

Notice to Data Users:
The documentation for this data set was provided solely by the Principal Investigator(s) and was not further developed, thoroughly reviewed, or edited by NSIDC. Thus, support for this data set may be limited.

SMEX04 Multispectral Radiometer Data: Arizona

Summary

The parameter for this data set is Multispectral Radiometer Reflectance. Summary files containing field averages are provided for simplicity. This data set is part of the Soil Moisture Experiment 2004 (SMEX04). The SMEX studies are designed to evaluate, among other things, the accuracy of AMSR-E soil moisture data. The U.S. portion of SMEX04 was conducted during July and August 2004. Data are provided in ASCII text files, and are available via FTP.

The Advanced Microwave Scanning Radiometer - Earth Observing System (AMSR-E) is a mission instrument launched aboard NASA's Aqua Satellite on 4 May 2002. AMSR-E validation studies linked to SMEX are designed to evaluate the accuracy of AMSR-E soil moisture data. Specific validation objectives include: assessing and refining soil moisture algorithm performance, verifying soil moisture estimation accuracy, investigating the effects of vegetation, surface temperature, topography, and soil texture on soil moisture accuracy, and determining the regions that are useful for AMSR-E soil moisture measurements.

Citing These Data:

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Overview Table

Category	Description
<u>Data format</u>	ASCII tab-delimited text files.
<u>Spatial coverage</u>	31.4° to 32.0° N, 109.7° to 110.3° W

<u>Temporal coverage</u>	29 July 2004 to 25 August 2004
<u>File naming convention</u>	AZ' is a regional site file, 'RG' is a watershed site file, and 'OVER' is an overpass file. 'Raw' is a raw data file and 'Sum' is a summary data file.
<u>File size</u>	3 KB to 232 KB
<u>Parameter(s)</u>	Multispectral Radiometer Reflectance
<u>Procedures for obtaining data</u>	Data are available via FTP.

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1. Contacts and Acknowledgments:

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2. Detailed Data Description:

Format:

ASCII tab-delimited text files.

File Naming Convention:

Regional site data files contain the symbol 'AZ', Walnut Gulch Watershed site data files contain the symbol 'RG', and Overpass data files contain the symbol 'OVER'.

Raw data files contain the word RAW, and summary data files contain the word SUM. Summary data files contain the average of the sampling sites at each field. Some files also contain a version number (such as V2 for version 2) if the file has been revised.

File Size:

File sizes range from 3 KB to 234 KB.

Spatial Coverage:

Southernmost Latitude: 31.4° N
Northernmost Latitude: 32.0° N
Westernmost Longitude: 109.7° W
Easternmost Longitude: 110.3° W

Temporal Coverage:

29 July 2004 to 25 August 2004

Temporal Resolution:

Data was collected on multiple days at multiple sites.

Parameter or Variable:

Parameter Description:

Parameters in this data set are: Multispectral Radiometer Reflectance. The following table describes the units of measurement and sources of each parameter.

Parameter	Unit of Measurement	Sensor
Multispectral Radiometer Reflectance	%	CropScan MSR-16R

Parameter Range:

The following tables detail the column headings for each data file in the categories of multispectral radiometer reflectance.

Multispectral Radiometer Reflectance

'SMEX04_RAW_XX_MSR' – Raw Data Columns
(With XX being either AZ or RG or OVER)

Column Heading	Description
Field	Field location identification number, AZ is an Arizona regional site, RG is a Walnut Gulch Watershed site, CP01 is a Chili Pepper field, KT01 is the Kendall Tank, WS01 is a White area used for calibration.
Plot	Number of site within field
SS	Number of subsample within site
Date	Month/day/year
DOY	Day of year
Time	Time of sampling in MST
Latitude	Decimal Degree, WGS84
Longitude	Decimal Degree, WGS84
Easting	UTM, WGS84, Zone 12, in meters
Northing	UTM, WGS84, Zone 12, in meters

	Multispectral Radiometer Reflectance (%)
485nm	% reflectance at 485nm
560nm	% reflectance at 560nm
650nm	% reflectance at 650nm
660nm	% reflectance at 660nm
830nm	% reflectance at 830nm
850nm	% reflectance at 850nm
1240nm	% reflectance at 1240nm
1640nm	% reflectance at 1640nm
1650nm	% reflectance at 1650nm
Notes	Sampling notes – if any

'SMEX04_SUM_XX_MSR' – Summary Data Columns
(With XX being either AZ or RG or OVER)

Field	Field location identification number, AZ is an Arizona regional site, RG is a Walnut Gulch Watershed site, CP01 is a Chili Pepper field, KT01 is the Kendall Tank, WS01 is a White area used for calibration.
Date	Month/day/year
DOY	Day of year
Time	Time of sampling in MST
Latitude	Decimal Degree, WGS84
Longitude	Decimal Degree, WGS84
UTM_Easting	WGS84, Zone 12, in meters
UTM_Northing	WGS84, Zone 12, in meters
	Multispectral Radiometer Reflectance (%)
485nm – AVG	Average of % reflectance at 485nm
485nm – STD	Standard deviation of % reflectance at 485nm
560nm – AVG	Average of % reflectance at 560nm
560nm – STD	Standard deviation of % reflectance at 560nm
650nm – AVG	Average of % reflectance at 650nm
650nm – STD	Standard deviation of % reflectance at 650nm
660nm – AVG	Average of % reflectance at 660nm
660nm – STD	Standard deviation of % reflectance at 660nm
830nm – AVG	Average of % reflectance at 830nm

830nm – STD	Standard deviation of % reflectance at 830nm
850nm – AVG	Average of % reflectance at 850nm
850nm – STD	Standard deviation of % reflectance at 850nm
1240nm – AVG	Average of % reflectance at 1240nm
1240nm – STD	Standard deviation of % reflectance at 1240nm
1640nm – AVG	Average of % reflectance at 1640nm
1640nm – STD	Standard deviation of % reflectance at 1640nm
1650nm – AVG	Average of % reflectance at 1650nm
1650nm – STD	Standard deviation of % reflectance at 1650nm
Notes	Sampling notes – if any

Missing data are represented with -999

Error Sources:

Multispectral Radiometer:

The radiometer performs near simultaneous inputs of incident as well as reflected irradiation. This allows useful measurements of percent reflectance to 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. Some days or parts of days, it was too cloudy to take any multispectral radiometer measurements.

3. Data Access and Tools:

Data Access:

Data are available via FTP.

Software and Tools:

No special tools are required to view these data. A spreadsheet program which recognizes tab-delimited text files, such as MS Excel is recommended. Also, a word-processing program or Web browser will display the data.

Related Data Collections:

See related information on the NSIDC Soil Moisture Experiment (SMEX) Web site:

http://nsidc.org/data/amsr_validation/soil_moisture/index.html

4. Data Acquisition and Processing:

Theory of Measurements:

Surface reflectance data is valuable in developing methods to estimate the vegetation water content and other canopy variables. Observations made concurrent with biomass sampling provide the essential information needed for larger scale mapping with satellite observations. In addition, reflectance measurements made concurrent with satellite overpasses allow the validation of reflectance estimates based upon correction algorithms.

Field Sampling:

Reflectance measurements were collected at every Arizona Regional and most Walnut Gulch Watershed fields at least once during the field campaign. Several Walnut Gulch Watershed fields were not sampled due to location, weather conditions or an instrument failure on August 23, 2004. The sampling was conducted between 09:00 and 16:00 local time.

Two sites in each of the fields were sampled; every effort was made to have one of these locations coincide with the soil moisture sampling point. At each site, 3 parallel transects centering on the soil sampling point were sampled. The following sampling scheme was used for field sampling: Take a reading every 5 meters for 25 meters. Repeat, for a total of 3 replications located 10 meters apart. See SMEX04 Experiment plan for more details.

Overpass Sampling:

Each different land use type (shrubs, grasslands, etc...) was characterized by transect sampling. Reflectance measurements were collected at representative sites. A quarry and a holding tank were

also sampled for calibration purposes. This was done weekly, to coincide with the Landsat and ASTER overpasses. Due to weather conditions, no reflectance measurements were taken for the August 14, 2004 Landsat overpass.

The following sampling scheme was used for transect sampling: Take a reading every 5 meters for 25 meters, walk 75 meters, continue until you have gone 400 meters. Walk over 100 meters. Do another 400 meter transect heading back in the direction that you started. See SMEX04 Experiment plan for more details. On July 29, 2004 and August 6, 2004, 4 transects were sampled at RG82 and RG83. On August 22, 2004, 2 transects were sampled at RG82 and RG83. There is no quarry calibration for the August 22, 2004 overpass due to weather conditions.

Sensor or Instrument Description:

Multispectral Radiometer

Investigators used MSR-16R Multispectral radiometers manufactured by CropScan to measure reflectance. The CropScan Multispectral Radiometer (MSR) is an inexpensive instrument that has up-and-down-looking detectors and the ability to measure sunlight at different wavelengths. The CropScan multispectral radiometer systems consist of a radiometer, data logger controller (DLC) or A/D converter, terminal, telescoping support pole, connecting cables and operating software. The radiometer uses silicon or germanium photodiodes as light transducers. Matched sets of the transducers with filters to select wavelength bands are oriented in the radiometer housing to measure incident and reflected irradiation. In this experiment the wavelengths measured were: 485, 560, 650, 660, 830, 850, 1240, 1640, 1650 nm. These bands provide data for selected channels of the Landsat Thematic Mapper and MODIS instruments. Channels were chosen to provide NDVI as well as a variety of vegetation water content indices under consideration.

For more information see: www.cropscan.com/msr.html

5. References and Related Publications:

Please see the NSIDC SMEX04 site for more information and to access data:

http://nsidc.org/data/amr_validation/soil_moisture/smex04/index.html

6. Document Information:

List of Acronyms

The following acronyms are used in this document:

AMSR-E - Advanced Microwave Scanning Radiometer – Earth Observing System

AVG – Average

AZ – Arizona Regional Site

FTP – File transfer protocol

MSR – Multispectral Radiometer

MST – Mountain Standard Time

RG – Walnut Gulch Watershed Site (Rain Gage)

SMEX - Soil Moisture Experiment

STD – Standard Deviation

Terra MODIS – Moderate Resolution Imaging Spectroradiometer on the Terra satellite

TM5 – Thematic Mapper Instrument on Landsat 5 satellite

UTM - Universal Transverse Mercator

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