SMEX03 Vegetation Data: Georgia, Version 1

USER GUIDE

How to Cite These Data

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

SMEX03 Vegetation 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/UAPN8GAYSU83. [Date Accessed].

National Snow and Ice Data Center

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1   DETAILED DATA DESCRIPTION

This data set includes data collected over the Soil Moisture Experiment 2003 (SMEX03) area of Georgia, USA.

The following table gives an overview of the data contained in each file.

Table 1 Data Overview

File Name	Data Description
GA_SMEX03_forest_plants.txt	Plant identification data for forest sites
GA_SMEX03_forest_raw.txt	Site characterization data for forest sites
GA_SMEX03_reflectance_raw.txt	Multispectral Radiometer Reflectance data only
GA_SMEX03_roughness_raw.txt	Raw surface roughness measurements
GA_SMEX03_vegetation_raw.txt	Site characterization data for cotton, peanut, and pasture sites

1.1 Format

Data are in tab-delimited ASCII text files.

The following tables describe the column headings for the files in this dataset.

Table 2 Column Headings for GA_SMEX03_forest_plants.txt

Column	Column Heading	Description
1	Site	Site location identification code
2	Plot	Plot number
3	Common Name	Plant common name
4	Scientific Name	Plant scientific name

Column	Column Heading	Description
5	Notes	Data collection notes

Table 3 Column Headings for GA_SMEX03_forest_raw.txt

Column	Column Heading	Description
1	Site	Site location identification code
2	Crop	Type of vegetation
3	Date	Month / day / year
4	Plot	Plot number
5	RowSpacing(m)	Space between tree rows in meters
6	TreeDensity(trees/m)	Trees per unit length in rows in trees per meter
7	TreeDensity(trees/ha)	Trees per unit area in trees per hectare
8	TreeHeight(m)	Average tree height in meters

Column	Column Heading	Description
9	DiameterAtBreastHeight(m)	Tree diameter at breast height in meter
10	AverageBasalArea(m2)	Average basal area in meters squared
11	Canopy(%)	Percentage of canopy cover
12	ArealPlantWater(kg/m2)	Areal plant water content of understory in kilograms per meters squared
13	ArealPlantGreen(kg/m2)	Areal plant green biomass of understory in kilograms per meters squared
14	LAI	Leaf area index (m^2/m^2)
15	UnderstoryVegetation(%GroundCover)	Understory vegetation cover in percentage of ground cover
16	UnderstoryPineNeedleLitter(%GroundCover)	Understory pine needle litter cover in percentage of ground cover
17	UnderstoryBareSoil(%GroundCover)	Understory bare soil in percentage of ground cover
18	Notes	Data collection notes

Table 4 Column Headings for GA_SMEX03_reflectance_raw.txt

Column	Column Heading	Description
1	Site	Site location identification code
2	Crop	Type of vegetation
3	Date	Month / day / year
4	Plot#	Plot number
5	Row/Position	Row ID
6	Latitude	Latitude in decimal degrees, WGS84
7	Longitude	Longitude in decimal degrees, WGS84
8	Time	Time of sampling in Eastern Daylight Time (EDT)
9	SunAngle	Angle of the sun during reading in degrees
10	IrradianceAt560nm(watts/m2/micron)	Sun irradiance at 560 nm in watts per meters squared per micron
11	485	MSR Reflectance (avgerage of % reflectance at 485 nm)

12	560	MSR Reflectance (avgerage of % reflectance at 560 nm)
13	650	MSR Reflectance (avgerage of % reflectance at 650 nm)
14	660	MSR Reflectance (avgerage of % reflectance at 660 nm)
15	830	MSR Reflectance (avgerage of % reflectance at 830 nm)
16	850	MSR Reflectance (avgerage of % reflectance at 850 nm)
17	1240	MSR Reflectance (avgerage of % reflectance at 1240 nm)
18	1640	MSR Reflectance (avgerage of % reflectance at 1640 nm)
19	1650	MSR Reflectance (avgerage of % reflectance at 1650 nm)
20	Notes	Data collection notes

Table 5 Column Headings for GA_SMEX03_roughness_raw.txt

Column	Column Heading	Description
1	Site	Site location identification code
2	Crop	Type of vegetation
3	Date	Month / day / year
4	PlotNumber	Plot number
5	AcrossRowOrAlongRow	Direction of measurements
6	NumberOfPoints	Number of points sampled
7	RMS(cm)	Root mean square height in centimeters
8	CorrelationLength(cm)	Correlation length in centimeters
9	Adjusted RMS	Adjusted root mean square height in centimeters
10	"Power Function,n"	Power function

Table 6 Column Headings for GA_SMEX03_vegetation_raw.txt

Column	Column Heading	Description
1	Site	Site location identification code
2	Crop	Type of vegetation
3	Date	Month / day / year
4	Plot	Plot number
5	Row	For row crop sites, row ID; no rows for pasture
6	Latitude	Latitude in decimal degrees, WGS84
7	Longitude	Longitude in decimal degrees, WGS84
8	CropDensity(plants/m^2)	Crop density in plants per meters squared
9	PlantHeight(cm)	Plant height in centimeters
10	GreenBiomass(kg/m^2)	Plant green biomass in kilograms per meters squared
11	DryBiomass(kg/m^2)	Plant dry biomass in kilograms per meters squared

12	AboveGroundMoisture(kg/m^2)	Above ground moisture content in kilograms per meters squared
13	LAI	Leaf area index (m^2/m^2)
14	Sun/Shade	Sun conditions during LAI reading
15	GrowthStage	Description of growth stage

The collection sites noted in column 1 of each file are distinguished by a location identification code where:

GA	=	Georgia
V	=	vegetation site
##	=	site number

1.2 Spatial Coverage

Southernmost Latitude: 31.20 º N

Northernmost Latitude: 31.82 º N

Westernmost Longitude: 83.94 º W

Easternmost Longitude: 83.43 º W

1.3 Temporal Coverage

16 June 2003 to 21 July 2003

1.3.1   Temporal Resolution

Data was collected on multiple days at multiple sites.

1.4 Parameter or Variable

Text goes here

1.4.1   Parameter Description

Parameters in this data set are Leaf Area Index (LAI), Multispectral Radiometer (MSR) Reflectance, plant height, plant density, areal wet biomass, areal dry biomass, and areal water content. The following table describes the units of measurement and sources of each parameter.

Table 7 Parameter Descriptions

Parameter	Unit of Measurement	Sensor
LAI	m^2/m^2	LI-COR LAI-2000
MSR Reflectance	percentage	CROPSCAN MSR-16R
Plant Height	cm	manual data collection
Plant Density	plants/m^2	manual data collection
Areal Wet Biomass	kg/m^2	manual data collection
Areal Dry Biomass	kg/m^2	manual data collection
Areal Water Content	kg/m^2	manual data collection

1.4.2   Sample Data Record

Sample files of this data set are shown below. The value -99 is a fill value for missing data.

The following sample of 4 rows shows all five columns from the file GA_SMEX03_forest_plants.txt.

```
Site    Plot    Common Name          Scientific Name         Notes
GAV29   1       American beauty bush  Callicarpa americana
                verbena               Verbena sp.
                iron weed             Veronia sp.
                bahaia grass          Paspalum notatum        50% of vegetation
```

The following sample of 4 rows shows the first four columns and the last two columns from GA_SMEX03_forest_raw.txt.

```
Site     Crop         Date        Plot   ...   UnderstoryBareSoil(%GroundCover)   Notes
GAV29    slash pine   6/24/2003   1      ...   5                                  Every 4th row cut
GAV29    slash pine   6/24/2003   2      ...   5                                  Every 4th row cut
GAV49    slash pine   6/26/2003   1      ...   10                                 Every 2nd row cut
GAV49    slash pine   6/26/2003   2      ...   10                                 Every 2nd row cut
```

The following sample of 4 rows shows the first four columns and the last two columns from GA_SMEX03_reflectance_raw.txt.

```
Site     Crop                Date        Plot#   ...   1650    Notes
GAV20    Strip till cotton   6/18/2003   -99     ...   -99     cloudy, no data collected
GAV20    Strip till cotton   6/25/2003   1       ...   38.74
GAV20    Strip till cotton   6/25/2003   1       ...   39.87
GAV20    Strip till cotton   6/25/2003   1       ...   36.64
```

The following sample of 4 rows shows the first four columns and the last two columns from GA_SMEX03_roughness_raw.txt.

```
Site     Crop                Date        PlotNumber   ...   AdjustedRMS   "PowerFunction,n"
GAV20    strip-till-cotton   6/18/2003   1            ...   0.945         1
GAV20    strip-till-cotton   6/18/2003   1            ...   1.68          1
GAV20    strip-till-cotton   6/18/2003   2            ...   0.855         1.2
GAV20    strip-till-cotton   6/18/2003   2            ...   1.056         1.1
```

The following sample of 4 rows shows the first four columns and the last two columns from GA_SMEX03_vegetation_raw.txt.

```
Site     Crop                Date        Plot   ...   Sun/Shade   GrowthStage
GAV20    strip-till-cotton   6/18/2003   1      ...   SHADE       3-node,young
GAV20    strip-till-cotton   6/18/2003   1      ...   SHADE
GAV20    strip-till-cotton   6/18/2003   1      ...   SHADE
GAV20    strip-till-cotton   6/18/2003   1      ...   SHADE
```

2   SOFTWARE AND TOOLS

3   DATA ACQUISITION AND PROCESSING

3.1 Sampling

Sampling was performed on fields typical of the South-Georgia Agricultural area. The sampling was concentrated in the Upper Suwannee Watershed, with a greater concentration of sites within the Little River Experimental Watershed. Sampling consisted of recording vegetation height and plant density, collecting vegetation biomass samples, and taking MSR reflectance and LAI

measurements. Two locations in each of the row crop and forest sites were sampled, while three locations were sampled at the pasture sites. Every effort was made to have these locations coincide with soil moisture sampling points. Sampling was conducted between 10:00 and 14:00 EDT.

3.2 Vegetation Moisture

Samples were collected manually. In the laboratory they were weighed, dried at 60 degrees Celsius for 48 to 96 hours, and then weighed again.

3.3 Computing Areal Water Content

The following steps were used to compute areal water content:

Row Crops:

- Determine by manual collection the water content for a known number of plants, convert to a per plant basis
- Calculate the number of plants per square meter using the row and plant spacing
- Multiply the water content per plant by the number of plants per square meter to get water content per square meter

Non-Row Crops:

- Determine by manual collection the water content for a 0.44 meter by 0.44 meter area
- Divide the water content by 0.1936 to get water content per square meter

3.3.1   Leaf Area Index Meter

LAI measurements made above and below the canopy were used to determine canopy light interception at five angles. Measurements were made by positioning the optical sensor and pressing a button, which sent the data to the data logger. Multiple below-canopy readings were taken so that LAI calculations were based on a large sample of the foliage canopy.

3.3.2   MSR Reflectance

The MSR reflectance wavelengths measured were: 485, 560, 650, 660, 830, 850, 1240, 1640, 1650 nm. These bands provided data for selected channels of the LandSat TM and MODIS instruments. Channels were chosen to provide a Normalized Difference Vegetation Index (NDVI) as well as a variety of vegetation water content indices under consideration.

3.4 Theory of Measurements

The goal of vegetation sampling is to generate the vegetation products used to estimate surface soil moisture detected by passive microwave radiometers. Sampling was designed to coincide with satellite overpasses, such as LandSat Thematic Mapper (TM) and Terra-MODIS, which can be used to estimate vegetation water content on the regional scale.

3.5 Derivation Techniques and Algorithms

3.5.1 Error Sources

LAI

Direct-beam radiation reflected into the sensor from upper leaves in the canopy can be confused with open sky. This causes the LAI to be underestimated. Samplers were instructed to sample with the sun to their backs, but occasionally direct sunlight may enter the sensor. The data were examined for this and for evidence of variable sky conditions during the measurement sequence.

MSR Reflectance

The MSR measures near simultaneous inputs of incident as well as reflected irradiation. Useful measurements of percent reflectance may be obtained during cloudy conditions with incident irradiance levels down to approximately 300 watts per square meter. Measurements obtained with an incident irradiance level of less than 300 watts had to be discarded. Several days were too cloudy to take any multispectral radiometer measurements.

3.6 Sensor or Instrument Description

Leaf Area Index Meter

Investigators used LI-COR LAI-2000 plant canopy analyzers to measure LAI using an indirect noncontact method based on light transmittance through the canopy. The LAI-2000 calculates LAI from radiation measurements made with a fish-eye optical sensor (148 degree field-of-view).

For more information, visit the LI-COR LAI-2000 product Web site.

Multispectral Radiometer

Investigators used the MSR-16R manufactured by CROPSCAN to measure reflectance. The MSR is an inexpensive instrument that has up-and-down-looking detectors and the ability to measure sunlight at different wavelengths. It uses silicon or germanium photodiodes as light transducers.

Matched sets of the transducers with filters to select wavelength bands are oriented in the MSR housing to measure incident and reflected irradiation.

For more information, visit the CROPSCAN MSR product Web site.

4   REFERENCES AND RELATED PUBLICATIONS

As a condition of using these data, you must cite the use of this data set using the following citation. For more information, see our Use and Copyright Web page.

Bosch, D., L. Marshall, D. Rowland, and J. Jacobs. 2008. SMEX03 Vegetation Data: Georgia. [indicate subset used]. Boulder, Colorado USA: NASA National Snow and Ice Data Center Distributed Active Archive Center. doi: 10.5067/UAPN8GAYSU83.

4.1 Related Data Collections

AMSR-E/Aqua Data at NSIDC: AMSR-E standard products available at NSIDC

4.2 Related Websites

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

5   CONTACTS AND ACKNOWLEDGMENTS

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6 DOCUMENT INFORMATION

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