SMEX02 Watershed Vitel Network Soil Moisture Data, Walnut Creek, Iowa, Version 1

USER GUIDE

How to Cite These Data

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

Jackson, T. and M. Cosh. 2003. *SMEX02 Watershed Vitel Network Soil Moisture Data, Walnut Creek, Iowa, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/QVYK0YPVIRW6. [Date Accessed].

National Snow and Ice Data Center

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1   DETAILED DATA DESCRIPTION

1.1 Format

Data consist of tab-delimited ASCII text files. The following table describes the column headings for each data file.

Heading	Description
Year	Four-digit year
DOY	Numerical day of year
Hour	Local daylight savings time

Site	Watershed site number (corresponds to the data file name):
	  3 = WC03 41.9802° N 93.7399° W
	  6 = WC06 41.9330° N 93.7534° W
	  13 = WC13 41.9521° N 93.6877° W
	  14 = WC14 41.9460° N 93.6961° W
	151 = WC151 41.9378° N 93.6632° W
	152 = WC152 41.9378° N 93.6647° W
	161 = WC161 41.9342° N 93.6627° W
	162 = WC162 41.9355° N 93.6641° W
	  23 = WC23 41.9925° N 93.5351° W
	  24 = WC24 41.9928° N 93.5288° W
	  25 = WC25 41.9423° N 93.5394° W
	  33 = WC33 41.9755° N 93.6444° W

V1	Voltage 1
V2	Voltage 2
V3	Voltage 3
V4	Voltage 4
Soil	Soil type (1 = Sand; 2 = Silt; 3 = Clay)
Ercent	Real dielectric constant
Eicent	Imaginary dielectric constant
Temp	°C
Ercent25	Real dielectric constant, temperature corrected to 25° C
Eicent25	Imaginary dielectric constant, temperature corrected to 25° C
Waterwfv	Water fraction volume in m^3/m^3 (volumetric soil moisture)
NACLburden	Soil salinity in g NaCl/liter

Heading	Description
Concent	Soil conductivity in S/m
concent25	Temperature-corrected (25 C) soil conductivity in S/m
watercond	Temperature-corrected (25 C) soil water conductivity in S/m

1.2 File and Directory Structure

There are 12 data files (ASCII text files), one for each probe. All files are located in the tower_vitel_sensors directory.

1.3 File Naming Convention

File names are of the form "WCxxx_HP_VSM.txt," where:

- WC signifies the Walnut Creek watershed site
- xxx is a number that corresponds to the flux tower location near which the probe was installed
- HP signifies Hyrda Probe
- VSM signifies volumetric soil moisture

1.4 Spatial Coverage

Data were collected at sites within approximately:

Southernmost Latitude: 41.9° N

Northernmost Latitude: 42.0° N

Westernmost Longitude: -93.8° W

Easternmost Longitude: -93.4° W

1.5 Temporal Coverage

Data were collected from 23 June 2002 to 12 July 2002.

1.5.1 Temporal Resolution

Data were collected hourly.

1.6 Parameter or Variable

1.6.1 Parameter Description

Parameters in this data set include the following:

Parameter	Unit of Measurement
Soil temperature	°C
Soil moisture	Water fraction volume (m^3/m^3)
Soil salinity	g NaCl/liter
Soil conductivity	MKS unit S/m

1.6.2 Sample Data Record

The following is a sample from file "WC23_HP_VSM.txt." Only the header and the first four data rows are shown; only the first 10 of the 19 columns are shown.

Year	DOY	Hour	Site	V1	V2	V3	V4	Soil	Ercent
2002	177	1000	23	1.9783	1.538	1.2116	0.6332	2	8.8
2002	177	1100	23	1.9745	1.5322	1.2018	0.56798	2	8.82
2002	177	1200	23	1.9718	1.5279	1.1944	0.53559	2	8.83
2002	177	1300	23	1.9711	1.5262	1.1908	0.50254	2	8.84

2 SOFTWARE AND TOOLS

No special tools are required to view these data.

3 DATA ACQUISITION AND PROCESSING

A network of Vitel Hydra Probes was installed near most of the flux towers that were established for the SMEX02 experiment. A total of 12 probes were installed in mid-June 2002 throughout the Walnut Creek watershed area at a depth of 5 cm. The probes recorded data on an hourly basis.

Figure 1. Flux Tower

3.1 Derivation Techniques and Algorithms

3.1.1 Processing Steps

The Vitel Type A Hydra Probe (HP) soil moisture probe determines soil moisture and salinity by making a high frequency (50-MHz) complex dielectric constant measurement, which simultaneously resolves the capacitive and conductive parts of a soil's electrical response. The capacitive part of the response is most indicative of soil moisture, while the conductive part reflects mostly soil salinity. Temperature is determined from a calibrated thermistor incorporated into the probe head.

The HP has three main structural components: a multiconductor cable, a probe head, and sensing tines. The probes were installed horizontally in the soil, with the center tine at a depth of 5 cm.

The HP measured the real and imaginary dielectric constants. Because both the real and imaginary dielectric constants vary somewhat with temperature, a temperature correction using the measured soil temperature is applied to produce temperature-corrected values for the real and imaginary dielectric constant. The temperature correction amounts to calculating what the dielectric constants should be at 25° C.

The output data from an HP consists of a time stamp and four voltages (V1-V4), which are converted to estimate the soil moisture and soil temperature through a program provided by Stevens-Vitel. The program requires the four voltages and a soil classification (sand=1, silt=2, and clay=3). For this region, silt was used as the appropriate soil type for each of the HP installations.

Preliminary calibration of the probes indicated that with the exception of the WC33 site, the probes measured volumetric soil moisture accurately for the installation location. Therefore, the quality control of these data was limited to removing samples for which the program returned erroneous data because of corrupted voltages. These voltages may be a result of several things, including faulty installation, lightning strikes, and rodent impact. Erroneous samples were removed, so the data are not continuous for every HP.

3.2 Sensor or Instrument Description

Measurements were taken using Vitel Type A Hydra Probes (HP). This version is compatible with Campbell CR-10 data loggers; the temperature output voltage never exceeds 2.5 V. Refer to the manufacturer, Stevens-Vitel for more information.

Figure 2. Vitel Hydra Probe

4 REFERENCES AND RELATED PUBLICATIONS

Please see the SMEX02 site for more information, and the AMSR-E site to access data.

5 CONTACTS AND ACKNOWLEDGMENTS

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6 DOCUMENT INFORMATION

6.1 Publication Date

20 August 2005

6.2 Date Last Updated

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