunk height was recorded with the hypsometer or a yard stick. The number and angle of primary branches were recorded based on visual inspection. The fractional ground cover and understory height were measured by laying down a quadrat in a representative area close to the 10 m point and recording the values based on visual inspection or by using a yard stick for the height. Destructive sampling involves harvesting an "average" tree for intensive destructive measurements. One "average" tree per field was felled using a chainsaw and the following parameters were measured:

- Trunk diameter at each 30 cm interval;
- Wafer of approximately 3 cm thickness for gravimetric measurements at each 30 cm interval;
- Primary branch angles;
- Number of branches (primary, secondary) and leaf count;
- All branch lengths, diameters, and when possible, dielectric constant;
- 3-4 samples of branches for gravimetric measurements; and
- Note on leaf clumping.

At the time of destructive sampling, the spatial information was not processed. The "average" tree was selected based on visual inspection of diameter and height compared to other trees in the forest. Along with the spatial sampling information, these parameters are essential in the electromagnetic modeling of forests. Trunks and branches are modeled as cylinders with the same properties (diameters, length, dielectric, branch angle, etc.) as the average tree in the site. The measurements above provide the distributions needed to do such modeling.

See more details in sections 1.1 and 2.1.3 of the SMAPVEX12 Database Report, released 18 December 2012.

2.1 Quality, Errors, and Limitations

In general, the quality of the data meets the typical quality expected from this type of field campaign with the given sampling strategy. See details of the sampling approach in section 2.2.3 of the SMAPVEX12 Database Report, released 18 December 2012.

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

Mahta Moghaddam
Department of Electrical Engineering
University of Southern California
Los Angeles, CA 90089 USA

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5 DOCUMENT INFORMATION

5.1 Publication Date

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5.2 Date Last Updated

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