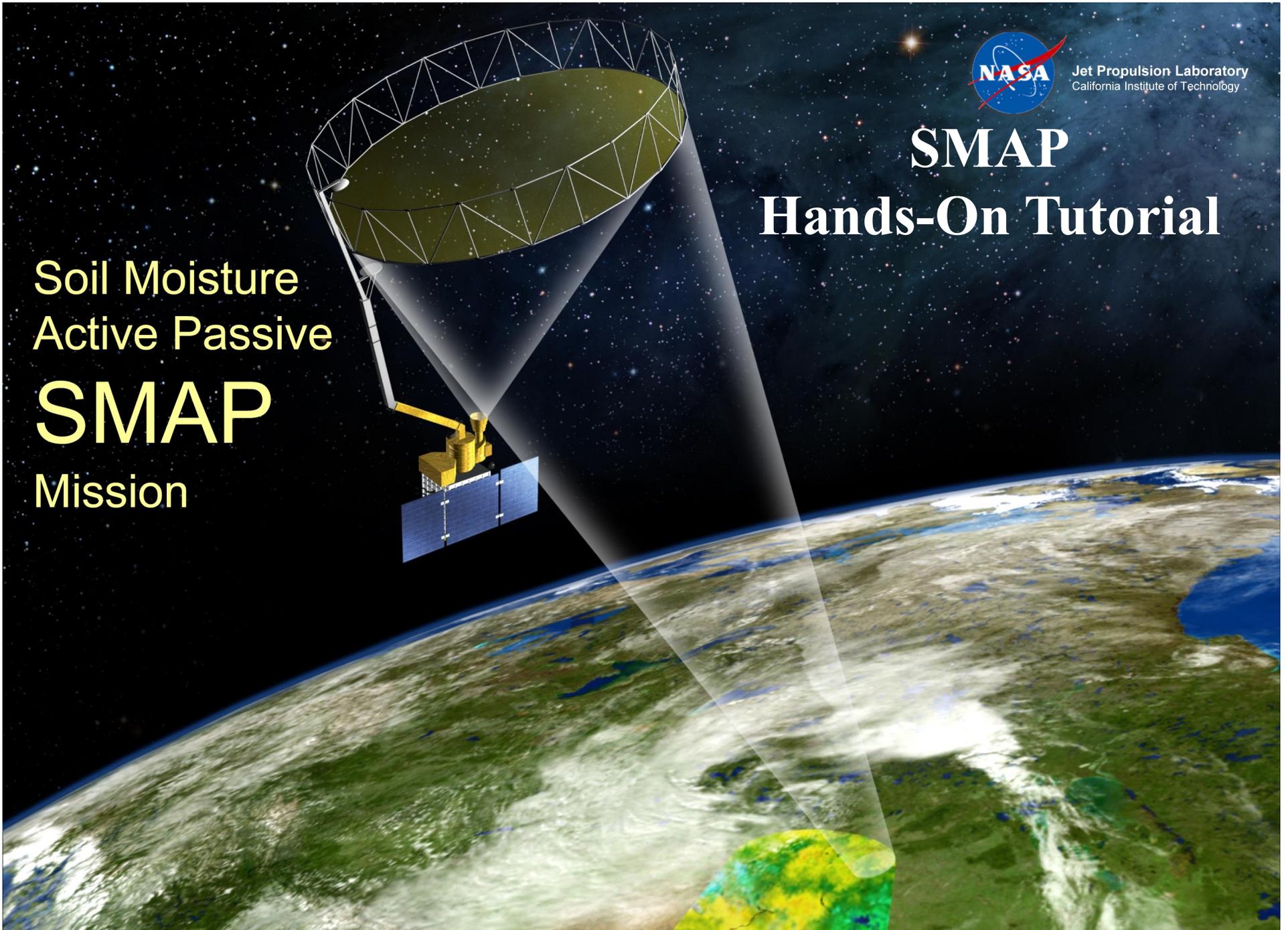




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SMAP Hands-On Tutorial

Soil Moisture
Active Passive
SMAP
Mission





Outline



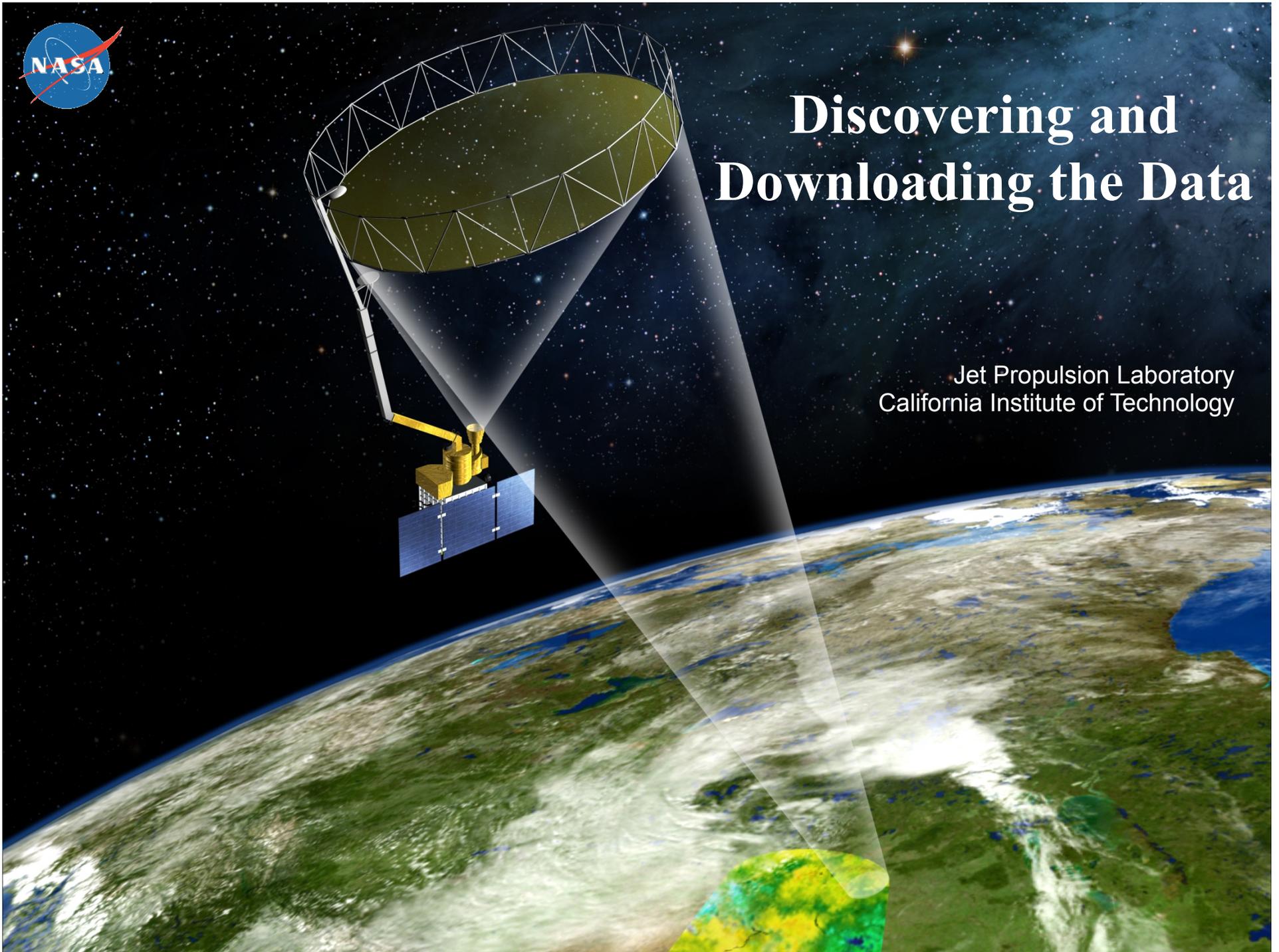
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- 1. Discovering and downloading the data*
- 2. Visualizing the data*
- 3. Analyzing the data*



Discovering and Downloading the Data

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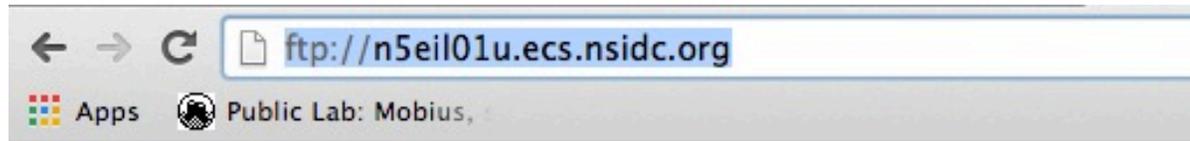


Data Access: FTP



FTP : <ftp://n5eil01u.ecs.nsidc.org/>

Direct access to the entire archive of data



Index of /

| Name | Size | Date Modified |
|--|-------|-----------------------|
|  AMSA | 0 B | 8/22/13, 12:00:00 AM |
|  AQUARIUS | 0 B | 12/3/13, 12:00:00 AM |
|  BRWS | 0 B | 8/22/13, 12:00:00 AM |
|  DP0 | 0 B | 8/22/13, 12:00:00 AM |
|  DP1 | 0 B | 11/26/13, 12:00:00 AM |
|  DP2 | 0 B | 8/22/13, 12:00:00 AM |
|  DP3 | 0 B | 1/6/14, 12:00:00 AM |
|  DP4 | 0 B | 1/22/14, 12:00:00 AM |
|  DPRecentInserts_20150419 | 377 B | 4/20/15, 1:05:00 PM |
|  DPRecentInserts_20150420 | 377 B | 4/21/15, 1:05:00 PM |
|  DPRecentInserts_20150421 | 612 B | 4/22/15, 1:05:00 PM |
|  DPRecentInserts_20150422 | 612 B | 4/23/15, 1:05:00 PM |
|  DPRecentInserts_20150423 | 408 B | 4/24/15, 1:05:00 PM |
|  DPRecentInserts_20150424 | 648 B | 4/25/15, 1:05:00 PM |
|  DPRecentInserts_20150425 | 546 B | 4/26/15, 1:05:00 PM |



Data Access: Reverb



Reverb: <http://reverb.echo.nasa.gov/>

Reformatting,
reprojection,
and spatial
and parameter
subsetting
services.

The screenshot displays the Reverb ECHO web interface. At the top, there is a navigation bar with links for THDATA, Data Discovery, DAACs, Community, and Science Disciplines. Below this is the NASA logo and the text "National Aeronautics and Space Administration". The main header features the EOSDIS logo and "NASA's Earth Observing System Data and Information System". On the right, it says "Reverb | ECHO The Next Generation Earth Science Discovery Tool".

The interface is divided into several sections:

- Search Options:** A sidebar on the left with categories: Spatial, Search Terms, Temporal, Platforms & Instruments, Campaigns, Processing Levels, and Science Keywords. It includes buttons for "Save Query" and "Clear Criteria", a "Feedback?" section, and "Availability" and "Notices" sections.
- Step 1: Select Search Criteria:** The main area is split into three panels:
 - Spatial Search:** Features a "Bounding Box" input field with the example coordinates "-50.736, 163.477, -11.144, 105.680 (S,E,N,W)", a "Reset" button, and a "Clear" button. Below is a satellite map of the world with a bounding box tool and a "Satellite" dropdown menu.
 - Search Terms:** A text input field with the example "e.g. MODIS Fire AST_L1A" and a "Clear" button.
 - Temporal Search:** Includes "START" and "END" date pickers with "Clear" buttons. A note states "* all times must be specified in GMT". There are also "Date Range" and "Annual Repeating Dates" options.
- Step 2: Select Datasets:** A list of search results showing "Found 5868 datasets. Total Query Time: 0.41s". The first three results are:
 - 15 Minute Stream Flow Data: USGS (FIFE) - Archive Center: ORNL_DAAC, Short Name: doi:10.3334/ORNLDAAC/1, Version: 1
 - 2000 Pilot Environmental Sustainability Index (ESI) - Archive Center: SEDAC, Short Name: CIESIN_SEDAC_ESI_2000, Version: 2000.00
 - 2001 Environmental Sustainability Index (ESI) - Archive Center: SEDAC, Short Name: CIESIN_SEDAC_ESI_2001, Version: 2001.00



Data Access: Worldview



[Worldview](https://earthdata.nasa.gov/labs/worldview/): <https://earthdata.nasa.gov/labs/worldview/>

Interactively
browse and
download
full-resolution
imagery.

The screenshot displays the NASA Worldview web application interface. On the left, a sidebar contains the following layers and overlays:

- BASE LAYERS**
 - Corrected Reflectance (True Color) Aqua / MODIS
 - Corrected Reflectance (True Color) Terra / MODIS
- OVERLAYS**
 - Place Labels © OpenStreetMap (license), Natural Earth
 - Coastlines / Borders / Roads © OpenStreetMap (license), Natural Earth
 - Coastlines © OpenStreetMap (license)

The main view shows a satellite image of Earth with several black arrows pointing to specific locations. The interface includes a top navigation bar with icons for home, search, and help. A bottom navigation bar shows the current date as 2015 JUN 23 and a timeline for the month of June 2015. A scale bar indicates 2000 km and 1000 mi. The coordinates 43.5234°, -109.4062° and the EPSG:4326 projection are displayed.



Data Access: Subscription



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[Subscription: http://nsidc.org/daac/subscriptions.html](http://nsidc.org/daac/subscriptions.html)

Automatic
delivery of data
as it becomes
available.

NSIDC National Snow & Ice Data Center

DATA RESEARCH NEWS ABOUT SEARCH Web pages

NASA Distributed Active Archive Center (DAAC) at NSIDC
Supporting scientific study of the cryosphere

DAAC Home
DAAC Data Sets
Order Data
About the DAAC
Projects in Development
Outreach
User Services Office
User Working Group

DAAC Data Subscription Requests

Subscriptions are available for Aquarius, MODIS, and NISE data. Subscriptions apply only to future data as they are delivered to NSIDC; they cannot be used to receive data already in NSIDC's archive. This option is convenient if you require new data for a specific region as they are ingested into NSIDC's data archive, but you do not want to actively search and order data files each time. Based on your preference, NSIDC can either push new data to your local server via File Transfer Protocol (FTP) or Secure Copy (SCP), or can stage data on our FTP site for you to pull. Subscriptions can also be bundled on a weekly basis or whatever you prefer if you do not want to receive e-mail notifications each time a data file is ingested into NSIDC's archive. Please indicate this preference in the subscription form linked at the end of this page.

This page explains the basic information NSIDC needs to process your subscription request. We encourage you to read these sections carefully before entering your information in the subscription request form, linked at the end of this page.

User Information
Subscription Preferences
FTP Push/SCP Requests
Product Information
Data Volumes

User Information

Please provide your name, address, organization, e-mail address, affiliation type, and category.

Subscription Preferences

METHOD OF DATA DELIVERY

- **FTP Push:** Data files are sent to your local server via FTP as soon as they are available.
- **FTP Pull:** Data files are staged on NSIDC's FTP site for you to pull at your convenience. You have thirty days to retrieve your data before files are automatically deleted.
- **Secure Copy (SCP):** Data files are securely transferred to your local server using this secure shell protocol as soon as the data files are available.



Data Access: NSIDC



[SMAP Web site](http://nsidc.org/data/smap/smap-data.html) at NSIDC DAAC: <http://nsidc.org/data/smap/smap-data.html>

Access to the radiometer data and all L2, L3, and L4 products.

Data access, data set user guide documents, tools, news, published research, quality information, FAQs, and many other resources.

The screenshot shows the NSIDC website for SMAP Data. The header includes the NSIDC logo and navigation links for DATA, RESEARCH, NEWS, and ABOUT. Below the header, there is a banner for "NASA Distributed Active Archive Center (DAAC) at NSIDC" and "SMAP Data: Soil Moisture Active Passive Data". A sidebar on the left contains navigation links for Overview, Data Sets, SMAP Data, and Validation Data. The main content area features a section titled "SMAP Data" with a paragraph explaining that SMAP science data will be available starting in Summer 2015 at the NASA National Snow and Ice Data Center DAAC and the NASA Alaska Satellite Facility DAAC. Below this is a table listing various data sets with their IDs, descriptions, resolutions, latencies, and sources.

| Data Set ID | SMAP Data Set Description | Resolution | Latency ¹ | ATBD ² | Source ³ |
|-------------|---|------------|----------------------|----------------------|---------------------|
| SPL1AA | L1A Raw Radar Data in Time Order | — | 12 hrs | N/A | ASF |
| SPL1AP | L1A Radiometer Raw Data in Time Order | — | 12 hrs | N/A | NSIDC |
| SPL1B50 | L1B Low-Resolution Radar σ_0 in Time Order | 5x30 km | 12 hrs | View | ASF |
| SPL1BTB | L1B Radiometer $7B$ in Time Order | 36x47 km | 12 hrs | View | NSIDC |
| SPL1CS0 | L1C High-Resolution Radar σ_0 (half orbit gridded) | 1 km | 12 hrs | View | ASF |
| SPL1CTB | L1C Radiometer $7B$ (half orbit, gridded) | 36 km | 12 hrs | View | NSIDC |
| SPL2SMA | L2 Soil Moisture (radar, half orbit) | 3 km | 24 hrs | View | NSIDC |
| SPL2SMP | L2 Soil Moisture (radiometer, half orbit) | 36 km | 24 hrs | View | NSIDC |
| SPL2SMAP | L2 Soil Moisture (radar/radiometer, half orbit) | 9 km | 24 hrs | View | NSIDC |
| SPL3FTA | L3 Freeze-Thaw State (radar, daily composite) | 3 km | 50 hrs | View | NSIDC |
| SPL3SMA | L3 Soil Moisture (radar, daily composite) | 3 km | 50 hrs | View | NSIDC |
| SPL3SMP | L3 Soil Moisture (radiometer, daily composite) | 36 km | 50 hrs | View | NSIDC |



Data Access: ASF



[SMAP Web site](https://www.asf.alaska.edu/smap/) at ASF DAAC: <https://www.asf.alaska.edu/smap/>

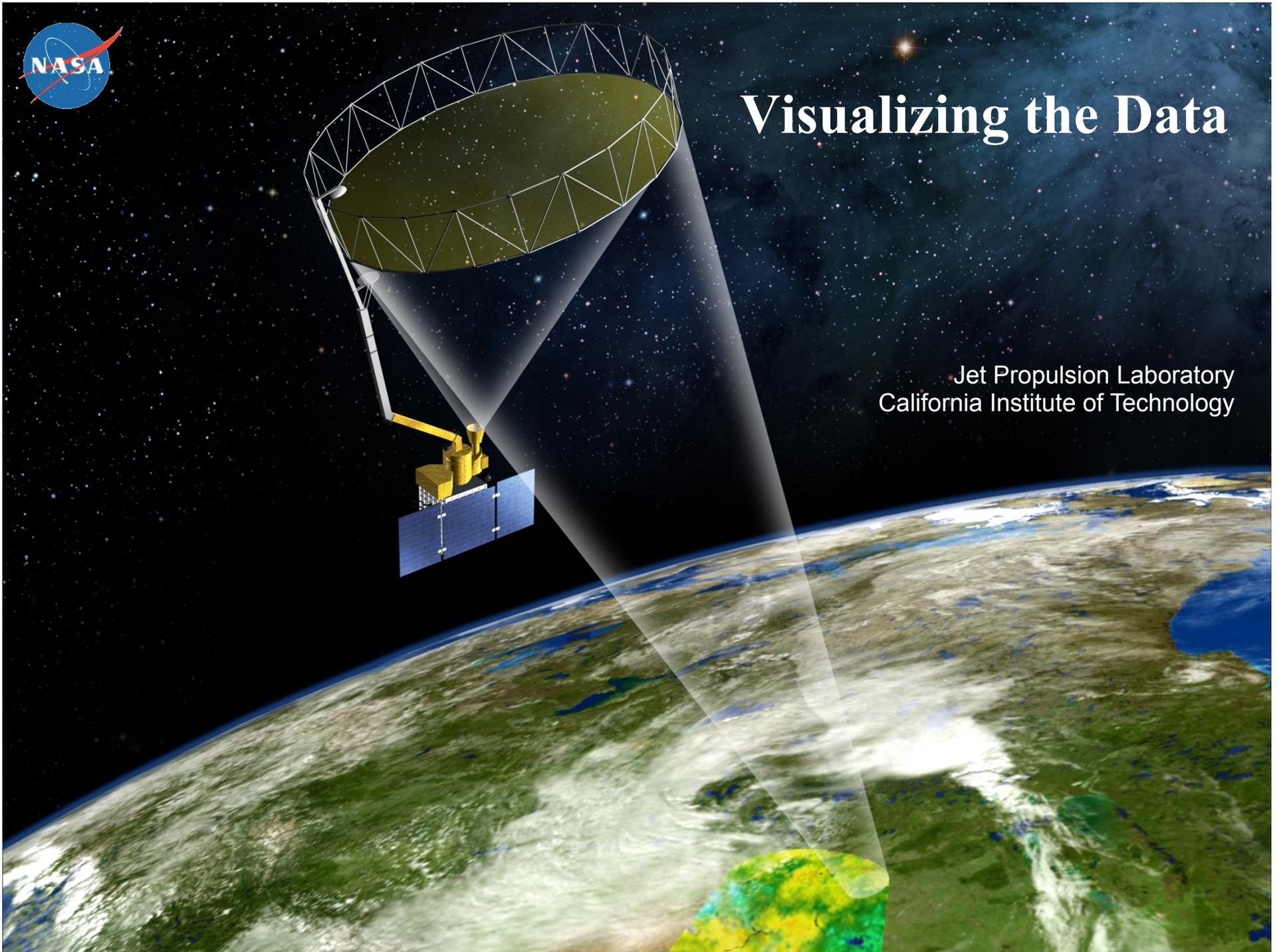
Access to the radar data only.
Data access, data set user guide documents, tools, news, published research, quality information, FAQs, and many other resources.

The screenshot shows the Alaska Satellite Facility (ASF) website. At the top, the ASF logo and name are displayed with the tagline "Making remote-sensing data accessible since 1991". Below the logo is a navigation menu with links for Home, Get Data, Datasets, Data Tools, About SAR, News, and About ASF. A search bar is located on the right side of the menu. The main content area features a large image of the SMAP satellite in orbit over Earth. The text on the page reads: "Soil Moisture Active Passive (SMAP) NASA's new mission spotlights the global significance of soil-moisture science Launched January 2015". To the right of the main text, there are three sections: "About SMAP" (New SMAP data on soil moisture and freeze/thaw state will improve climate forecasting and much more. Read more...), "Data & Imagery" (SMAP data and imagery will be available at ASF DAAC and NSIDC DAAC at no cost to registered users. Read more...), and "Documents & Tools" (Access the ASF SMAP mission and the SMAP Handbook, tools such as MapReady, publications and more. Read more...).



Visualizing the Data

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SMAP Data Product Design



- **All products are in HDF format**
 - Each SMAP HDF file contains the primary data file (e.g. soil moisture, freeze/thaw, radar data) and all files used in the production of that primary dataset. These files include metadata, instrument data, flags and masks, data product, etc.

- **Projection: EASE2 grid**
 - Equal area projection
 - Level 2, 3, 4, and radiometer L1C are in this projection

- **Values**
 - Radiometer data (brightness temperature) is in Kelvin
 - Radar data is in sigma naught
 - Soil moisture is a volumetric measurement expressed as cm^3/cm^3
 - Freeze/thaw is a binary measurement, either frozen or thawed
 - **Net ecosystem exchange unit is in grams of carbon/square meter per day**



Tools for Reading HD5



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http://www.hdfgroup.org/products/hdf5_tools/index.html

SOFTWARE USING HDF5

CONTENTS:

- ⊕ [HDF5 Tools and Software](#)
- ⊕ [HDF5 Tools by Category](#) (view, edit, export, convert, import)
- ⊕ [Table \(Summary\) of Software Using HDF5](#)
- ⊕ [HDF5 Command-line Tools](#)

HDF5 Tools and Software:

- ⊕ [HDF-Java Products and HDFView](#): HDFView Java browser for HDF4 and HDF5 and HDF Java wrappers
- ⊕ [HDF5 Command-line Tools](#): Tools included with the HDF5 distribution
- ⊕ [HDF5DotNet - C++/CLI Wrapper of the HDF5 Library](#)
- ⊕ [H4toH5 Conversion Library and Tools](#): A library and tools for converting to and from HDF4 and HDF5.
- ⊕ [h5check](#): A tool to check the validity of an HDF5 file.
- ⊕ [h5edit](#): A tool for editing an HDF5 file. The current (first) release only supports commands for the creation and deletion of attributes of datasets and groups. More commands will be implemented in the future. This software is sponsored by the JPSS project. **NEW**
- ⊕ [HDF5 XML Information Page](#): DTD and tools for using HDF5 with XML.

See the [Downloads](#) page to access this tool:

- ⊕ [h5fix_obj_nmsgs](#): Corrects corrupt object header (rare problem prior to 1.6.6). Search on [Miscounted](#) [here](#).

HDF5 Tools by Category

[Table of \(major\) HDF5 tools by categories](#)

Table (Summary) of Software Using HDF5:

This table includes not only HDF5 tools, but also other software known to use HDF5.

[Sorted by Name](#) [🗄]

[Sorted by Application Type](#) [🗄]

Also see short [descriptions](#) for many of the applications listed in the above tables.

HDF5 Command-line Tools

Following is a list of the HDF5 command-line tools that are available on most platforms supported with HDF5. These utilities are automatically built when building HDF5, and come with the pre-compiled binary distribution of HDF5. They can also be downloaded separately.

- ⊕ [gif2h5/h52gif](#) - Converts to/from GIF file and HDF5.
- ⊕ [h5cc](#), [h5fc](#), [h5c++](#) - Simplifies compiling an HDF5 application. [Also see [FAQ](#)]
- ⊕ [h5debug](#) - Debugs an existing HDF5 file at a low level.
- ⊕ [h5diff](#) - Compares two HDF5 files and reports the differences.
- ⊕ [h5dump](#) - Enables the user to examine the contents of an HDF5 file and dump those contents to an ASCII file.
- ⊕ [h5import](#) - Imports ASCII or binary data into HDF5.
- ⊕ [h5jam/h5unjam](#) - Add/Remove text to/from User Block at the beginning of an HDF5 file.
- ⊕ [h5ls](#) - Lists selected information about file objects in the specified format.
- ⊕ [h5perf](#) - Measures Parallel HDF5 performance.
- ⊕ [h5redeploy](#) - Updates HDF5 compiler tools' paths after the HDF5 software has been installed in a new location. See [h5cc](#).



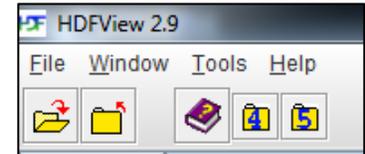
HDFView Example: Level 3 SM_AP



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1. Launch HDFView.

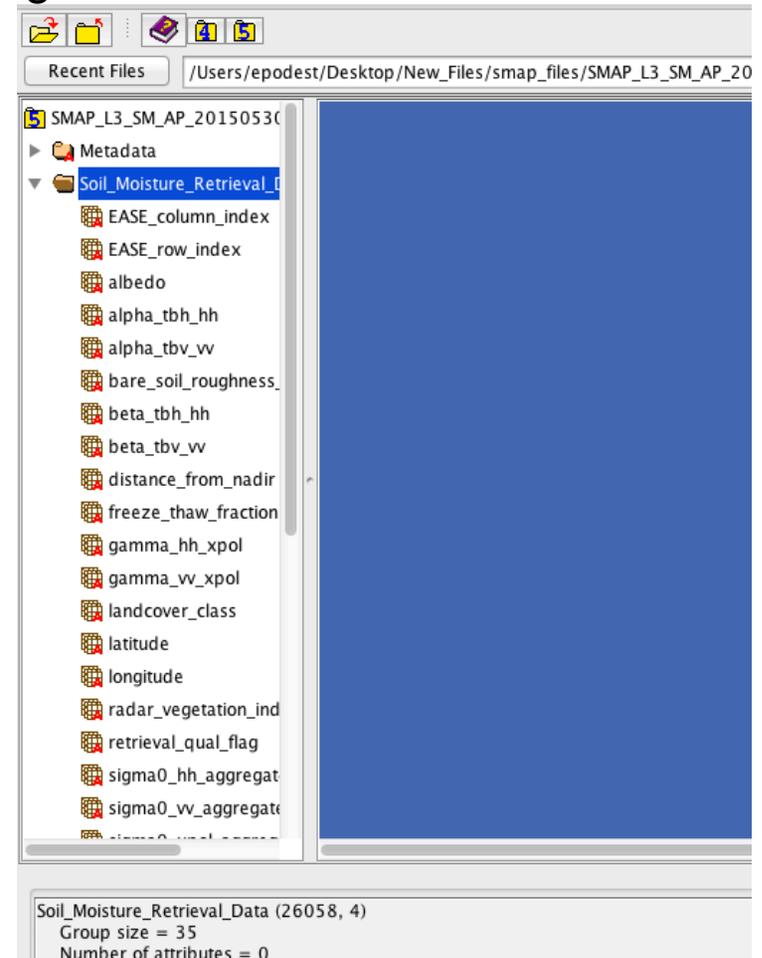
2. Open the SMAP data file,
“SMAP_L3_SM_AP_20150530_T11630_001.h5 ”using the File menu
or the icon on the toolbar.



-In the HDFView window, the left panel displays
the file structure, the right panel displays data, and
the bottom panel displays other information, such
as metadata.

-In the left panel, Groups are represented by
folders and Datasets are represented as icons.

3. Double-click on a Group to display the Datasets
contained in that Group.





HDFView Example: Level 3 SM_AP



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4. Double-click on a Dataset to display the data in the right panel.
Metadata for that particular dataset is displayed in the bottom.

Recent Files | /Users/epodest/Desktop/New_Files/smap_files/SMAP_L3_SM_AP_20150530_T11630_001.h5

soil_moisture at /Soil_Moisture_Retrieval_Data/ [SMAP_L3_SM_AP_20150530_T11630_001.h5 in /Users/epode...

Table

0-based

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 1 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 2 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 3 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 4 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 5 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 6 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 7 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 8 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 9 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 10 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 11 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 12 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 13 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 14 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 15 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 16 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 17 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 18 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 19 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 20 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 21 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 22 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 23 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 24 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |
| 25 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 | -9999.0 |

soil_moisture (46114457, 4)
32-bit floating-point, 1624 x 3856
Number of attributes = 6
_FillValue = -9999.0
coordinates = /Soil_Moisture_Retrieval_Data/latitude /Soil_Moisture_Retrieval_Data/longitude
long_name = Representative soil moisture measurement for the Earth based grid cell.
units = cm**3/cm**3
valid_max = 0.75
valid_min = 0.02



HDFView Example: Level 3 SM_AP



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Latitude and longitude for each 9 km soil moisture measurement cell is in the lat/lon dataset

Recent Files: /Users/epodest/Desktop/New_Files/smap_files/SMAP_L3_SM_AP_20150530_T11630_001.h5

File List (Left):

- albedo
- alpha_tbh_hh
- alpha_tbv_vv
- bare_soil_roughness_retrie
- beta_tbh_hh
- beta_tbv_vv
- distance_from_nadir
- freeze_thaw_fraction
- gamma_hh_xpol
- gamma_vv_xpol
- landcover_class
- latitude**
- longitude
- radar_vegetation_index
- retrieval_qual_flag
- sigma0_hh_aggregated
- sigma0_vv_aggregated
- sigma0_xpol_aggregated
- soil_moisture
- soil_moisture_std_dev
- spacecraft_overpass_time
- spacecraft_overpass_time

Table: latitude at /Soil_Moisture_Retrieval_Data/ [SMAP_L3_SM_AP_20150530_T11630_001.h5 in /Users/epodest/De...]

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 0 | 84.65642 | 84.65642 | 84.65642 | 84.65642 | 84.65642 | 84.65642 | 84.65642 | 84.65642 | 84.65642 | 84.65642 |
| 1 | 83.95421 | 83.95421 | 83.95421 | 83.95421 | 83.95421 | 83.95421 | 83.95421 | 83.95421 | 83.95421 | 83.95421 |
| 2 | 83.32521 | 83.32521 | 83.32521 | 83.32521 | 83.32521 | 83.32521 | 83.32521 | 83.32521 | 83.32521 | 83.32521 |
| 3 | 82.75034 | 82.75034 | 82.75034 | 82.75034 | 82.75034 | 82.75034 | 82.75034 | 82.75034 | 82.75034 | 82.75034 |
| 4 | 82.2176 | 82.2176 | 82.2176 | 82.2176 | 82.2176 | 82.2176 | 82.2176 | 82.2176 | 82.2176 | 82.2176 |
| 5 | 81.71884 | 81.71884 | 81.71884 | 81.71884 | 81.71884 | 81.71884 | 81.71884 | 81.71884 | 81.71884 | 81.71884 |
| 6 | 81.24827 | 81.24827 | 81.24827 | 81.24827 | 81.24827 | 81.24827 | 81.24827 | 81.24827 | 81.24827 | 81.24827 |
| 7 | 80.80154 | 80.80154 | 80.80154 | 80.80154 | 80.80154 | 80.80154 | 80.80154 | 80.80154 | 80.80154 | 80.80154 |
| 8 | 80.37534 | 80.37534 | 80.37534 | 80.37534 | 80.37534 | 80.37534 | 80.37534 | 80.37534 | 80.37534 | 80.37534 |
| 9 | 79.96706 | 79.96706 | 79.96706 | 79.96706 | 79.96706 | 79.96706 | 79.96706 | 79.96706 | 79.96706 | 79.96706 |
| 10 | 79.57458 | 79.57458 | 79.57458 | 79.57458 | 79.57458 | 79.57458 | 79.57458 | 79.57458 | 79.57458 | 79.57458 |
| 11 | 79.19619 | 79.19619 | 79.19619 | 79.19619 | 79.19619 | 79.19619 | 79.19619 | 79.19619 | 79.19619 | 79.19619 |
| 12 | 78.83045 | 78.83045 | 78.83045 | 78.83045 | 78.83045 | 78.83045 | 78.83045 | 78.83045 | 78.83045 | 78.83045 |
| 13 | 78.47616 | 78.47616 | 78.47616 | 78.47616 | 78.47616 | 78.47616 | 78.47616 | 78.47616 | 78.47616 | 78.47616 |
| 14 | 78.13229 | 78.13229 | 78.13229 | 78.13229 | 78.13229 | 78.13229 | 78.13229 | 78.13229 | 78.13229 | 78.13229 |
| 15 | 77.797966 | 77.797966 | 77.797966 | 77.797966 | 77.797966 | 77.797966 | 77.797966 | 77.797966 | 77.797966 | 77.797966 |
| 16 | 77.47241 | 77.47241 | 77.47241 | 77.47241 | 77.47241 | 77.47241 | 77.47241 | 77.47241 | 77.47241 | 77.47241 |
| 17 | 77.154976 | 77.154976 | 77.154976 | 77.154976 | 77.154976 | 77.154976 | 77.154976 | 77.154976 | 77.154976 | 77.154976 |
| 18 | 76.845055 | 76.845055 | 76.845055 | 76.845055 | 76.845055 | 76.845055 | 76.845055 | 76.845055 | 76.845055 | 76.845055 |
| 19 | 76.54214 | 76.54214 | 76.54214 | 76.54214 | 76.54214 | 76.54214 | 76.54214 | 76.54214 | 76.54214 | 76.54214 |
| 20 | 76.245766 | 76.245766 | 76.245766 | 76.245766 | 76.245766 | 76.245766 | 76.245766 | 76.245766 | 76.245766 | 76.245766 |
| 21 | 75.95551 | 75.95551 | 75.95551 | 75.95551 | 75.95551 | 75.95551 | 75.95551 | 75.95551 | 75.95551 | 75.95551 |
| 22 | 75.67102 | 75.67102 | 75.67102 | 75.67102 | 75.67102 | 75.67102 | 75.67102 | 75.67102 | 75.67102 | 75.67102 |
| 23 | 75.391945 | 75.391945 | 75.391945 | 75.391945 | 75.391945 | 75.391945 | 75.391945 | 75.391945 | 75.391945 | 75.391945 |
| 24 | 75.11797 | 75.11797 | 75.11797 | 75.11797 | 75.11797 | 75.11797 | 75.11797 | 75.11797 | 75.11797 | 75.11797 |
| 25 | 74.84885 | 74.84885 | 74.84885 | 74.84885 | 74.84885 | 74.84885 | 74.84885 | 74.84885 | 74.84885 | 74.84885 |

latitude (9419810, 4)
32-bit floating-point, 1624 x 3856
Number of attributes = 2
long_name = Latitude of the center of the Earth based grid cell.
units = degrees_north



HDFView Example: Level 3 SM_AP



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5. Right-click on a Group or Dataset in the left panel to see the different viewing and editing capabilities of HDFView. Select “show properties” to display information such as type and dimensions of the data.

The screenshot displays the HDFView interface. On the left, a file browser shows a list of datasets including 'albedo', 'alpha_tbh_hh', 'alpha_tbv_wv', 'bare_soil_roughness_retrie', 'beta_tbh_hh', 'beta_tbv_wv', 'distance_from_nadir', 'freeze_thaw_fraction', 'gamma_hh_xpol', 'gamma_vv_xpol', 'landcover_class', 'latitude', 'longitude', 'radar_vegetation_index', 'retrieval_qual_flag', 'sigma0_hh_aggregated', 'sigma0_vv_aggregated', 'sigma0_xpol_aggregated', 'soil_moisture', 'soil_moisture', 'spacecraft', and 'spacecraft'. The 'soil_moisture' dataset is selected, and a context menu is open with 'Show Properties' highlighted. The main window shows a table of data for 'soil_moisture' at '/Soil_Moisture_Retrieval_Data/soil_moisture'. The table has 4 columns (0, 1, 2, 3) and 25 rows (0-24). The data values are mostly -9999.0, with some values in the last row being -9999.0, -9999.0, -9999.0, and -9999.0. A 'Properties' dialog box is open, showing the following information:

Properties - /Soil_Moisture_Retrieval_Data/soil_moisture

General | Attributes

Name: soil_moisture
Path: /Soil_Moisture_Retrieval_Data/
Type: HDF5 Scalar Dataset
Object Ref: 46114457, 4

Dataspace and Datatype

No. of Dimension(s): 2
Dimension Size(s): 1624 x 3856
Max Dimension Size(s): 1624 x 3856
Data Type: 32-bit floating-point

Chunking: 1 X 3856
Compression: GZIP: level = 2, Storage allocation time: Incremental
Fill value: NONE

Close

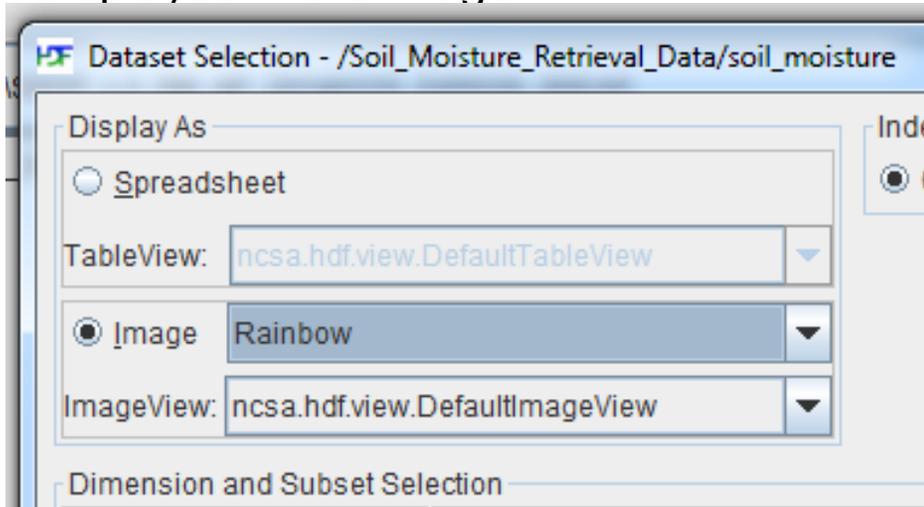


HDFView Example: Level 3 SM_AP



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6. Right-click on the “soil_moisture” dataset and select “Open As”. In the dialog box, select “Image” and the “Rainbow” palette. Click ok. The “soil_moisture” dataset will be displayed as an image in the right panel. Due to the large range of values for this dataset (-9999 to 0.75), the image displays only red, black, and white. In order to more clearly visualize the valid soil moisture values, change the value range displayed in the image.





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7. In the ImageView window, click on “Image” and then “Set Value Range”. Type “0” in the “Lower Bound” text box and “0.5” in the “Upper Bound” text box and click ok. The software automatically converts these values to scientific notation.

The screenshot shows the HDFView software interface. The main window displays a satellite image of soil moisture data. A menu is open, showing the 'Image' option selected. The 'Image Value Range' dialog box is open, showing the 'Lower Bound' set to 0E0 and the 'Upper Bound' set to 5E-1. The 'Image' menu is open, showing the 'Set Value Range' option circled in red. The 'Image Value Range' dialog box has a title bar that reads 'Image Value Range'. The 'Lower Bound' text box contains '0E0' and the 'Upper Bound' text box contains '5E-1'. The dialog box also features a horizontal slider for each bound and buttons for 'Ok', 'Cancel', and 'Apply'. The background image shows a map of the United States with a color scale on the right side, ranging from 0.00E0 (black) to 5.00E-1 (red).



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8. To view the soil moisture data value at a point controlled by your cursor, click on “Image” and then “Show Value”. Data values will now be displayed in the bottom left corner of the ImageView window.

The screenshot displays the HDFView application window titled "soil_moisture at". The "Image" menu is open, showing various options. The "Show Value" option is circled in red. The main image area shows a global map with soil moisture data overlaid in a color scale from blue (low) to red (high). A color bar on the right side of the image provides the scale values. The bottom left corner of the image view shows the coordinates and value: "x=1176, y=952, value=0.18562013", which is also circled in red.

| Value |
|---------|
| 0.00E0 |
| 1.96E-2 |
| 3.92E-2 |
| 5.88E-2 |
| 7.84E-2 |
| 9.80E-2 |
| 1.18E-1 |
| 1.37E-1 |
| 1.57E-1 |
| 1.76E-1 |
| 1.96E-1 |
| 2.16E-1 |
| 2.35E-1 |
| 2.55E-1 |
| 2.75E-1 |
| 2.94E-1 |
| 3.14E-1 |
| 3.33E-1 |
| 3.53E-1 |
| 3.73E-1 |
| 3.92E-1 |
| 4.12E-1 |
| 4.31E-1 |
| 4.51E-1 |
| 4.71E-1 |
| 5.00E-1 |