

**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 Leaf Area Index Data: Arizona

### Summary

The parameter for this data set is Leaf Area Index. Raw data files and summary files containing field averages are provided. 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:

Jackson, Thomas J., and Lynn G. McKee. 2009. *SMEX04 Leaf Area Index Data: Arizona*. Boulder, Colorado USA: NASA DAAC at the National Snow and Ice Data Center.

### 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. 'Raw' is a raw data file and 'Sum' is a summary data file.
<u>File size</u>	3 KB to 29 KB
<u>Parameter(s)</u>	Leaf Area Index (LAI)
<u>Procedures for obtaining data</u>	Data are available via FTP.

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### 1. Contacts and Acknowledgments:

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#### Acknowledgements:

Many graduate students and volunteers worked to collect the field data. We would like to thank the Soil Moisture Experiment 2004

Science Team, the Southwest Watershed Research Center and the Walnut Gulch Experimental Watershed for their assistance. We would also like to thank the National Aeronautics and Space Administration for their generous contributions to the study. This work was supported by the NASA Aqua AMSR, Terrestrial Hydrology and Global Water Cycle Programs.

## **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'. 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 29 KB.

### **Spatial Coverage:**

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

The parameter in this data set is: Leaf Area Index (LAI). The following table describes the units of measurement and sources for the parameter.

Parameter	Unit of Measurement	Sensor
Leaf Area Index (LAI)	m <sup>2</sup> /m <sup>2</sup> LI-COR	LAI-2000

## 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\_LAI' – Raw Data Columns  
(With XX being either AZ or RG)

Column Heading	Description
Field	Field location identification number, AZ is an Arizona regional site, RG is a Walnut Gulch Watershed site,
Site	Number of site within field
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
LAI Leaf	Area Index
Notes	Sampling notes – if any

'SMEX04\_SUM\_XX\_LAI' – Summary Data Columns  
(With XX being either AZ or RG)

Field	Field location identification number, AZ is an Arizona
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	regional site, RG is a Walnut Gulch Watershed 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
LAI – AVG	Average of Leaf Area Index
LAI – STD	Standard Deviation of Leaf Area Index
Notes	Sampling notes – if any

Missing data are represented with -999

### **Error Sources:**

### **Leaf Area Index:**

Direct-beam radiation reflected into the sensor from upper leaves in the canopy can be confused with open sky, causing 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.

## **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](http://nsidc.org/data/amsr_validation/soil_moisture/index.html)

## **4. Data Acquisition and Processing:**

### **Theory of Measurements:**

Leaf Area Index data is valuable in developing methods to estimate the vegetation water content and other canopy variables. The goal of vegetation sampling is to generate the vegetation products used to estimate surface soil moisture from passive microwave radiometers.

### **Field Sampling:**

Leaf Area Index readings 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. 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 LAI-2000 units were set to average 5 locations into a single value, using one observation taken above the canopy and 5 beneath the canopy. 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.

### **Sensor or Instrument Description:**

#### **Leaf Area Index Meter**

Investigators used LiCor LAI-2000 plant canopy analyzers to measure leaf area index (LAI) using an indirect non-contact method based on

light transmittance through the canopy. The LAI-2000 calculates LAI from radiation measurements made with a "fish-eye" optical sensor (148° field-of-view). Measurements made above and below the canopy are used to determine canopy light interception at 5 angles.

Measurements are made by positioning the optical sensor and pressing a button, which sends the data to the data logger. Multiple below-canopy readings are taken so that LAI calculations are based on a large sample of the foliage canopy. After collecting above-canopy and below-canopy measurements, the control data logger performs all calculations and the results are available for immediate inspection. For more information see:  
[www.licor.com/env/Products/AreaMeters/lai2000/2000.jsp](http://www.licor.com/env/Products/AreaMeters/lai2000/2000.jsp)

## **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](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  
LAI – Leaf Area Index  
MST – Mountain Standard Time  
RG – Walnut Gulch Watershed Site (Rain Gage)  
SMEX - Soil Moisture Experiment  
STD – Standard Deviation  
UTM - Universal Transverse Mercator

### **Document Creation Date:**

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