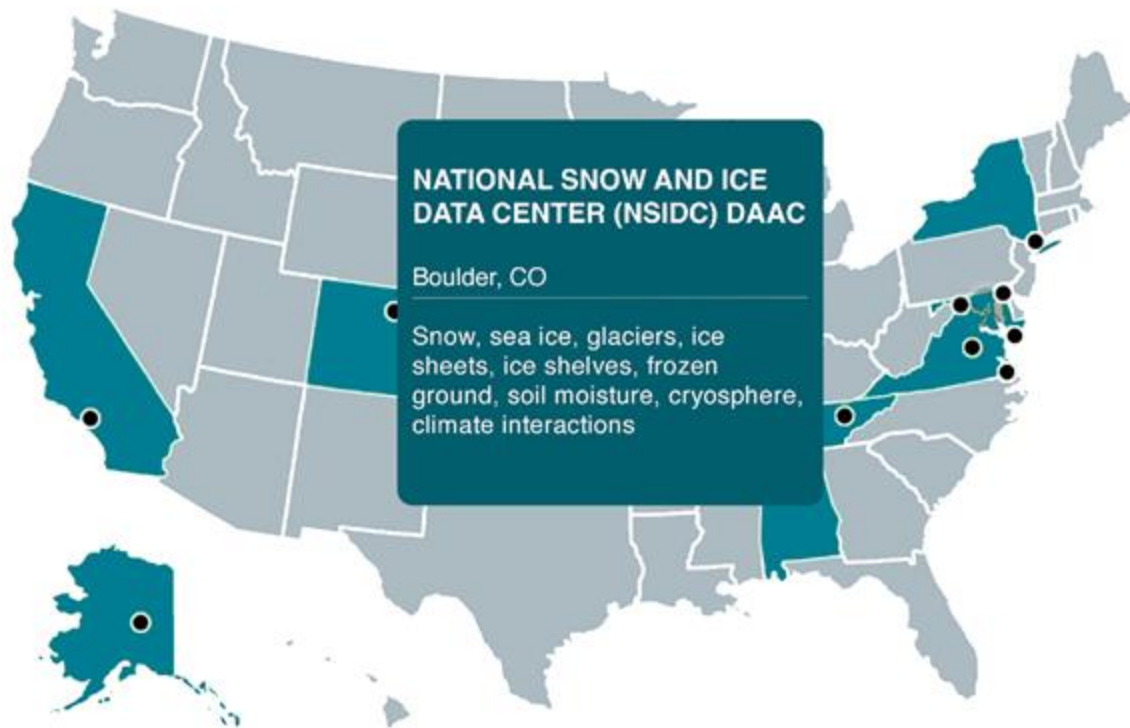


ICESAT-2 DATA PRODUCTS, TOOLS AND SERVICES AT NSIDC DAAC

Lisa Kaser, NSIDC DAAC ICESat-2 Data Management Lead (lisa.kaser@colorado.edu)

NATIONAL SNOW AND ICE DATA CENTER (NSIDC) DAAC



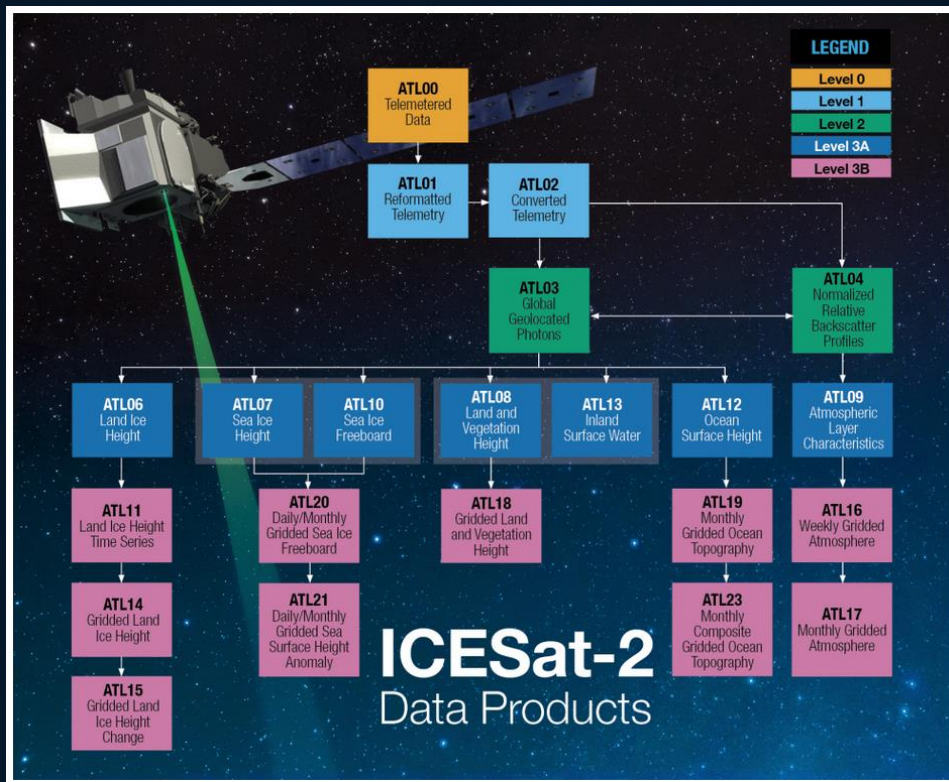
- One of the 12 DAACs within the NASA's Earth Observing System Data and Information System (EOSDIS)
- Program within NSIDC, CIRES, CU Boulder
- Data from several NASA Missions and Programs including ICESat-2, ICESat, IceBridge, SMAP, MODIS, VIIRS and more



ICESAT-2 DATA PRODUCTS AT NSIDC DAAC



ICESAT-2 STANDARD DATA PRODUCTS



- ATL02-ATL23
 - Available for on-prem and cloud download or direct access in the cloud
 - ~45 day latency
- Quick look data sets:
 - Sea ice height (ATL07QL), land and vegetation height (ATL08QL), atmospheric layer characteristics (ATL09QL), sea ice freeboard (ATL10QL), inland surface water (ATL13QL)
 - ~3 day latency
- Future data sets:
 - ATL24 – bathymetry
 - ATL25 – lake ice
- Future quick look data sets:
 - Geolocated photons (ATL03QL), gridded sea ice freeboard (ATL20QL), lake ice (ATL25QL)
- Current version 6: 26 December 2018 – 31 July 2024
- Version 7 expected in spring 2025 with cloud-optimized HDF5 files for ATL03, and potentially others

<https://nsidc.org/data/icesat-2/products>





DATA DISCOVERY, DOCUMENTS, TOOLS AND SERVICES



NSIDC DAAC ICESAT-2 MISSION PAGE

ICESat-2
The Ice, Cloud, and land Elevation Satellite-2

Overview

The NSIDC DAAC ICESat-2 data collection includes data products derived from the Advanced Topographic Laser Altimeter System (ATLAS) instrument aboard the Ice, Cloud and land Elevation Satellite-2 (ICESat-2). ATLAS has a single laser split into six beams and arranged in three pairs to better gauge the slope of Earth's surface. The device measures heights across Earth's surface by comparing the time it takes for a laser pulse to echo from the ground back to the receiver as it orbits the Earth. It is exceptionally fast, shooting out 10,000 laser pulses per second compared with only 40 pulses per second from its predecessor, the Geoscience Laser Altimeter System (GLAS), and taking measurements every 28 inches as it propels forward through space. ICESat-2 data products at the NSIDC DAAC describe elevations of sea ice, land ice, forest canopies, water height, urban areas, and more. Data observations span from late 2018 to present.

ICESat-2 is the third in a series of NASA missions designed to provide continuous polar observations over time. Previous missions include the ICESat/GLAS mission, which collected satellite observations from 2003 to early 2010, followed by Operation IceBridge. The Operation IceBridge mission included more than 1,000 aircraft surveys from 2009 to 2019 and primarily served to bridge the gap between ICESat/GLAS and ICESat-2 and validate ICESat-2 measurements. The NSIDC DAAC provides data from all three missions.

When combined with data from the ICESat/GLAS and Operation IceBridge data collections, ICESat-2 data enable researchers to investigate and better understand changes occurring in the cryosphere over time. They can also use these data to monitor changes in sea ice thickness over time, to detect icebergs and forecast where they will travel, and to better predict how Earth's melting glaciers will impact global sea rise in the future. Using data collected from ATLAS, researchers can estimate the annual height changes of the Greenland and Antarctic ice sheets to within four

- Overview
- Documentation
- Help Articles
- Data Tools
- Data Announcements
- Published Research
- ICESat-2 Product Overviews
- Related Data
- Data

Support

Standard products (ATL02-ATL23)

Related Data

- ICESat-2 ATL derived data sets
 - Grounding zone for antarctic ice shelves
 - Sea ice thickness (along-track and gridded)
 - Boreal biomass density
 - Sea ice melt pond characteristics
- Calibration/Validation data
- Pre-launch airborne simulation data

<https://nsidc.org/data/icesat-2>



NSIDC DAAC ICESAT-2 MISSION PAGE

Overview

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- Overview
- Documentation
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- Published Research
- ICESat-2 Product Overviews
- Related Data
- Data

Support

User guides, ATBD's and other related documentation

Help articles

ICESat-2 related data announcements

User support at nsidc@nsidc.org

<https://nsidc.org/data/icesat-2>



DATA SET SPECIFIC LANDING PAGES

The screenshot shows the top navigation bar of the National Snow and Ice Data Center (NSIDC) website. The main header features the NSIDC logo and the text "National Snow and Ice Data Center a part of CIRES at the University of Colorado Boulder". Navigation links include "NEWS & ANALYSES", "DATA", "OUR RESEARCH", "LEARN", and "ABOUT". A search icon and a user profile icon are also present. Below the navigation bar is a dark blue banner with the NASA logo and the title "ATLAS/ICESat-2 L2A Global Geolocated Photon Data, Version 6". Underneath the title, it says "DATA SET ID: ATL03" and "DOI: 10.5067/ATLAS/ATL03.006". A row of four circular icons is displayed: "USER GUIDE", "CITATION", "SUBSCRIBE", and "SERVICE". Below this row, a message states "This is the most recent version of these data. [Version Summary](#)". The main content area is titled "Overview" and contains a paragraph describing the data set. A sidebar on the right lists "Overview", "Data Access & Tools", "Documentation", and "Help Articles". At the bottom right of the sidebar is a "Support" button. The "Parameter(s): TERRAIN ELEVATION" is listed at the bottom left of the main content area.

National Snow and Ice Data Center
a part of CIRES at the University of Colorado Boulder

NEWS & ANALYSES ▾ DATA ▾ OUR RESEARCH LEARN ▾ ABOUT ▾

ATLAS/ICESat-2 L2A Global Geolocated Photon Data, Version 6

DATA SET ID: ATL03
DOI: 10.5067/ATLAS/ATL03.006

USER GUIDE CITATION SUBSCRIBE SERVICE

This is the most recent version of these data. [Version Summary](#) ▾

Overview

This data set (ATL03) contains height above the WGS 84 ellipsoid (ITRF2014 reference frame), latitude, longitude, and time for all photons downlinked by the Advanced Topographic Laser Altimeter System (ATLAS) instrument on board the Ice, Cloud and land Elevation Satellite-2 (ICESat-2) observatory. The ATL03 product was designed to be a single source for all photon data and ancillary information needed by higher-level ATLAS/ICESat-2 products. As such, it also includes spacecraft and instrument parameters and ancillary data not explicitly required for ATL03.

Parameter(s): TERRAIN ELEVATION

Overview
Data Access & Tools
Documentation
Help Articles

Support

User Guide:
Comprehensive product documentation on file structure, variable info, data acquisition, etc.

Citation:

The screenshot shows the citation information for the data set. It starts with the text "As a condition of using these data, you must cite the use of this data set." Below this, the data set ID "10.5067/ATLAS/ATL08.005" is displayed. A dropdown menu for "Select a Citation Style" is set to "APA". The citation text reads: "Neuenschwander, A. L., K. L. Pitts, B. P. Jellay, J. Robbins, B. Klotz, S. C. Popescu, R. F. Nelson, D. Harding, D. Pederson, and R. Sheridan. (2021). ATLAS/ICESat-2 L3A Land and Vegetation Height, Version 5 [Data Set]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. <https://doi.org/10.5067/ATLAS/ATL08.005>. Date Accessed 04-21-2023." A "COPY DATA CITATION" button is located at the bottom right of the citation information.

As a condition of using these data, you must cite the use of this data set.

10.5067/ATLAS/ATL08.005

Select a Citation Style
APA

Neuenschwander, A. L., K. L. Pitts, B. P. Jellay, J. Robbins, B. Klotz, S. C. Popescu, R. F. Nelson, D. Harding, D. Pederson, and R. Sheridan. (2021). ATLAS/ICESat-2 L3A Land and Vegetation Height, Version 5 [Data Set]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. <https://doi.org/10.5067/ATLAS/ATL08.005>. Date Accessed 04-21-2023.

COPY DATA CITATION

<https://nsidc.org/data/atl03>



DATA SET SPECIFIC LANDING PAGES

The screenshot shows the NSIDC website header with navigation links: NEWS & ANALYSES, DATA, OUR RESEARCH, LEARN, and ABOUT. The main content area features the title "ATLAS/ICESat-2 L2A Global Geolocated Photon Data, Version 6" and the NASA logo. Below the title are icons for USER GUIDE, CITATION, SUBSCRIBE, and SERVICE. A note states "This is the most recent version of these data. Version Summary". The "Overview" section contains a paragraph describing the data set and a "Parameter(s): TERRAIN ELEVATION" field. A sidebar on the right lists "Overview", "Data Access & Tools", "Documentation", and "Help Articles". A "Support" button is located at the bottom right of the page.

Subscribe:

Sign up to receive email updates of the data set e.g. new versions or data access changes during the cloud transition

Service:

Levels of service model for all data sets at NSIDC. ATLO3-ATL23 are designated at **Comprehensive support**

<https://nsidc.org/data/atl03>



DATA SET SPECIFIC LANDING PAGES

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National Snow and Ice Data Center
a part of CIRES at the University of Colorado Boulder

NEWS & ANALYSES ▾ DATA ▾ OUR RESEARCH LEARN ▾ ABOUT ▾ 🔍 🏠

ATLAS/ICESat-2 L2A Global Geolocated Photon Data, Version 6

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Parameter(s): TERRAIN ELEVATION

- Overview
- Data Access & Tools
- Documentation
- Help Articles

Support

Access and tools for the data product

Known issues, ATBDs, Data Dictionaries, User Guides

Help articles for the data product

<https://nsidc.org/data/atl03>



ICESAT-2 DATA ACCESS AND TOOLS

[HTTPS File System](#) →

[Get Data](#) **Tags to distinguish tool function**

Quickly download a few files using a web browser, or access data through a command-line utility such as WGET.

[NASA Earthdata Cloud Data Access Guide](#)

Type: Service

[NASA Earthdata Cloud \(AWS S3\)](#) →

[Get Data](#) **Link to tool/service**

Access data directly from the NASA Earthdata Cloud via Amazon Web Services Simple Storage Service (AWS S3). This access option is only available when working within the us-west-2 region and requires additional AWS S3 credentials.

[NASA Earthdata Cloud Data Access Guide](#)
[AWS S3 Credentials](#)

Type: Service [View Metadata](#)

[Customized Programmatic Data Access Service](#) →

[Get Data](#) [Customize](#)

Programmatically request selected data products through our API. This tool is valuable for selecting just the parameters you need from big data sets. Apply spatial and temporal filters, subsetting, reformatting, and reprojection.

[Programmatic Data Access Guide](#)

Type: Service **Last updated:** April 2023 [View Metadata](#)

[NASA Earthdata Search](#) →

[Visualize](#) [Search & Discover](#) [Get Data](#)

Search and order data from all NASA DAACs using spatial and temporal filters in a map interface. Reformatting, reprojecting, and subsetting options are available for some data sets.

[How to search, order, and customize data with NASA Earthdata Search](#)

Type: Web Application

[OpenAltimetry](#) →

[Visualize](#) [Get Data](#) [Search & Discover](#) [Customize](#)

Discover, access, and visualize data from NASA's ICESat and ICESat-2 missions. **Supported software languages:** Python

[Help article](#) **[Link to instructional guide](#)**

Type: Web Application [View Metadata](#)

Customization Capabilities:

Spatial Subsetting, Temporal Subsetting

Output Formats:

ASCII, CSV, HDF5

[earthaccess](#) →

[Get Data](#) [Search & Discover](#)

earthaccess is a python library to search and access NASA Earth science data with just a few lines of code.

Supported software languages: Python

[GitHub Repository](#)

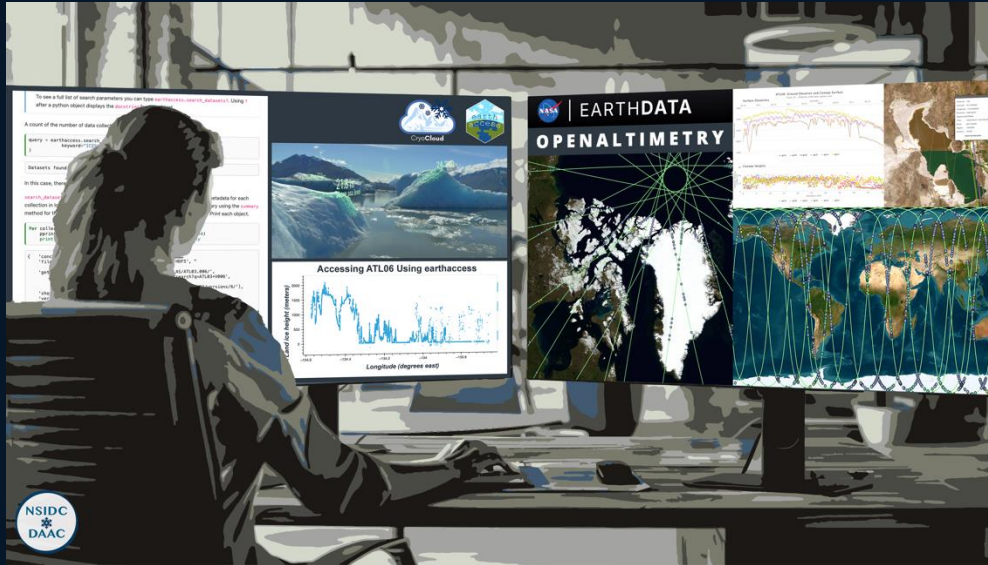
Type: Downloadable Software

Last updated: February 2024

[View Metadata](#)



TEASER FOR NSIDC DAAC TUTORIAL



Monday 18:00-19:30

- Access ICESat-2 and CryoSat-2 from cloud
- Plot data from both missions in the same map
- Using earthaccess to access ICESat-2
- Using cs2eo query and script to download CryoSat-2

Thursday 17:00-18:00

- In-depth demo on earthaccess
- If requested: OpenAltimetry demo

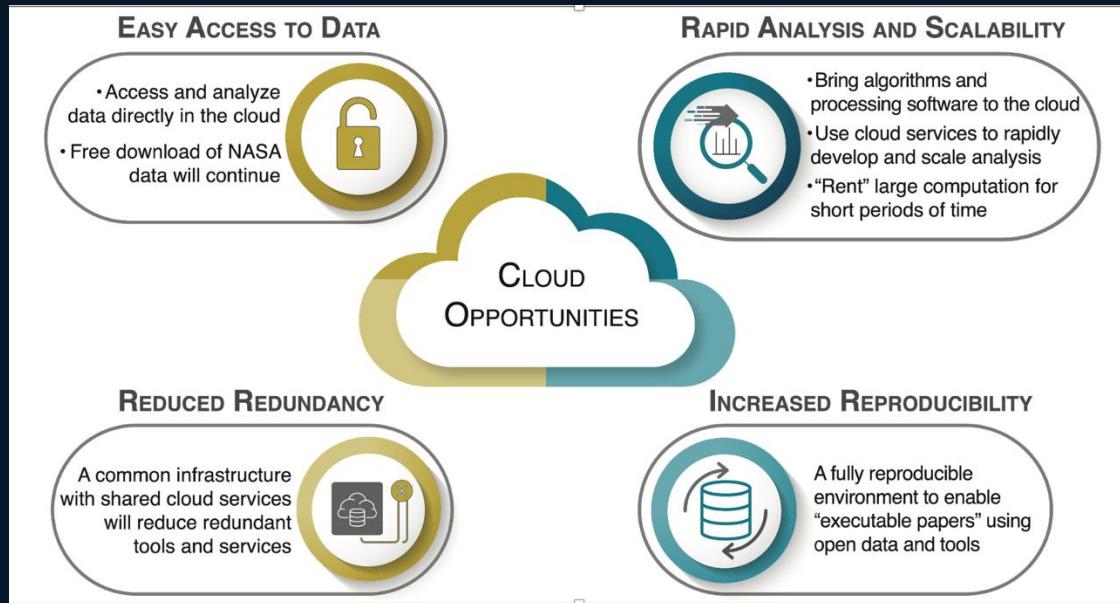


TRANSITION OF DATA AND TOOLS TO EARTHDATA CLOUD



NASA EARTH SCIENCE DATA IN THE CLOUD

NASA DAACs are migrating data and tools to the NASA Earthdata Cloud to respond to growing data volumes and to take advantage of cloud benefits.



ICESAT-2 IN EARTHDATA CLOUD

Current Status

- ICESat-2 standard data products (ATL02-ATL23) available from on-prem system and cloud
- Transformation services (subsetting & reformatting) available on-prem
- Supporting user transition to cloud data access

Next 2 Years

- ICESat-2 Quicklook and related datasets made available in the cloud
- Establish critical transformation services in the cloud
- Shut off on-prem data access and transformation services

- All data are available for download from on-prem or cloud at no cost to the user



CLOUD RESOURCES

- NSIDC DAAC general resources on finding data in the cloud, downloading cloud data, and working in the cloud:
 - [NSIDC cloud access guide](#)
 - [NSIDC GitHub tutorials](#)
- ICESat-2 specific resources in the CryoCloud Cookbook:
 - [Introduction to NASA Earthdata Cloud and ICESat-2](#)
 - [NASA Earthdata Cloud and data access using earthaccess and icepyx](#)
- [NASA Openscapes Earthdata Cloud Cookbook](#)
 - Very comprehensive resource
 - Includes resources on learning how to work with data in the cloud, tutorials, workshops, etc.



ICESAT-2 DATA DISTRIBUTION METRICS

- ATL02-ATL23 standard products downloaded from on-prem system (28 May 2019 – 31 July 2024):
 - 8,914 registered distinct users from 133 countries
 - 54,852,912 science file downloads
 - Top countries: China, USA, India, UK, Canada
- Cloud metrics (29 September 2022 – 31 July 2024)
 - 1404 registered distinct users of 74 countries
 - 1,816,414 science files accessed
 - Top countries: China, USA, India, UK, Canada
- Quick look data sets (22 March 2022 – 31 July 2024):
 - 475 registered distinct users of 52 countries
 - 53,153 science file downloads
 - Top countries: USA, China, India, Brazil, Canada





THANK YOU

