

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 Vegetation Water Content Data

Summary

Large-scale maps of vegetation water content are necessary for the accurate estimation of surface soil moisture via microwave remote sensing. To support this type of remote sensing during SMEX04, a vegetation sampling campaign was conducted in coordination with satellite calibration and correction to result in an estimated map of vegetation water content. Data are provided in binary format 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:

Cosh, Michael H., E. Raymond Hunt Jr., Thomas J. Jackson, and Tugrul Yilmaz. 2009. *SMEX04 Vegetation Water Content Data*. Boulder, Colorado USA: National Snow and Ice Data Center. Digital media.

Overview Table

Category	Description
Data Format	Binary files
Spatial Coverage	Southernmost Latitude: 29.33° N Northernmost Latitude: 32.69° N Westernmost Longitude: 111.40° W Easternmost Longitude: 108.56° W
Temporal Coverage	Between 29 July 2004 and 30 August 2004
File naming Convention	“VWC_211.bin” refers to Arizona and Sonora vegetation water content matrix for July 29, 2004. “VWC_243.bin” refers to Arizona and Sonora vegetation water content matrix for August 30, 2004.
File Size	100 MB per file
Parameter(s)	Vegetation Water Content in kg/m ² (VWC = DN/100)
Procedures for obtaining Data	Data are available for FTP

Table of Contents

1. Contacts and Acknowledgments
2. Detailed Data Description
3. Data Access and Tools
4. References and Related Publications
5. Document Information

1. Contacts and Acknowledgments

Investigators Name and Title:

E. Raymond Hunt Jr., Physical Scientist, Thomas J. Jackson, Hydrologist USDA-ARS-Hydrology and Remote Sensing Laboratory

Technical Contact:

NSIDC User Services
National Snow and Ice Data Center
CIRES, 449 UCB
University of Colorado
Boulder, CO 80309-0449
Phone: (303) 492-6199
Fax: (303) 492-2468
Form: Contact NSICD User Services
Email: nsidc@nsidc.org

Acknowledgments:

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 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:

Binary Data Files

File Naming Convention:

VWC_211.bin
211 is the Julian day of year (July 29, 2004)

File size:

File sizes 100 MB

Geolocation Information:

Arizona and Sonora:

Projection Universal Transverse Mercator Zone 12 in meters

WGS84 Ellipsoid – ITRF and CTRS realization

Upper Left Corner	3617160 N	462240 E
Upper Right Corner	3617160 N	728880 E
Lower Left Corner	3246690 N	462240 E
Lower Right Corner	3246690 N	728880 E

Upper Left Corner	32.69150833	-111.40281667
Upper Right Corner	32.66840833	-108.55928056
Lower Left Corner	29.34876944	-111.38899167
Lower Right Corner	29.32851667	-108.64295556

Interior dimensions are 30 m by 30 m.

Dimensions of image: 8550 by 12190

Temporal Coverage:

Between July 29 2004 and August 30 2004

Parameter or Variable:

Vegetation Water Content (VWC) was derived from the Normalized Difference Infrared Index (NDII), which is a ratio of bands available from the Landsat 5 Thematic Mapper. The ratio is defined as:

$$NDII = \frac{TM\ Band4 - TM\ Band5}{TM\ Band4 + TM\ Band5}$$

Two days of TM coverage were available for the calculation of NDII during SMEX04. The overpasses occurred on 7/29/04 and 8/30/04. Ground-truth VWC measurements were taken as part of the SMEX04 experiment.

The first step was to determine the trend of VWC versus NDII for various vegetation types. All vegetation was analyzed and a single equation for all vegetation types was estimated to convert NDII to VWC.

$$VWC = 0.557692308 * NDII + 0.13923$$

This equation was applied to the July 29, 2004 and August 30, 2004 scenes. To estimate VWC for the dates between these dates, a linear approximation was done.

Take digital number / 100 for kg/m² of vegetation water content.

Error Sources: The pixel resolution of TM is 30 m by 30 m, but the sampling size of VWC at the surface is less than 1 m². Also, data were collected for the duration of the experiment; however, there were only two days of satellite overpass during the experiment. Therefore, there was some error in comparing ground data to the satellite scenes.

3. Data Access and Tools

Software and Tools:

The data are stored in binary format. ArcView, ENVI, or other similar visualization software packages are required to view these data.

4. References and Related Publications

Please see the SMEX04 site for more information, and the NSIDC SMEX site to access data.

5. Document Information

List of Acronyms:

The following acronyms were used in this document:

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

ENVI – Environment for Visualizing Images

FTP – File Transfer Protocol

NDII – Normalized Difference Infrared Index

SMEX – Soil Moisture Experiment

TM – Thematic Mapper

VWC – Vegetation Water Content