

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.

Oklahoma North and South Vegetation Water Content



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 SMEX03, a vegetation sampling campaign was conducted in coordination with satellite calibration and correction to result in a map of estimated vegetation water content. Data are provided in binary 8-bit 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:

Jackson, T. J., and M. H. Cosh, SMEX03 Oklahoma North and South Vegetation Water Content Data, Boulder, CO: National Snow and Ice Data Center. Digital media.

Overview Table

Category	Description
Data Format	Binary files
Spatial Coverage	Southernmost Latitude: 34.49° N Northernmost Latitude: 35.39° N Westernmost Longitude: 98.29° W Easternmost Longitude: 97.76° W
Temporal Coverage	July 10, 2003
File naming Convention	“VWC_OS_071003.bil” refers to Oklahoma South vegetation water content matrix for July 10, 2003. “VWC_ON_071003.bil” refers to Oklahoma North vegetation water content matrix for July 10, 2003.
File Size	5.0 MB to 6.7 MB
Parameter(s)	Vegetation Water Content in kg/m ² (VWC = DN/32)
Procedures for obtaining Data	Data are available for FTP

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1. Contacts and Acknowledgments

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Acknowledgments:

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2. Detailed Data Description

Format:

Binary Data Files

File Naming Convention:

VWC_OS_071003.bil
VWC_ON_071003.bil

OS indicates Oklahoma South, and ON indicates Oklahoma North. Data are presented for July 10, 2003, which is assumed to be a reasonable approximation for the study period.

File size:

File sizes range from 5.0 MB to 6.7 MB

Geolocation Information:

Oklahoma North:

Projection Universal Transverse Mercator Zone 14 in meters
WGS84 Ellipsoid – ITRF and CTRS realization

Upper Left Corner	4081020 N	585790 E
Upper Right Corner	4081020 N	640990 E
Lower Left Corner	3997020 N	585790 E
Lower Right Corner	3997020 N	640990 E

Upper Left Corner	36.87122	-98.037441719
Upper Right Corner	36.86460	-97.418273713
Lower Left Corner	36.11405	-98.046766559

Lower Right Corner 36.10761 -97.433591947

Interior dimensions are 30 m by 30 m.

Dimensions of image: 2800 by 1840

Oklahoma South:

Projection Universal Transverse Mercator Zone 14 in meters

WGS84 Ellipsoid – ITRF and CTRS realization

Upper Left Corner 3920100 N 560380 E

Upper Right Corner 3920100 N 617980 E

Lower Left Corner 3812100 N 560380 E

Lower Right Corner 3812100 N 617980 E

Upper Left Corner 35.42248 -98.334881531

Upper Right Corner 35.41732 -97.700496383

Lower Left Corner 34.44865 -98.342696988

Lower Right Corner 34.44367 -97.715762369

Interior dimensions are 30 m by 30 m.

Dimensions of image: 3600 by 1920

Temporal Coverage:

July 10 2003

Parameter or Variable:

Vegetation Water Content (VWC) was derived from the Normalized Difference Water Index (NDWI), which is a ratio of bands available from the Landsat (5&7) Thematic Mapper. The ratio is defined as

$$NDWI = (Band4 - Band5) / (Band4 + Band5).$$

Four days of TM coverage were available for the calculation of NDWI during SMEX03. The overpasses occurred on 5/31/03, 7/10/03, 7/26/03, and 8/27/03. However, because of the harvesting which occurred between 5/31/03 and 7/10/03 and the dry period which occurred during the experiment, it is reasonable to use only the 7/10/03 for estimation. Ground-truth VWC measurements were taken as part of the SMEX03 experiment.

The first step was to determine the trend of VWC versus NDWI for various vegetation types. All vegetation data are compared to the 7/10/03 scene. The following equations were used to convert NDWI to VWC.

Land Cover:	Equation
Pasture:	$VWC = 0.476 * NDWI + 0.3015$
Winter Wheat:	$VWC = 0.5994 * NDWI + 0.1928$
Corn:	$VWC = 4.85$ (a constant)

Soybeans:	VWC = 0.87 (a constant)	
Alfalfa:	VWC = 1.2192 * NDWI +0.1941	
Forest:	VWC = 8.0 (a constant)	

These equations were applied to the scene when available. To estimate information for each day, pixels were linearly interpolated.

Land Cover:	RMSE:	Bias:
Pasture:	0.192 kg/m ²	0.023 kg/m ²
Winter Wheat:	0.088 kg/m ²	-0.011 kg/m ²
Corn:	0.544 kg/m ²	-0.539 kg/m ²
Soybeans:	0.357 kg/m ²	0.069 kg/m ²
Alfalfa:	0.135 kg/m ²	0.000 kg/m ²
Forest:	unavailable	unavailable

Corn and Soybean data were examined for application to the SMEX03 dataset, however, the small number of data points available for validation revealed a poor comparison.

Divide digital number by 32 for kg/m² 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 was collected for the duration of the experiment; however, there is only one day 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:

No special tools are required to view these data. They are stored in binary format.

4. Data Acquisition and Processing

Data are stored in binary format to save space. **Divide the digital number by 32 for kg/m² vegetation water content.**

5. References and Related Publications

Please see the SMEX03 site for more information, and the NSIDC SMEX site to access data.

6. Document Information

Glossary and Acronyms:

Please see the EOSDIS Glossary of Terms for a general list of terms.

List of Acronyms:

Please see the EOSDIS Acronyms list for a general list of Acronyms.

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

FTP – File Transfer Protocol

LW – Little Washita

ON – Oklahoma North

OS – Oklahoma South

SMEX – Soil Moisture Experiment

TM – Thematic Mapper