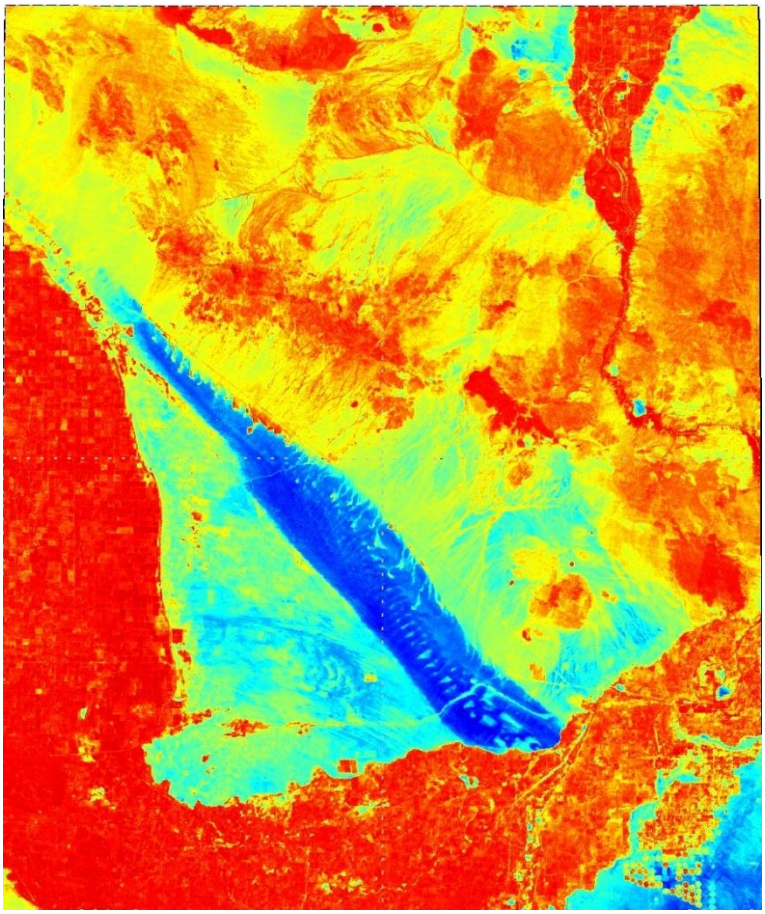
NORTH AMERICAN ADVANCED SPACEBORNE THERMAL EMISSION AND REFLECTION RADIOMETER (ASTER) LAND SURFACE EMISSIVITY DATABASE VERSION (NAALSED) VERSION 003



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1.0 Introduction

The North American Advanced Spaceborne Thermal Emission and Reflection radiometer (ASTER) Land Surface Emissivity Database (NAALSED) was developed by the California Institute of Technology, the academic home of National Aeronautics and Space Administration's (NASA) Jet Propulsion Laboratory (JPL). The product is hosted and distributed by NASA's Land Processes Distributed Active Archive Center (LP DAAC) at the U.S. Geological Survey's (USGS) Center for Earth Resources Observation and Science (EROS).

This version 3 collection was compiled from the best available ASTER input acquired during the "leaf-on" season (July, August, and September) from 2000 to 2010 over the North American continent. Each NAALSED tile contains several layers of related science data sets (SDS) such as surface Emissivity, Temperature, and a top of atmosphere Normalized Difference Vegetation Index (NDVI). Additional supporting SDSs include a regional version of the ASTER Global Digital Elevation Model (GDEM) resampled to 100-meters (m), a land water map, pixel geographic coordinates, and the number of observations used as input.

2.0 Algorithm Description

The NAALSED parameters are averaged for every clear-sky pixel available in the ASTER mission record from 2000 through 2010. A New ASTER Cloud Mask Algorithm (NACMA)[2] was developed specifically to identify inputs to the ASTER Land Surface Emissivity Aggregation Algorithm (ALSEA)[1] that generates the parameter means and standard deviations in each tile. A full description of the methodology used to generate NAALSED is available in the References section below.[3]

3.0 Science Data Sets

NAALSED includes seven HDF Data Groups, within which are nineteen SDSs (data layers). The geophysical SDSs (emissivity, temperature, and NDVI) contain mean values for the parameter and standard deviations per pixel. Emissivity is calculated for each of five ASTER thermal wavelength bands, and is packaged in three dimensions (emissivity, x/y, band). The supporting SDSs (ASTER GDEM, land water map, geolocation, observations) contain standard data values for each pixel in a NAALSED tile.

Data Group	Science Data Set	Units	Data Type	Valid Range	Scaling Factor (*)
Emissivity	Mean for Band 10 (8.3μm) for Band 11 (8.6 μm) for Band 12 (9.1 μm) for Band 13 (10.6 μm) for Band 14 (11.3 μm)	None	16-bit signed integer	0 to 1000 Fill -9999	0.001
	Standard Deviation for Band 10 (8.3 μm) for Band 11 (8.6 μm) for Band 12 (9.1 μm) for Band 13 (10.6 μm) for Band 14 (11.3 μm)	None	16-bit signed integer	-1000 to 1000 Fill -9999	0.001
Temperature	Mean	Kelvin	32-bit signed integer	0 to 65535 Fill -9999	0.01
	Standard Deviation	Kelvin	16-bit signed integer	0 to 65535 Fill -9999	0.001
NDVI	Mean	None	16-bit signed integer	0 to 100 Fill -9999	0.01
	Standard Deviation	None	16-bit signed integer	0 to 100 Fill -9999	0.001
ASTER GDEM	100-m ASTGDEM	Meters	16-bit signed integer	-500 to 9,000 Fill -9999	NA
Land Water Map	Land Water Map	None	16-bit unsigned integer	0 land 1 water Fill -9999	NA
Geolocation	Latitude	Decimal Degrees	32-bit floating point	22 to 80	0.001
	Longitude	Decimal Degrees	32-bit floating point	-54 to -171	0.001
Observations	Number of Observations	Number per pixel	16-bit unsigned integer	NA	NA

Table 1 Science Data Set Specifications

4.0 Product Characteristics

NAALSED tiles are produced at 100-m spatial resolution on a geographic mapping grid and formatted in Hierarchical Data Format Version 5 (HDF5). The HDF5 file format can be visualized and navigated using the HDFView tool distributed at no cost from The HDF Group (see LP DAAC Tools Page at https://lpdaac.usgs.gov/tools). Some propriety software is also capable of reading HDF5, for example MATLAB and PYTHON, but NASA and USGS can neither confirm nor deny their application.

NAALSED files are named with a convention based on geographic location. For example, in the filename "naalsed.v003.summer.44.-090.0001.h5,"

"naalsed" is the data collection
"v003" is the collection version
"summer" indicates input data spanning July, August, and September
"44" is the latitude of the upper left (northwest) corner of the 1° x 1° tile
"-090" is the longitude of the upper left (northwest) corner of the 1° x 1° tile
"0001" indicates a spatial resolution of 100-m and
"h5" identifies the file as HDF5 format.

Characteristic	Description
File format	Hierarchical Data Format Version 5 (HDF5)
Projection	Geographic Latitude and Longitude
Average tile volume	~40 megabytes (MB)
Total collection volume	137 gigabytes (GB)
Total number of tiles	3,327
Tile dimensions	1 degree (°) by 1°
Data type	16 and 32-bit integer
Geographic coverage	(80° North, -17°1° West), (22° North, -54° West)
Temporal range	July, August, September 2000-2010
Pixel Resolution	100-meters (m)
Dimensions	1,000 rows by 1,000 columns

Table 2 Basic Product Specifications

5.0 Product Access

NAALSED tiles are available through Reverb, LP DAAC Data Pool, and USGS Earth Explorer search and order interfaces, as listed below. The products are free of charge and not subject to any redistribution policies.

Reverb:	http://reverb.echo.nasa.gov/reverb/
LP DAAC Data Pool:	https://lpdaac.usgs.gov/lpdaac/get_data/data_pool
USGS EarthExplorer:	http://earthexplorer.usgs.gov

6.0 Acknowledgment and Citation

NASA LP DAAC requests that users include the following acknowledgment when publishing results using the NAALSED collection.

"NAALSED data were obtained through <the online Data Pool or Reverb> at the NASA Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota (http://lpdaac.usgs.gov/get_data)."

Citation for the NAALSED collection as shown below is also requested by the data provider.

"The ASTER Land Surface Emissivity Database was developed by NASA as referenced in Hulley, G.C., and S.J. Hook, 2010, IEEE Transactions on Geoscience and Remote Sensing, DOI:10.1109/TGRS.2010.2063034."

7.0 References

Additional sources of information on the NAALSED collection are available on the Internet through these links:

ASTER Emissivity Web Page:	http://emissivity.jpl.nasa.gov
ASTER Science Team (JPL) Web Page:	http://asterweb.jpl.nasa.gov

Below are references to some of the publications to date that address the NAALSED and its history. Copies of these publications are available upon request from LP DAAC User Services (See Contact Information below).

[1] Hulley, G.C., S.J. Hook, and , A.M. Baldridge, 2008, ASTER Land Surface Emissivity Database of California and Nevada, Geophysical Research Letters, Vol. 35, L13401, doi:10.1029/2008GL034507

[2] Hulley G.C., and S.J. Hook, 2008, A New Methodology for Cloud Detection and Classification with Advanced Spaceborne Thermal Emission and Reflection (ASTER) Data , Geophysical Research Letters, Vol. 35, L16812, doi:10.1029/2008GL034644

[3] Hulley, G. C. and S. J. Hook, 2009 The North American ASTER land surface emissivity database (NAALSED) version 2.0, Remote Sensing of Environment, vol. 113, no. 9, pp. 1967–1975, September

[4] Hulley, G.C., and S.J. Hook, 2010, Generating Consistent Land Surface Temperature and Emissivity Products Between ASTER and MODIS Data for Earth Science Research, IEEE Transactions on Geoscience and Remote Sensing, DOI: 10.1109/TGRS.2010.2063034.

[5]Hulley, G. C., S. J. Hook, and A. M. Baldridge, 2009. Validation of the North American ASTER Land Surface Emissivity Database (NAALSED) Version 2.0., Remote Sensing of Environment, 113, 2224-2233

8.0 Contact Information

LP DAAC User Services staff are the primary point of contact for users of LP DAAC products and services and may be contacted with questions about products, access, tools, or policies.

LP DAAC User Services
U.S. Geological Survey (USGS)
Center for Earth Resources Observation and Science (EROS)
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Sioux Falls, SD 57198-001

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Facsimile:	605-594-6963
E-mail:	lpdaac@usgs.gov
Web:	http://lpdaac.usgs.gov/customer_service

9.0 Acronym List

Acronym	Description
°	degree
ALSEA	ASTER Land Surface Emissivity Aggregation Algorithm
ASTER	Advanced Spaceborne Thermal Emission and Reflection radiometer
Caltech	California Institute of Technology
DAAC	Distributed Active Archive Center
EROS	Center for Earth Resources Observation and Science
FTP	File Transfer Protocol
GB	gigabyte
GDEM	Global Data Elevation Model
HDF	Hierarchical Data Format
IEEE	Institute of Electrical and Electronics Engineers
JPL	Jet Propulsion Laboratory
LP	Land Processes
μm	Micrometer
m	Meter
MB	Megabyte
NA	Not Applicable
NAALSED	North American ASTER Land Surface Emissivity Database
NACMA	New ASTER Cloud Mask Algorithm
NASA	National Aeronautics and Space Administration
NDVI	Normalized Difference Vegetation Index
SDS	Science Data Set
TB	terabyte
TOA	Top of atmosphere
TSSC	Technical Services Support Contract
USGS	U.S. Geological Survey
V003	Version 3