LP DAAC Access and Capabilities

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NASA’s LP DAAC

- Land Processes (LP) Distributed Active Archive Center (DAAC)
  - https://lpdaac.usgs.gov
- Located in Sioux Falls, SD at the USGS Earth Resources Observation Science (EROS) Center
NASA’s LP DAAC

- 1 of 12 NASA Earth Observing System Data and Information System (EOSDIS) DAACs
- Part of in NASA’s Earth Science Data Systems Program

USGS  NASA
What is a DAAC?

- Tiered Customer Support
- Sister DAAC support
- Distribution
- Archive
- Standards
- Access
- Training
- Outreach
- New technology exploration
- Research and applied sciences support

-USGS
-NASA
What does the LP DAAC do?

Processes, archives, and distributes land data products to NASA PI’s, DOI land managers, and 100,000’s of users in the public earth science remote sensing community.
LP DAAC Distributed Data Products

MODIS

MEaSUREs

ASTER

Community
A petabyte (PB) is a lot of data:
- 1 PB is 20 million four-drawer filing cabinets full of text
- 1 PB is 13.3 years of HD-TV video
- 1.5 PB is the size of 10 billion photos on Facebook
MODIS Products at the LP DAAC

- **Albedo**
- **Surface Reflectance**
- **LST**
- **NDVI**
MODIS Land Data Products

- Moderate Resolution Imaging Spectroradiometer (MODIS)
- On board NASA’s Terra and Aqua satellites
- Level 2 and Level 3 land products

<table>
<thead>
<tr>
<th>Temporal Coverage</th>
<th>2000 (Terra), 2002 (Aqua) - Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographic Coverage</td>
<td>Global</td>
</tr>
<tr>
<td>Spatial Resolution</td>
<td>250 m, 500 m, 1,000 m, 5,600 m</td>
</tr>
<tr>
<td>Unique Products</td>
<td>126 and growing!</td>
</tr>
</tbody>
</table>
MODIS Data Product Types

- Radiation Budget Variables
  - Surface Reflectance
  - BRDF and Albedo
  - Land Surface Temperature and Emissivity
- Vegetation
- Thermal Anomalies and Fire
- Vegetation Characteristics
- Land Cover
MODIS Version 6 Collection-Wide Changes

- Geolocation updates
- Polarization Corrected L1B
- New Land Water mask
- Improved Cloud mask
Product-Specific Updates

MOD09A1: MODIS/Terra Surface Reflectance 8-Day L3 Global 500m SIN Grid V006

Description

The MODIS Terra MOD09A1 Version 6 product provides an estimate of the surface spectral reflectance of Terra MODIS Bands 1-7 corrected for atmospheric conditions such as gases, aerosols, and Rayleigh scattering. Along with the seven 500m reflectance bands is a Quality layer and four observation bands. For each pixel, a value is selected from all the acquisitions within the 8-day composite period. The criteria for the pixel choice include cloud and solar zenith. When several acquisitions meet the criteria the pixel with the minimum channel 3 (blue) value is used. Validation at stage 3 has been achieved for all MODIS Surface Reflectance products.

Improvements/Changes from Previous Versions

- Improvement to the aerosol retrieval and correction algorithm and use of new aerosol retrieval Look up Tables.
- Refinements to the internal snow, cloud, and cloud shadow detection algorithms. Uses BRDF database to better constrain the different threshold used.
- Processes ocean bands to create a new Surface Reflectance Ocean product and provide QA data sets for these bands.
- Improved discrimination of salt pans from cloud and snow and flag salt pan in QA band.

Citation

PI Name: Eric Vermote
DOI: 10.5067/MODIS/MOD09A1.006
What’s new in MODIS Version 6

- Radiation Budget Variables
  - New surface reflectance products (M*DOCGA and M*DTGBA)
  - New Land Surface Temperature and Emissivity products created in response to user community requests (M*D11B2, M*D11B3)

Available now!
What’s new in MODIS Version 6

- **Ecosystem Variables**
  - New compositing process for Vegetation Indices (M*D13s)
  - Improved resolution of Leaf Area Index/FPAR (M*D15s), Gross and Net Primary Productivity (M*D17s) products

Available now!
Monthly MODIS NDVI V5 vs. V6

Temporal Comparison

Site: 14, South Dakota, 44.30450439, -101.1726074
Quality: Show Good Quality

Layer Comparison

Layer 1: MOD13A3_005__1_km_monthly_NDVI
Layer 2: MOD13A3_006__1_km_monthly_NDVI

Categorical Overview

Time Series

Dates Selected: All

Legend:
- 005__1_km_monthly_NDVI
- 006__1_km_monthly_NDVI

Graph showing time series of NDVI values for years 2011 to 2016.
Monthly MODIS NDVI V5 vs. V6

South Dakota, 44.30450439, -101.1726074
Monthly MODIS NDVI V5 vs. V6

South Dakota,
44.30450439,
-101.1726074

July 2013
What’s new in MODIS Version 6

- Landcover Characteristics
  - Fire
    - Detection of fire over water, e.g. offshore gas flaring
      - *Users must now appeal to bits 0–1 of the pixel-level algorithm QA layer to unambiguously discriminate land from water pixels.*
    - Improved detection of small fires
    - Bug fix for assessment of cloud and water pixels next to fire pixels near the scan edge
What’s new in MODIS Version 6

- **Radiation Budget Variables**
  - New Surface Reflectance algorithm applied to bands 1-7 (MCD*19s)
  - New Land Surface Temp. & Emissivity (M*D21s)
  - New Albedo data product structure (MCD43’s)

- **Ecosystem Variables**
  - Evapotranspiration (M*D16s)

- **Landcover Characteristics**
  - VCF products (MOD44B)
  - New 3 year land cover products (MCD12)

*Coming this summer!*    
*Or beyond*
ASTER Products at the LP DAAC
ASTER

- Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER)
- One of five instruments onboard NASA’s Terra satellite
- Partnership between NASA, Japan's Ministry of Economy, Trade and Industry (METI), and the National Institute of Advanced Industrial Science and Technology (AIST)
- Select products available at no charge over U.S. and Territories

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<tbody>
<tr>
<td>Geographic Coverage</td>
<td>Global</td>
</tr>
<tr>
<td>Spatial Resolution</td>
<td>15 m, (VNIR), 30 m (SWIR), 90 m (TIR)</td>
</tr>
<tr>
<td>Unique Products</td>
<td>6 standard, 10 on-demand</td>
</tr>
</tbody>
</table>
ASTER Acquisition and Coverage

- Data have been collected since 2000
- ~2.7 million scenes
- ~515 scenes/day
- Global coverage
  - Taskable
  - Pointable
  - Expedited
- ASTER can collect in stereo (3D)
  - Uses nadir- and aft-looking near infrared cameras

Spatial and temporal coverage may vary
Terra ASTER Data Products

- Registered At-Sensor Radiance (AST_L1B)
  - Precision Terrain Corrected (AST_L1T)
  - Expedited (AST_L1BE)
  - Orthorectified* (AST14OTH, AST14DMO)
- Reconstructed Unprocessed Instrument Data (AST_L1A)
  - Expedited (AST_L1AE)
- Surface Reflectance* (AST_07, 07XT)
- Surface Radiance* (AST_09, 09XT, 09T)
- Surface Kinetic Temperature* (AST_08)
- Surface Emissivity* (AST_05)
- Global Digital Elevation Model (GDEM) (AST_GTM)
- Scene-based elevation* (AST14DEM)

*On-demand higher level products
ASTER L1T

- ASTER Level 1 Precision Terrain Corrected Registered At-Sensor Radiance (AST_L1T)
- Generated with a single resampling of an ASTER Level 1A input scene
- Orthorectified
- Rotated north-up
- Soon to be input for ASTER higher-level products
ASTER L1T Product contents

- Science Data (.HDF) and metadata (.XML)
- VNIR and TIR Full Resolution Browses (Geotiff)
- Quality Assurance (QA) file (.txt) and metadata (.XML)
- Bundled Browse (.HDF) and metadata (.XML)
- VNIR, TIR, and QA browses (.jpeg)

Files available via HTTP download
ASTER L1T
GIS-Ready Browse

QA Browse

VNIR/SWIR Browse
*SWIR band 4 included for pre-April 2008 data

TIR Browse

USGS  NASA
MEaSUREs Products at the LP DAAC

- NASA Shuttle Radar Topography Mission (SRTM) v3
- Web-Enabled Landsat Data (WELD)
MEaSUREs

- Making Earth Science Data Records for Use in Research Environments (MEaSUREs)
- Supported by NASA’s Earth Science Program
- Projects are focused on product generation, availability, and utility
- The LP DAAC is one of 10 participating DAACs that distribute MEaSUREs data products
Shuttle Radar Topography Mission (SRTM) Version 3.0

- Created by the Jet Propulsion Laboratory (JPL)
- Principal Investigator: Michael Kobrick, JPL
- Rasterized SRTM data with voids filled from ASTER GDEM2, USGS GMTED2010, and USGS NED

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<thead>
<tr>
<th>Geographic Coverage</th>
<th>Global (60°N to 56°S latitude)</th>
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<tbody>
<tr>
<td>Spatial Resolution</td>
<td>1 and 3 arc-seconds*</td>
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<tr>
<td>Tile Size</td>
<td>1° x 1°</td>
</tr>
<tr>
<td>Unique Products</td>
<td>8</td>
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</tbody>
</table>

*Version 2.1 NASA SRTM is 30 arc seconds
NASA SRTM v3

Mount Elgon, Uganda

3 arc-seconds 1 arc-second
Web-Enabled Landsat Data (WELD)

- Created by South Dakota State University (SDSU)
- Principle Investigator:  David Roy, SDSU
- Annual, seasonal, monthly, and weekly tiled mosaics of Landsat 7 ETM+

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<thead>
<tr>
<th>Temporal Coverage</th>
<th>2003 - 2012</th>
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<tr>
<td>Geographic Coverage</td>
<td>U.S.</td>
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<tr>
<td>Spatial Resolution</td>
<td>30 meter</td>
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<tr>
<td>Unique Products</td>
<td>11</td>
</tr>
</tbody>
</table>
Community Products

- Derived from one or more NASA EOS missions
- Generated by selected science investigators

ASTER Global Emissivity Database (GED)
ASTER GED

- Principal Investigator: Glynn Hulley, NASA Jet Propulsion Laboratory (JPL)
- Land surface emissivity derived from ASTER data

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<tr>
<td>Geographic Coverage</td>
<td>Global</td>
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<tr>
<td>Spatial Resolution</td>
<td>100 meter, 1 kilometer</td>
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<tr>
<td>Tile Size</td>
<td>1° x 1°</td>
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<tr>
<td>Unique Products</td>
<td>4</td>
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</table>
Data Access

- NASA EOSDIS Earthdata Search Client
- NASA Reverb
- USGS EarthExplorer
- USGS GloVis
- LP DAAC Data Pool & DAAC2Disk
- LP DAAC AppEEARS
LP DAAC Data Pool & DAAC2Disk

Data Pool

The Data Pool is the publicly available portion of the LP DAAC online holdings. Data Pool provides a more direct way to access files by foregoing their retrieval from the nearline tape storage devices. All Data Pool holdings are available at no cost to the user.

Available datasets include:
- All MODIS data holdings
- ASTER Level - 1T data for the U.S. and Territories
- ASTER Level - 1B data for the U.S. and Territories
- ASTER Level - 1A and Level - 1B Exported data
- All WELO data holdings
- All NASA SRTM V3.0 data holdings
- All ASTER GED data holdings

Direct HTTP Access  LP DAAC2Disk Download Manager

Direct access to data directories for immediate HTTP retrieval is available via the following links:

- ASTER
- MODIS AQUI
- MODIS TERRA
- MODIS COMBINED
- SRTM
- WELO
Application for Extracting and Exploring Analysis Ready Samples (AppEEARS)

Simplicity

Interpretability

Traceability

Efficiency

Data in minutes or hours, not days
15 point samples
2 data layers
6 years
1,081 data records
1,152 granules
~3.5 hours

https://lpdaacsvc.cr.usgs.gov/appeears/
Want to learn more?

Voice: 605-594-6116
Toll Free: 866-573-3222
(866-LPE-DAAC)
Fax: 605-594-6963
E-mail: LPDAAC@usgs.gov
Web: https://lpdaac.usgs.gov/
Questions???

https://lists.nasa.gov/mailman/listinfo/lpdaac