



# SMEX03 ASTER Level-1B Data: Oklahoma, 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.

Jackson, T. 2008. *SMEX03 ASTER Level-1B Data: Oklahoma, Version 1*. [Indicate subset used].

Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center.

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

FOR CURRENT INFORMATION, VISIT <https://nsidc.org/data/NSIDC-0325>



National Snow and Ice Data Center

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# 1 DETAILED DATA DESCRIPTION

## 1.1 Format

The ASTER Level-1B data are scaled radiance Data Numbers stored as 16 bit unsigned integers in little-endian byte order, and consist of one binary file per band. Each binary file is accompanied by a tab-delimited ASCII header file. Missing data are set to zero. Depending on the band, the binary files have a different number of columns and rows:

- VNIR files (bands 1-3) are 3680 columns by 5600 rows.
- SWIR files (bands 4-9) are 1840 columns by 2800 rows.
- TIR files (bands 10-14) are 614 columns by 933 rows.

To convert from Data Number (DN) to radiance at the sensor, the unit conversion coefficients are used. Refer to Equation 1. For more information, refer to the [ASTER User Handbook](#) (PDF, 3.6 MB)

The DN can be converted to radiance by using the following equation:

$\text{Radiance} = (\text{DNvalue} - 1) * \text{unit conversion coefficient}$	<b>(Equation 1)</b>
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The conversion coefficients are listed in Table 1.

**Table 1: Unit Conversion Coefficients**

Subsystem	Band No.	Unit Conversion Coefficient (W/(m*sr*µm)/DN)
VNIR	1	0.676
	2	0.708
	3N	0.862
SWIR	4	0.2174
	5	0.0696
	6	0.0625
	7	0.0597
	8	0.0417
	9	0.0318

Subsystem	Band No.	Unit Conversion Coefficient (W/(m <sup>2</sup> sr*μm)/DN)
TIR	10	0.006822
	11	0.006780
	12	0.006590
	13	0.005693
	14	0.005225

## 1.2 File and Directory Structure

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Data are available on the FTP site in the following directory:

/pub/DATASETS/AVDM/data/soil\_moisture/SMEX03/Oklahoma/satellite/ASTER/. Within the /ASTER/directory, there are two sub-directories as described in Table 2

**Table 2:** Directory Description

Directory	Description
OKN	Contains all Oklahoma North files for each sample date, two files per spectral band: one binary file and one header file
OKS	Contains all Oklahoma South files for each sample date, two files per spectral band: one binary file and one header file

## 1.3 File Naming Convention

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Files are named according to the following convention:

aster\_mmddyyyy\_sss\_bxx(x).bil

aster\_mmddyyyy\_sss\_bxx(x).hdr

where:

**Table 3:** Description of File Name Variables

Variable	Description
mm	2-digit month
dd	2-digit day
yyyy	4-digit year
sss	Site (oks = Oklahoma South, okn = Oklahoma North)
bxx(x)	Band number (for example, b03N refers to Band 3, Nadir-looking)
.bil	Indicates that this is a Band-Interleaved-by-Line binary data file.
.hdr	Indicates that this is a header file.

Example: aster\_07022003\_okn\_b10.bil (contains 02 July 2003 band 10 data for the Oklahoma North regional study area)

## 1.4 Spatial Coverage

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Data coverage includes the Oklahoma North and Oklahoma South regional study areas:

### **Oklahoma North:**

Southernmost Latitude: 36.12° N

Northernmost Latitude: 36.85° N

Westernmost Longitude: 98.00° W

Easternmost Longitude: 97.48° W

### **Oklahoma South:**

Southernmost Latitude: 34.45° N

Northernmost Latitude: 35.40° N

Westernmost Longitude: 98.26° W

Easternmost Longitude: 97.74° W

A detailed geographic description of the data set is shown in Table 4. The coordinates are in the Universal Transverse Mercator (UTM) Zone 14 projection and World Geodetic System (WGS) 84 datum.

**Table 4:** Geolocation of the Images

Site	Subsystem	Image Coordinates (Northing and Easting)			
		Upper left	Upper right	Lower left	Lower right
OKS	VNIR	555600E 3920100N	618000E 3920100N	555600E 3812100N	618000E 3812100N
	SWIR	555600E 3920100N	618000E 3920100N	555600E 3812100N	618000E 3812100N
	TIR	555570E 3920130N	617940E 3920130N	555570E 3812130N	617940E 3812130N
OKN	VNIR	585795E 4081005N	640995E 4081005N	585795E 3997005N	640995E 3997005N
	SWIR	585780E 4081020N	640980E 4081020N	585780E 3997020N	640980E 3997020N
	TIR	585720E 4081050N	640980E 4081050N	585780E 3997080N	640980E 3997080N

### 1.4.1 Spatial Resolution

VNIR, SWIR, and TIR have different resolutions: 15, 30, and 90 meters, respectively. Each ASTER scene covers an area of approximately 60 x 60 km.

### 1.4.2 Projection and Grid Description

Universal Transverse Mercator (UTM): Zone 14, World Geodetic System 1984 (WGS 84)

## 1.5 Temporal Coverage

Data were collected once daily for each region on 02 July 2003 and 18 July 2003. These data should be used with the recognition that they represent a single point in time. Satellite overpass times for each date and location are listed below:

- Satellite overpass times for 02 July 2003 were 17:24:47 and 17:25:13 GMT for Oklahoma North and Oklahoma South, respectively.

- Satellite overpass times for 18 July 2003 were 17:24:13 and 17:24:39 GMT for Oklahoma North and Oklahoma South, respectively.

## 1.6 Parameter or Variable

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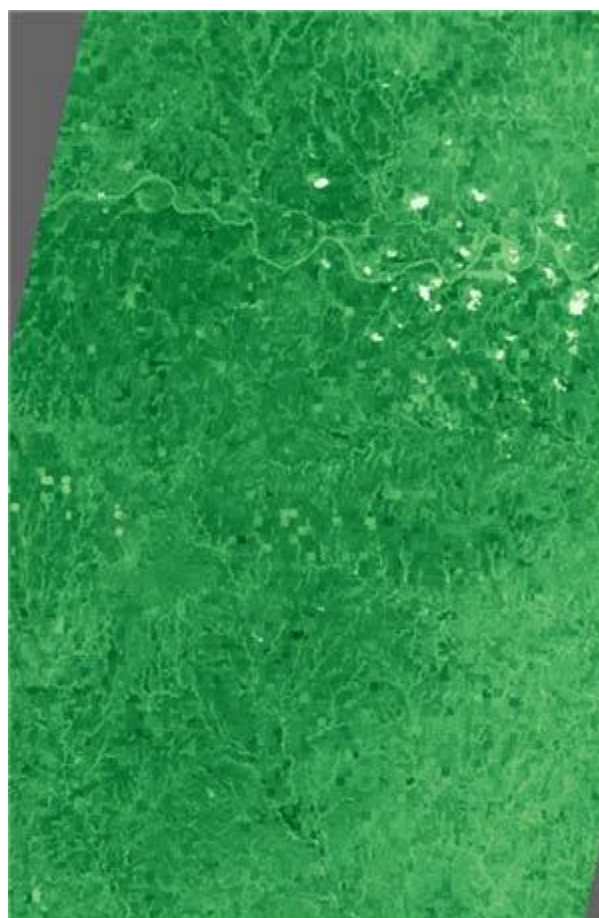
The parameter of this data set is radiance as expressed in units of  $W/(m^2 \cdot sr \cdot \mu m)$ .

### 1.6.1 Parameter Description

Radiance is the measure of the amount of electromagnetic radiation reflected or emitted by an object or surface.

### 1.6.2 Sample Data Record

Figure 1 shows a sample image from this data set.



**Figure 1.** Oklahoma North 02 July 2003 Sample Image

## 2 SOFTWARE AND TOOLS

### 2.1 Software and Tools

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Tools appropriate for viewing these data are [ArcView](#), [ENVI](#), or other similar software packages.

## 3 DATA ACQUISITION AND PROCESSING

### 3.1 Data Acquisition Methods

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For each day, five ASTER scenes were mosaicked to form one image. The smaller regional study areas of Oklahoma North and Oklahoma South were then extracted. Data are Level-1B with geometric and radiometric corrections applied.

### 3.2 Sensor or Instrument Description

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The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) is an advanced multispectral imager launched on board NASA's Terra spacecraft in December 1999. ASTER covers a wide spectral region with 14 bands from the visible to the thermal infrared with high spatial, spectral, and radiometric resolution. An additional backward-looking near-infrared band provides stereo coverage.

ASTER consists of three subsystems, or sensors. The high-resolution VNIR radiometer observes solar radiation reflected from the Earth's surface in three visible and near-infrared bands (1-3). The VNIR radiometer has a pointing capability of plus or minus 24 degrees from nadir in the cross-track direction. The radiometer is calibrated in orbit using halogen lamps. SWIR is a high-resolution, multispectral radiometer that detects reflected solar radiation from the Earth's surface (bands 4-9). SWIR can also change the boresight in the cross-track direction by plus or minus 8.55 degrees from nadir using a pointing mechanism. TIR is an advanced radiometer with five spectral bands (10-14) to detect emitted, thermal infrared radiation. See the [ASTER User Handbook](#) (PDF, 3.6 MB) for more information. Refer to Table 5 for spectral ranges.

**Table 5:** Subsystem Spectral Ranges

Subsystem	Band No.	Spectral Range (µm)
VNIR	1	0.52-0.60
	2	0.63-0.69



Subsystem	Band No.	Spectral Range (µm)
	3N	0.78-0.86
SWIR	4	1.60-1.70
	5	2.145-2.185
	6	2.185-2.225
	7	2.235-2.285
	8	2.295-2.365
	9	2.360-2.430
TIR	10	8.125-8.475
	11	8.475-8.825
	12	8.925-9.275
	13	10.25-10.95
	14	10.95-11.65

## 4 REFERENCES AND RELATED PUBLICATIONS

### 4.1 Related Data Collections

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Abrams, Michael and Simon Gaskin. ASTER User Handbook: Advanced Spaceborne Thermal Emission and Reflection Radiometer. Version 2. Jet Propulsion Laboratory.

[http://asterweb.jpl.nasa.gov/content/03\\_data/04\\_Documents/aster\\_user\\_guide\\_v2.pdf](http://asterweb.jpl.nasa.gov/content/03_data/04_Documents/aster_user_guide_v2.pdf), 3.6 MB.

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

[AMSR-E/Aqua Data at NSIDC](#): AMSR-E standard products available at NSIDC.

## 5 CONTACTS AND ACKNOWLEDGMENTS

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## 6 DOCUMENT INFORMATION

### 6.1 Publication Date

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### 6.2 Date Last Updated

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