

Small Gap Soil Moisture Probes Data

5TM

Author(s):	Regarding data questions contact:
Harindra Joseph S. Fernando Mailing address: 156 Fitzpatrick Hall of Engineering, Notre Dame, IN, USA, 46556 Tel./Fax.: 574-631-9346/ 574-631-9236, E-mail and web: Fernando.10@nd.edu, http://cees.nd.edu/profiles/hfernando	Laura S. Leo / Zachariah Silver Mailing address: 156 Fitzpatrick Hall of Engineering, Notre Dame, IN, USA, 46556 Tel./Fax.: 574-631-8419/574-631-9236 E-mail and web: LauraSandra.Leo.13@nd.edu / zsilver@nd.edu, https://engineering.nd.edu/profiles/lleo / https://engineering.nd.edu/profiles/zsilver

1.0 Data Set Overview

1.1 Time period covered by the data

Approximately September - October 2012 and May 2013. For specific times please refer to individual file names.

1.2 Physical location (latitude, longitude, elevation)

40.065436, -113.26218299999999, 1332.252698

1.3 Instrument type

Soil Probe

1.4 Data provider

University of Notre Dame

1.5 Web address references

<http://www3.nd.edu/~dynamics/materhorn/>

https://www.eol.ucar.edu/field_projects/materhorn-x

2.0 Instrument Description

Data collected by 5TM soil probes providing measurements every half minute.



2.1 Instrument website

<https://www.campbellsci.com/cr3000>, <https://www.decagon.com/en/soils/volumetric-water-content-sensors/5tm-vwc-temp/>, <https://s.campbellsci.com/documents/us/manuals/loggernet.pdf> TOA5 file format description (Appendix B, pages: B-4, B-3)

2.2 Table of specifications

Accuracy	Range	Frequency	Resolution
----------	-------	-----------	------------

<p>Apparent Dielectric Permittivity (ϵ_a): ± 1 ϵ_a from 1 - 40 (soil range); $\pm 15\%$ from 40 - 80</p> <p>Soil Volumetric Water Content (VWC): Using Topp equation: ± 0.03 m³/m³ ($\pm 3\%$ VWC) typical in mineral soils that have solution electrical conductivity < 10 dS/m; using medium specific calibration, ± 0.02 m³/m³ ($\pm 2\%$ VWC) in any porous medium Temperature: $\pm 1^\circ\text{C}$</p>	<p>ϵ_a: 1 (air) to 80 (water) Temperature: -40 - 60°C*</p> <p>*Sensors can be used at higher temperatures under some conditions. Contact Decagon for more details.</p>	<p>150 ms, the frequency can be set</p>	<p>ϵ_a: 0.1 ϵ_a from 1-20, < 0.75 ϵ_a from 20-80 VWC: 0.0008 m³/m³ (0.08% VWC) from 0 to 50% VWC Temperature: 0.1°C</p>
---	--	---	--

3.0 Data Collection and Processing

3.1 Description of data collection

3.2 Description of derived parameters and processing techniques used

Original data files are provided.

3.3 Description of quality assurance and control procedures

This dataset was not subject to any quality control or processing it has been provided in its original form.

3.4 Data intercomparisons

4.0 Data Format

4.1 Data file structure

TOA5, (ASCII csv with header)

4.2 File naming convention

dataProvider_instrument[_identifier]_tableNumber_rate_instrumentType_startDateAndTime_endDateAndTime.extension

4.3 Data format

comma delimited ASCII

4.4 Data layout

Each file has four header lines. First header line contains information on the logger and the consecutive three lines provides the column headers (variables, units and measurement types) for all subsequent rows of data contained within the file.

4.5 List of parameters with units, sampling intervals, frequency, range

Consult individual file headers.

4.6 Data version number and date

raw, v1.0, October 2016

4.7 Description of flags, codes used in the data, and definitions

4.8 Data sample

```
"TOA5", "5241", "CR3000", "5241", "CR3000.Std.13", "CPU:5TM.CR3", "32034", "
Data5TM"
"TIMESTAMP", "RECORD", "VWCm(1)", "VWCm(2)", "VWCm(3)", "Temp(1)", "Temp(2)
", "Temp(3)", "TEout(1)", "TEout(2)", "TEout(3)", "Pos_RawEb(1)", "Pos_RawE
b(2)", "Pos_RawEb(3)", "Pos_RawEC(1)", "Pos_RawEC(2)", "Pos_RawEC(3)", "Po
s_RawT(1)", "Pos_RawT(2)", "Pos_RawT(3)", "RawT(1)", "RawT(2)", "RawT(3)",
"VWCp(1)", "VWCp(2)", "VWCp(3)", "Eb(1)", "Eb(2)", "Eb(3)", "ep(1)", "ep(2)
", "ep(3)", "batt_volt"
"TS", "RN", "", "", "", "", "", "", "", "", "", "", "", "", "", "", "", ""
", "", "", "", "", "", "", "", "", "", "", ""
", "", "Smp", "Smp", "Smp", "Smp", "Smp", "Smp", "Smp", "Smp", "Smp", "Smp", "Sm
p", "Smp", "Smp", "Smp", "Smp", "Smp", "Smp", "Smp", "Smp", "Smp", "Smp", "Smp",
"Smp", "Smp", "Smp", "Smp", "Smp", "Smp", "Smp", "Smp", "Smp"
"2013-05-29
18:44:30", 74754, 0.148, 0.178, 0.154, 17.4, 17.5, 25.2, "NAN", "NAN", "NAN", 2,
2, 2, 6, 6, 6, 10, 10, 8, 574, 575, 652, 0, 0, 0, 8.02, 9.46, 8.28, 81.3, 81.2, 78.38, 12
.9
"2013-05-29
18:45:00", 74755, 0.148, 0.178, 0.154, 17.4, 17.5, 25.2, "NAN", "NAN", "NAN", 2,
2, 2, 6, 6, 6, 10, 10, 8, 574, 575, 652, 0, 0, 0, 8.02, 9.48, 8.28, 81.3, 81.2, 78.38, 12
.88
"2013-05-29
18:45:30", 74756, 0.148, 0.178, 0.154, 17.4, 17.5, 25.4, "NAN", "NAN", "NAN", 2,
2, 2, 6, 6, 6, 10, 10, 8, 574, 575, 654, 0, 0, 0, 8.02, 9.48, 8.28, 81.3, 81.2, 78.3, 12.
85
"2013-05-29
18:46:00", 74757, 0.148, 0.178, 0.153, 17.4, 17.5, 25.4, "NAN", "NAN", "NAN", 2,
2, 2, 6, 6, 6, 10, 10, 8, 574, 575, 654, 0, 0, 0, 8.02, 9.48, 8.26, 81.3, 81.2, 78.3, 12.
84
```

5.0 Data Remarks

5.1 PI's assessment of the data

1) Further notes (when available) for each recorded period is in the Records_5TM.xlsx file.

5.2 Missing data periods

5.3 Software compatibility

6.0 References

- [1] Fernando, H. J. S., E. R. Pardyjak, S. Di Sabatino, F. K. Chow, S. F. J. DeWekker, S. W. Hoch, J. Hacker, J. C. Pace, T. Pratt, Z. Pu, J. W. Steenburgh, C. D. Whiteman, Y. Wang, D. Zajic, B. Balsley, R. Dimitrova, G. D. Emmitt, C. W. Higgins, J. C. R. Hunt, J. G. Kniervel, D. Lawrence, Y. Liu, D. F. Nadeau, E. Kit, B. W. Blomquist, P. Conry, R. S. Coppersmith, E. Creegan, M. Felton, A. Grachev, N. Gunawardena, C. Hang, C. M. Hocut, G. Huynh, M. E. Jeglum, D. Jensen, V. Kulandaivelu, M. Lehner, L. S. Leo, D. Liberzon, J. D. Massey, K. McEnerney, S. Pal, T. Price, M. Sghiatti, Z. Silver, M. Thompson, H. Zhang, T. Zsedrovits, 2015: The MATERHORN – Unraveling the Intricacies of Mountain Weather, BAMS, doi: <http://dx.doi.org/10.1175/BAMS-D-13-00131.1>.