SMEX03 Little River Micronet Soil Moisture Data: Georgia, Version 1

USER GUIDE

How to Cite These Data

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

Bosch, D. and M. Cosh. 2008. *SMEX03 Little River Micronet Soil Moisture Data: Georgia, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/O4H3C4V9K5MR. [Date Accessed].

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

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/NSIDC-0329

National Snow and Ice Data Center

TABLE OF CONTENTS

1 DETAILED DATA DESCRIPTION

1.1 Format

Data are presented in ASCII comma-delimited text files. Table 1 details the data fields for each of the nineteen text files.

Table 1. Column Format for All Data Files

Column Heading	Units	Description
Date	MM/DD/YYYY (Month/Day/Year)	Date reading was made
Time	HH:MM (Hour:Minute)	Eastern Daylight Time (EDT)
2Temp	°F (Degrees Fahrenheit)	Soil temperature measurement 2 inches below surface
2WtrCnt	cm^3/cm^3 (Cubic Centimeters/Cubic Centimeters)	Soil water content measurement 2 inches below surface
2Sal	g/L (Grams/Liter)	Soil salinity measurement 2 inches below surface
2Con	mhos/m (Electrical Conductance/Meter)	Soil conductivity measurement 2 inches below surface
8Temp	°F (Degrees Fahrenheit)	Soil temperature measurement 8 inches below surface
8WtrCnt	cm^3/cm^3 (Cubic Centimeters/Cubic Centimeters)	Soil water content measurement 8 inches below surface
8Sal	g/L (Grams/Liter)	Soil salinity measurement 8 inches below surface
8Con	mhos/m (Electrical Conductance/Meter)	Soil conductivity measurement 8 inches below surface
12Temp	°F (Degrees Fahrenheit)	Soil temperature measurement 12 inches below surface
12WtrCnt	cm^3/cm^3 (Cubic Centimeters/Cubic Centimeters)	Soil water content measurement 12 inches below surface
12Sal	g/L (Grams/Liter)	Soil salinity measurement 12 inches below surface
12Con	mhos/m (Electrical Conductance/Meter)	Soil conductivity measurement 12 inches below surface
PrecipPrd	in (Inches)	Total precipitation rain gauge measurement per record period
PrecipDay	in (Inches)	Total precipitation rain gauge measurement per day

1.2 File and Directory Structure

Data are available on the FTP site in the soil_moisture_network directory. Nineteen ASCII files, each representing a different LRW Micronet station, are contained within this directory.

1.3 File Naming Convention

Files are named according to the following convention:

`RG##_MJJA_yyyy_.dat`

Where:

Table 2. Description of File Name Variables

Variable	Description
RG	LRW Micronet rain gauge station (RG = rain gauge)
##	LRW Micronet station identification number
MJJA	Indicates data collected during May, June, July, and August
yyyy	Four-digit year
.dat	Indicates that this is a data file.

Example: `RG08_MJJA_2003.dat`

1.4 Spatial Coverage

The data set covers LRW Micronet stations located in southeastern Georgia:

Southernmost Latitude: 31.4° N

Northernmost Latitude: 31.8° N

Westernmost Longitude: 83.75° W

Easternmost Longitude: 83.4° W

Table 3 lists a detailed geographic description of the 19 LRW Micronet stations. Location information is georeferenced to the World Geodetic System 1984 (WGS 84) datum.

Table 3. Geolocation of Measurements

LRW Micronet Rain Gauge Station	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Northing (Meters)	Easting (Meters)
RG08	31.48656	-83.5737	3486396	255514
RG12	31.52344	-83.63895	3490633	249416
RG16	31.55747	-83.56733	3494245	256307
RG22	31.59112	-83.65478	3498174	248094
RG26	31.62946	-83.61244	3502329	252215
RG31	31.67102	-83.69819	3507136	244193
RG32	31.67275	-83.64213	3507197	249514
RG34	31.69171	-83.69268	3509417	244772
RG37	31.70929	-83.75400	3511512	239007
RG39	31.70491	-83.70537	3510911	243605
RG40	31.71093	-83.67384	3511504	246611
RG43	31.72600	-83.71642	3513275	242616
RG50	31.75212	-83.69296	3516117	244911
RG52	31.75630	-83.75168	3516720	239359
RG63	31.52143	-83.54790	3490205	258057
RG65	31.64325	-83.41135	3503419	271327
RG66	31.67191	-83.60215	3507013	253304
RG67	31.56676	-83.70344	3495586	243409
RG68	31.41240	-83.36482	3477727	275188

1.4.1 Spatial Resolution

The LRW Micronet stations are approximately 9 km apart.

1.5 Temporal Coverage

Data were acquired from 01 May 2003 to 31 August 2003.

1.5.1 Temporal Resolution

This data set includes soil moisture data and precipitation data at 30 minute intervals. Hydra Probe (HP) measurements were recorded every five minutes, then averaged, and rain gauge measurements were recorded every minute, then summed.

1.6 Parameter or Variable

1.6.1 Parameter Description

Parameters for this data set include:

- Precipitation (inches)
- Soil Temperature (°F)
- Volumetric Soil Moisture (cm3/cm3)
- Soil Conductivity (mhos/m)
- Soil Salinity (g/L)

1.6.2 Sample Data Record

Table 4 displays a partial sample of the data file RG08_MJJA_2003.dat. The first four columns and last four columns of the data file are shown for the first four rows.

Table 4. Sample Data Record

Date,	Time,	2Temp	2WtrCnt	..	12Sal,	12Con,	PrecipPrd	PrecipDa
"05/30/2003"	"11:00"	75.28,	0.1673,	..	0.0196	0.00088	0,	0
"05/30/2003"	"11:30"	76.15,	0.1658,	..	0.0187	0.00084	0,	0
"05/30/2003"	"12:00"	77.04,	0.1657,	..	0.0221	0.00098	0,	0
"05/30/2003"	"12:30"	77.94,	0.1658,	..	0.0197	0.00088	0,	0

2 DATA ACQUISITION AND PROCESSING

The LRW Micronet

The USDA-ARS SEWRL collected hydrologic and climatic data on the 334 km2 LRW near Tifton, Georgia, USA since 1968. The LRW Micronet hydrologic network consists of rain gauges and stream gauges within nested watersheds as shown in Figure 1. It is located in the headwaters of the Suwannee River Basin, a major interstate basin that begins in Georgia and empties into the Gulf of Mexico in the Big Bend region of Florida. The Suwannee River Basin is completely contained in the Coastal Plain Physiographic Region and is the largest free-flowing river in the Southeastern United States Coastal Plain. The Little River is a tributary of the Withlacoochee River which, along with the Alapaha River, is one of two main tributaries of the Suwannee River

Figure 1. LRW Micronet Hydrologic Network: Georgia, USA

The paired and nested arrangement of the experimental watershed facilitates testing of analytical formulas and modeling concepts. Instrumentation was installed in the late 1960s and early 1970s and has been in continuous operation since that time. Continued operation of this hydrologic network supports hydrologic research as well as the environmental quality and riparian research programs of the SEWRL and cooperators.

Extensive land use information (Williams 1982)(Perry, et al 1999) and physical characterization data (Sheridan and Ferreira 1992) exist for the LRW Micronet. The watershed land use is a mixture of row-crop agriculture, pasture and forage production, upland forest, and riparian forest. Sub-watersheds range from approximately 25 pecent to 65 percent agricultural land. Figures 2 and 3 show vegetation conditions in the Georgia regional study area as expected in late June. Rainfall in the region is poorly distributed and often occurs as short-duration, high-intensity convective thunderstorms (Bosch et al 1999). Hydrologic and water quality measurements collected on the watershed include: stream flow; precipitation; and nutrient, pathogenic bacteria, and pesticide content. The hydrologic measurement network consists of eight horizontal broad-crested weirs with v-notch center sections. Five minute continuous upstream and downstream stage data are recorded. Within the watershed, a network of 35 tipping bucket precipitation gauges record five minute cumulative rainfall. The spacing between the precipitation gauges varies from 3 to 8 km. A detailed data management system exists to provide processing, editing, and summarization of LRW Micronet data (Sheridan, et al 1995).

Figure 2. Peanut Crop in Georgia, USA

Vegetation conditions in the Georgia regional study area as expected in late June.

Figure 3. Cotton Crop in Georgia, USA

Vegetation conditions in the Georgia regional study area as expected in late June.

2.1 Data Acquisition Methods

In 2001, as part of the NASA Aqua Calibration/Validation Program, surface soil moisture sensors were installed at a number of locations in the LRW and surrounding region. Thirty-nine Stevens-Vitel soil moisture Hydra Probes were installed at thirteen locations within or near the watershed, spaced approximately 9 km apart. The data have been collected consistently since early 2002. An additional six LRW Micronet soil moisture sites were established in 2003, and are distributed at existing rain gauge sites and areas outside of the watershed. Refer to the Spatial Coverage section for a list of station locations.

Each of the nineteen LRW Micronet locations contain three soil moisture probes and a digital-recording rain gauge. The soil moisture sensors are installed at 2, 8, and 12 inches below the surface. 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 installation technique aims to minimize disruption to the site so that the probe measurement reflects the undisturbed site as much as possible. Precipitation totals are recorded

every minute during rainfall events and half-hour soil moisture averages are calculated from five minute readings. All ongoing data are transferred daily and available on a near-real-time basis from the SEWRL Web site. For SMEX03, hourly rainfall measurements were summed for 30 minute intervals and five minute soil moisture measurements were averaged for 30 minute intervals. The selected subset of Little River rain gauge sites provides watershed-area coverage and covers a range of soil types. Please refer to the LRW Web site for more information.

2.2 Derivation Techniques and Algorithms

The output data from the HP consists of a time stamp and four voltages (V1-V4). These voltages are converted to estimate the soil moisture and soil temperature through a program provided by the HP manufacturer, Stevens-Vitel. Refer to the Stevens-Vitel Web site for the Hydra.exe or the hyd-file.exe program. These programs require the four voltages and a soil classification, for example: Sand=1, Silt=2, and Clay=3. Each site was considered sand for this data set.

2.2.1 Quality Assessment

These data have been quality controlled and suspect or missing data have been removed. Consequently, the data are not continuous. Quality control and quality assurance have been limited, but investigations have led to some improvements. Several sensors have been eliminated from this averaging due to poor or suspicious performance. Arithmetic averages and averages based on nearest neighbor weighting are based on the same set of sensors. Standard deviations are also calculated for reference. Table 5 lists regions where measurements are either poor or outside the LRW Micronet.

Micronet Station rain gauge	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Northing (Meters)	Easting (Meters)	Quality
RG08	31.48656	-83.5737	3486396	255514	Poor
RG26	31.62946	-83.61244	3502329	252215	Poor
RG37	31.70929	-83.75400	3511512	239007	Poor
RG39	31.70491	-83.70537	3510911	243605	Poor
RG43	31.72600	-83.71642	3513275	242616	Poor
RG66	31.67191	-83.60215	3507013	253304	Outside LRW Micronet
RG67	31.56676	-83.70344	3495586	243409	Outside LRW Micronet
RG68	31.41240	-83.36482	3477727	275188	Outside LRW Micronet

2.2.2 Error Sources

The quality control of this data set was limited to removing samples for which the program returned erroneous data due to corrupted voltages. These voltages may be a result of several things, including for example, faulty installation, lightning strikes, and rodent impact. Erroneous samples were removed; therefore, the data are not continuous for every HP.

2.3 Sensor or Instrument Description

Soil moisture and temperature were measured using Stevens-Vitel Type A Hydra Probes, as shown in Figure 4. This version is compatible with Campbell CR-10 data loggers; the temperature output voltage never exceeds 2.5 volts. The HP has three main structural components: a multiconductor cable, a probe head, and sensing tines. Precipitation was measured using Texas Electronics tipping bucket rain gauges.

Figure 4. Stevens-Vitel Hydra Probe

3 REFERENCES AND RELATED PUBLICATIONS

Please refer to the USDA SMEX03 Web site for in-depth information on the science mission and goal of the SMEX project.

Refer to the Stevens-Vitel Web site for the Hydra.exe or the hyd-file.exe program.

3.1 Related Data Collections

https://nsidc.org/data/amsre: AMSR-E standard products available at NSIDC.

4 CONTACTS AND ACKNOWLEDGMENTS

David D. Bosch

Southeast Watershed Research Laboratory (SEWRL)

US Department of Agriculture (USDA) - Agricultural Research Service (ARS)

Tifton, GA 31794 USA

Michael H. Cosh

Hydrology and Remote Sensing Lab

US Department of Agriculture (USDA) - Agricultural Research Service (ARS)

Beltsville, MD 20705 USA

Acknowledgments:

The investigators would like to acknowledge the USDA ARS SEWRL in addition to the many graduate students and volunteers who collected the field data. They would also like to acknowledge NASA for their generous contributions to the study.

5 DOCUMENT INFORMATION

5.1 Publication Date

March 2008

5.2 Date Last Updated

19 April 2021