SMEX02 Land Surface Information: Geolocation, Surface Roughness, and Photographs, Version 1

USER GUIDE

How to Cite These Data

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

Jackson, T., M. Cosh, W. P. Dulaney, and L. McKee. 2004. *SMEX02 Land Surface Information: Geolocation, Surface Roughness, and Photographs, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/R9AA6FC58HES. [Date Accessed].

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

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/NSIDC-0204

National Snow and Ice Data Center

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1 DETAILED DATA DESCRIPTION

This data set combines various ancillary data (geolocation, surface roughness, and photographs) collected for the Iowa Soil Moisture Experiment 2002 (SMEX02) study region.

1.1 Format

Geolocation data are in 14 ASCII text files, including 13 tab-delimited (row/column) data files and one text document that describes the study areas and bounding boxes.

Surface roughness data are provided in two ASCII files.

Photographs are provided as JPEG image files.

Table 1 describes the variables used in the column headings for the surface roughness data files.

Table 1. Variables Used in Column Headings for Roughness Data Files

Heading	Description
`file name`	Name of the original file. Includes: site ID (for example, WC08) location in the field (A, B, C, or D) 1 for in-row pictures 2 for cross-row pictures
`np`	Number of points
`sigma`	rms height
`L`	Correlation length
`adj. sigma`	Slope-corrected (adjusted) rms height
`Exp.`	The power coefficient of the autocorrelation function

1.2 File and Directory Structure

Data are available on the HTTPS site in the `https://daacdata.apps.nsidc.org/pub/DATASETS/AVDM/data/soil_moisture/SMEX02/ancillary_data/ directory`. Within this directory there are five folders: `geolocation_information, landuse_classification, photographs, soils_database,` and `surface_roughness.`

1.3 File Naming Convention

This section explains the file naming convention used for this product with an example.

1.3.1 Geolocation Data Files

These files are named for the locations around the study site as shown in Table 2.

Table 2. File Naming Convention Used for Geolocation Data Files

File Name	Description
ASOS_Stations.txt	Automated Surface Observing System (ASOS) stations
AWOS_Stations.txt	Automated Weather Observing System (AWOS) stations
Bounding_Boxes.txt	SMEX02 study areas and bounding boxes (this is a text document)
IA_Field_Boundaries.txt	Iowa regional field boundaries
IA_Sites.txt	Iowa regional sampling sites
ISUW_Stations.txt	Iowa Agriculture Climate Network - Iowa State University (ISU) Crop, Soil, and Environmental Sciences
KCCI_Stations.txt	School Network for KCCI-TV in Des Moines, Iowa
Vegetation_Sites.txt	Walnut Creek vegetation sampling sites
WC_Basin.txt	Walnut Creek watershed boundary
WC_Field_Boundaries_V2.txt	Walnut Creek field boundaries
WC_Flux_Towers.txt	Flux tower locations
WC_Raingages.txt	Walnut Creek rain gages
WC_Sites.txt	Walnut Creek sampling sites
WC_Streamgages.txt	Walnut Creek stream gages

1.3.2 Surface Roughness

These data files are named for the type of scanning.

Example File Names

Grid: `grid_scanning.txt`

Slope: `slope_scanning.txt`.

1.3.3 Photograph

Example File Name: `IA13_03_062902.jpg` is from the Iowa regional area, field 13, index 03, and was taken on 29 June 2002.

`IAff_nn_mmddyy.jpg`

`WCff_nn_mmddyy.jpg`

Where:

Table 3. File Naming Convention Used for Photograph Files

Variable	Description
`IA`	Indicates the the Iowa Regional study region and WC indicates the Walnut Creek watershed.
`ff`	The field number in which the photograph was taken.
`nn`	The picture index number for that field.
`mmddyy`	The date (month, day, and year).

1.4 Spatial Coverage

Southernmost Latitude: 41.7° N

Northernmost Latitude: 42.66° N

Westernmost Longitude: 93.8° W

Easternmost Longitude: 93.2° W

1.5 Temporal Coverage

Data were collected from 22 June 2002 through 12 July 2002.

1.6 Parameter or Variable

1.6.1 Parameter Description

Geolocation data are provided as latitude and longitude coordinates, in decimal degrees, and in UTM coordinates, in meters.

Surface roughness data include root-mean-square height in centimeters and correlation length in centimeters.

Photographs of the study area are also provided.

1.6.2 Sample Data Record

The following geolocation sample is taken from the file `IA_sites.txt`.

```
Site_ID  Latitude Longitude       Easting  Northing
IA01     42.6599  -93.7174441207  4723296
IA02     42.5872  -93.7058442086  4715215
IA03     42.5066  -93.7192440911  4706278
IA04     42.4122  -93.7280440099  4695803
IA05     42.3417  -93.7287439977  4687974
```

The following surface roughness sample is from the file `grid_scanning.txt`.

```
              <------------- surface output ------------------><---Scorelat --
->
                             grid scanning (1 cm)

 file name          np      sigma     L       adj.sigma    Exp.            Exp
 wc01a1            101     0.778     4.079     0.772       1
 wc01a2            101     2.142    14.838     2.137       1.75
 wc01b1            101     0.557     3.734     0.557       1
 wc01b2            101     1.855     9.744     1.850       1.5             1.3
 wc01c1            101     0.467     5.107     0.467       1
```

2 DATA ACQUISITION AND PROCESSING

2.1 Geolocation

Geolocation data are provided in both latitude and longitude (decimal degrees) and in UTM coordinates (Zone 15, in meters). Georeferencing is based on the WGS84 ellipsoid. Geolocation data were collected by a variety of methods. Some site locations were determined using Landsat Thematic Mapper (TM) imagery, some by global positioning system (GPS) measurements, some from a combination of aircraft and GPS data, and some by other methods. Table 5 shows the geolocation data sources for the various types of SMEX02 locations.

Table 4. Geolocation Data Sources for the SMEX02 Locations

Type	Subtype	Georegistration Source	Data Type	Data Points
ASOS Stations	Points	Unknown	Point	15

Type	Subtype	Georegistration Source	Data Type	Data Points
AWOS Stations	Points	Unknown	Point	33
Bounding Box	Boundary	TM Image	Corners	4
Ground Soil Moisture	IA Sites	GPS	Point	47
	WC Sites	GPS	Clusters	14*31
	IA Field Boundaries	TM Image	Lower Left and Upper Right Corners	47*2
	WC Field Boundaries	TM Image	Lower Left and Upper Right Corners	31*2
Flux Towers	Point	GPS	Point	14
ISUW Sites	Point	Unknown	Point	12
KCCI Sites	Point	Unknown	Point	40
Rain Gages	Point	GPS	Point	22
Stream Gages	Point	GPS	Point	5
Watershed	Boundary	TM Image	Boundary	1465
Vegetation	Points	GPS	Point	31*3*5

2.2 Surface Roughness

The surface roughness data were derived from digital photographs, then processed to produce root-mean-square (rms) height, correlation length, and correlation function. Figure 1 shows the measuring board and how it was used in the field to photograph surface roughness. The commercial program SigmaScan pro 4 was used to digitize the roughness photographs.

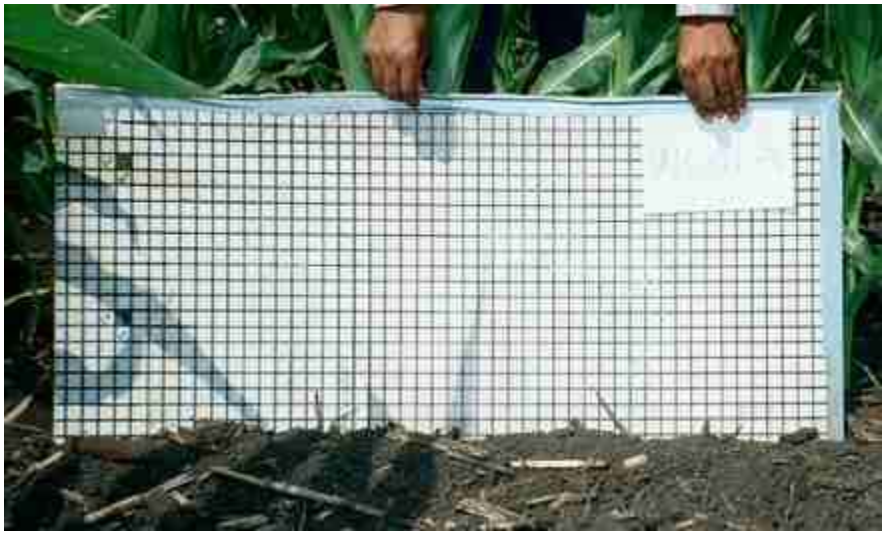

Figure 1. Measuring Board Used to Photograph Surface Roughness

Before scanning, the dimensions of the board were identified using reference points on the board. The surface was scanned in two ways:

1. Taking a height measurement at every cm (grid scanning)
2. Taking a height measurement at every point where the slope of the surface was changing or at least every cm (slope scanning)

The grid scanning method provides a random (or normal) distribution of the surface height, which is required for a correct computation of the rms height. With this method, some variation in the surface height is neglected, which could influence the computation of the correlation length.

The slope method approximates the surface roughness more accurately by taking a height measurement at each point the slope changed, or at a minimum of every centimeter. By increasing the density of the height measurements at points with many slope changes, the sampling of height measurements may be biased. This could influence the correct computation of the rms height. Therefore, two surface height data set were created:

1. Grid scanning data
2. Slope scanning data

Roughness parameters were calculated using programs named *surface* and *scorelat*. The *surface* program calculates the rms height and the correlation length and writes the computed autocorrelation curve to a file. This program also corrects for the slope of the roughness board using a least-square fit and calculates an adjusted rms height. The investigators recommended using the adjusted rms height ("adj.sigma" in the data files). The *scorelat* program was used only to create an autocorrelation curve, but it uses a different algorithm than does the surface program. Both autocorrelation curves of *surface* and *scorelat* were used to determine the autocorrelation

function. The *scorelat* program was successfully applied to only some of the digitized surfaces of the grid scanning and the slope scanning data set.

2.3 Photographs

Teams were assigned cameras throughout the experiment. Not all fields were photographed.

3 REFERENCES AND RELATED PUBLICATIONS

Please see the SMEX02 Web site for more information.

Dobson, M. C. and Ulaby, F. T. 1998. Mapping soil moisture distribution with imaging radar. In Principles & application of imaging radar, Henderson, F. M. and Lewis, A. J., 407- 430, New York: John Wiley & Sons.

4 CONTACTS AND ACKNOWLEDGMENTS

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5 DOCUMENT INFORMATION

5.1 Publication Date

January 2004

5.2 Date Last Updated

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