



# SMEX03 Landsat Thematic Mapper NDVI and NDWI: Georgia, Version 1

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## USER GUIDE

### How to Cite These Data

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

Bosch, D. and M. Cosh. 2007. *SMEX03 Landsat Thematic Mapper NDVI and NDWI: Georgia, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. doi: <https://doi.org/10.5067/B9IT2PCYAQBL>. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT [NSIDC@NSIDC.ORG](mailto:NSIDC@NSIDC.ORG)

FOR CURRENT INFORMATION, VISIT <https://nsidc.org/data/NSIDC-0330>



National Snow and Ice Data Center

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# 1 DETAILED DATA DESCRIPTION

This Normalized Difference Vegetation Index (NDVI) and Normalized Difference Water Index (NDWI) data set was developed from Landsat 5 Thematic Mapper (TM) data for use in studying land cover features during the Soil Moisture Experiment 2003 (SMEX03). This Normalized Difference Vegetation Index (NDVI) and Normalized Difference Water Index (NDWI) data set was developed from Landsat 5 Thematic Mapper (TM) data for use in studying land cover features during the Soil Moisture Experiment 2003 (SMEX03).

## 1.1 Format

Data are presented in flat binary data files composed of 4-byte floating point numbers in little-endian ordering with accompanying ENVI ASCII header files. Image dimensions are 3440 rows by 1840 columns.

## 1.2 File and Directory Structure

Data are on the FTP site in the NDWI\_NDVI directory, as described in Table 1.

**Table 1.** Files Contained in this Data Set

File Name	Description	File Size
072003_GA_NDVI.fst	Contains NDVI data for the Georgia regional study area for 20 July 2003	24.7 MB
072003_GA_NDVI.hdr	NDVI ENVI header file	1 KB
072003_GA_NDWI.fst	Contains NDWI data for the Georgia regional study area for 20 July 2003	24.7 MB
072003_GA_NDWI.hdr	NDWI ENVI header file	1 KB

## 1.3 File Naming Convention

Files are named according to the following convention:

mmddy\_ss\_iiii.fst

where:

**Table 2.** Description of File Name Variables

Variable	Description
mm	Two-digit month

Variable	Description
dd	Two-digit day
yy	Two-digit year
ss	Site (GA)
iiii	Index (NDVI, NDWI)
.fst	Indicates that this is a dbFast binary data file
.hdr	Indicates that this is a header file

Example: 072003\_GA\_NDVI.fst

## 1.4 Spatial Coverage

This data set covers the Georgia regional study area as referenced by the following:

Southernmost Latitude: 30.96° N

Northernmost Latitude: 31.90° N

Westernmost Longitude: 83.97° W

Easternmost Longitude: 83.36° W

A detailed geographic description of the data set is shown in Table 3. Geolocation coordinates correspond to the center of each corner pixel.

**Table 3:** Geolocation of the Images

Regional Study Area	Image Coordinates			
	Northing	Easting	Latitude	Longitude
Upper Left Corner	3532170	219030	31.890693508	-83.970521377
Upper Right Corner	3532170	274200	31.902987034	-83.387729205
Lower Left Corner	3429000	219030	30.961072002	-83.941333124
Lower Right Corner	3429000	274200	30.972927502	-83.364252777

### 1.4.1 Spatial Resolution

Both Landsat NDVI and NDWI data files have a pixel size of 30 m by 30 m.

## 1.4.2 Projection and Grid Description

The projection is Universal Transverse Mercator (UTM), Zone 17, with the North American Datum 1983 (NAD 83) applied.

## Temporal Coverage

Data were acquired on 20 July 2003.

## 1.6 Parameter or Variable

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The parameters are NDVI and NDWI

NDVI is the difference between the visible red and Near-InfraRed (NIR) bands over their sum. The NDVI is a measure of vegetation amount and condition. It is associated with vegetation canopy characteristics such as biomass, leaf area index, and percentage of vegetation cover. NDVI helps researchers determine the density of vegetation in an area.

NDWI is the difference between the NIR and Mid-InfraRed (MIR) bands over their sum. NDWI gives a measurement of soil moisture. Refer to Equations 1 and 2 in the Data Acquisition and Processing section for NDVI and NDWI algorithms.

### 1.6.1 Parameter Range

Typically, the NDVI and NDWI vary between -1 and +1. For this data set, however, the parameter range is -0.525532 to 0.764273 for the NDVI and -0.0668948 to 1.01413 for the NDWI. Missing values are set to 0.

### 1.6.2 Parameter Source

Two TM scenes from Landsat 5 path row 18/38 were used to produce this NDVI and NDWI data set.

### 1.6.3 Sample Data Record

Figures 1 and 2 show sample thumbnail images from this data set.



**Figure 1.** Georgia NDVI 20 July 2003. Sample from Image File 072003\_GA\_NDVI.fst.



**Figure 2.** Georgia NDWI 20 July 2003. Sample from Image File 072003\_GA\_NDWI.fst.

## 2 SOFTWARE AND TOOLS

Tools appropriate for viewing these data are ArcView, ENVI, or other similar software package.

### 3 DATA ACQUISITION AND PROCESSING

#### 3.1 Data Source

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Data were derived from bands 3 (red), 4 (NIR), and 5 (MIR) of the Landsat 5 TM sensor.

#### 3.2 Derivation Techniques and Algorithms

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The NDVI and NDWI were computed for each pixel using Equations 1 and 2, respectively, as applied to the TM bands described in Table 4 (Gao, 1996):

NDVI =	$\rho(\text{band } 4) - \rho(\text{band } 3)$	
	—————	<b>(Equation 1)</b>
	$\rho(\text{band } 4) + \rho(\text{band } 3)$	

and

NDWI =	$\rho(\text{band } 4) - \rho(\text{band } 5)$	
	—————	<b>(Equation 2)</b>
	$\rho(\text{band } 4) + \rho(\text{band } 5)$	

Where:

**Table 4.** Algorithm Description

Variable	Description
$\rho(\text{band } 4)$	Reflectance value for the TM NIR band 4
$\rho(\text{band } 3)$	Reflectance value for the TM red band 3
$\rho(\text{band } 5)$	Reflectance value for the TM MIR band 5

Refer to the **Parameter** or **Variable** section for a description of NDVI and NDWI.

#### 3.3 Sensor or Instrument Description

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The TM instrument is a multispectral scanning radiometer carried on Landsats 4 and 5. It has seven spectral bands with a spatial resolution of 30 m for most bands. Refer to the [TM Web site](#) for additional technical details.



## 4 REFERENCES AND RELATED PUBLICATIONS

As a condition of using these data, you must cite the use of this data set using the following citation. For more information, see our Use and Copyright Web page.

Bosch, D. and M. Cosh. 2007. SMEX03 Landsat Thematic Mapper NDVI and NDWI: Georgia. [indicate subset used]. Boulder, Colorado USA: NASA National Snow and Ice Data Center Distributed Active Archive Center. doi: [10.5067/B9IT2PCYAQBL..](https://doi.org/10.5067/B9IT2PCYAQBL..)

<https://nsidc.org/data/amsre>: AMSR-E/Aqua Data at NSIDC standard products available at NSIDC

### 4.1 Related Websites

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Please visit the [USDA SMEX 03](#) Web site for in-depth information on the science mission and goal of the SMEX project.

## 5 CONTACTS AND ACKNOWLEDGMENTS

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### Acknowledgments:

The investigators would like to acknowledge the numerous graduate students and volunteers who collected the field data, the Soil Moisture Experiment 2003 Science Team, and the Southeast Watershed Research Laboratory (SEWRL) for their assistance. They also thank the National Aeronautics and Space Administration (NASA) for their generous contributions to the study. This work was supported by the NASA Aqua AMSR, Terrestrial Hydrology, and Global Water Cycle programs.

## 6 DOCUMENT INFORMATION

### 6.1 Publication Date

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March 2008

### 6.2 Date Last Updated

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30 March 2021