

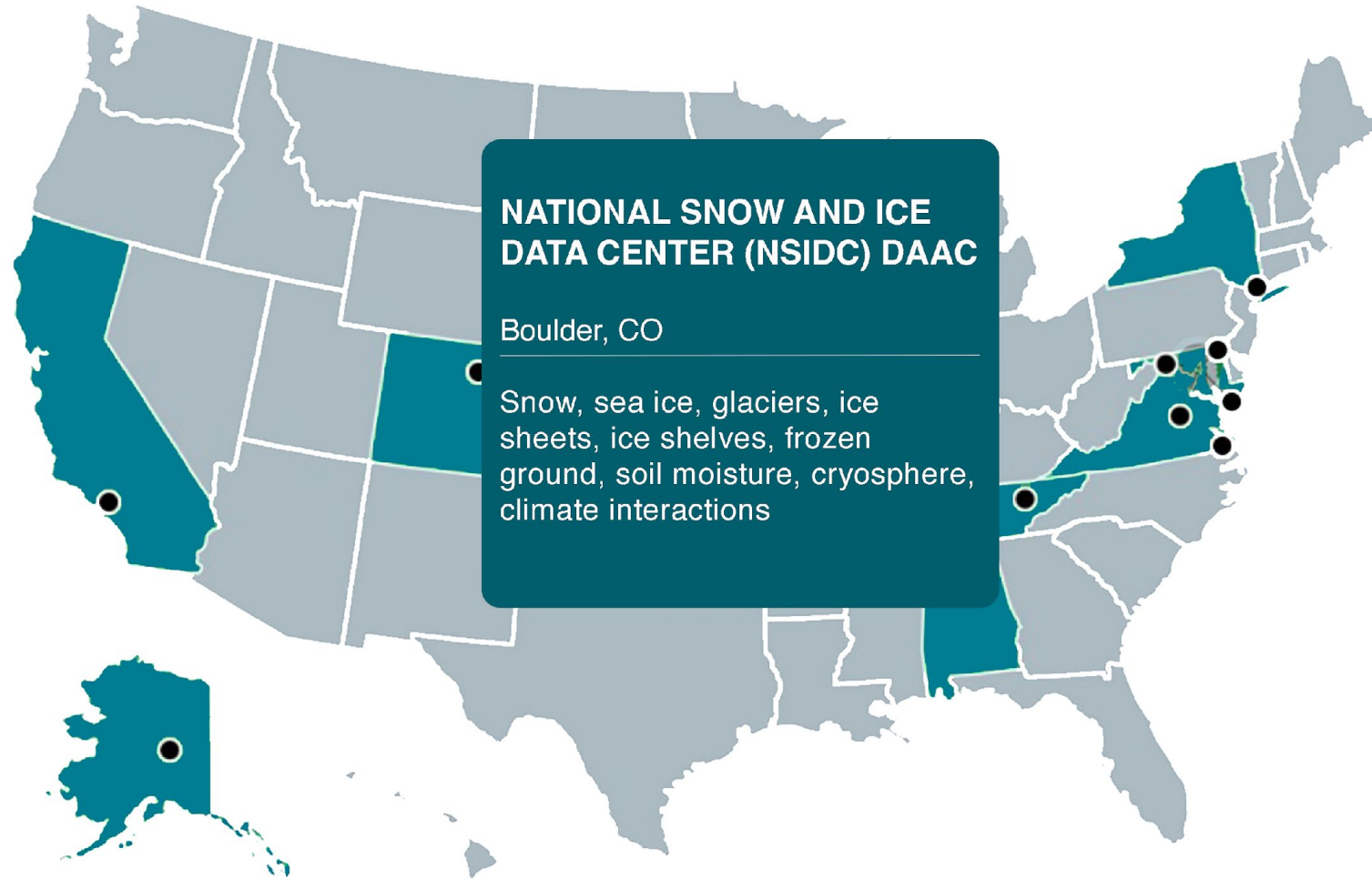


National Aeronautics and  
Space Administration

# ICESAT-2 DATA PRODUCTS AT NSIDC DAAC

Dr. Lisa Kaser, NSIDC DAAC ICESat-2 Data Management Lead ([lisa.kaser@colorado.edu](mailto:lisa.kaser@colorado.edu))

# NATIONAL SNOW AND ICE DATA CENTER (NSIDC) DAAC



- One of the 12 DAACs within NASA's Earth Science Data and Information System (ESDIS)
- Hundreds of data products in support of cryospheric research, global change detection, and water resource management.

<https://www.earthdata.nasa.gov/centers/nsidc-daac>



# NATIONAL SNOW AND ICE DATA CENTER (NSIDC) DAAC



- Program within NSIDC, Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder
- **Science-focused data stewardship** for NASA data, by combining expertise in cryospheric sciences and Earth science data management.

# NSIDC DAAC MISSIONS AND PROGRAMS

NSIDC DAAC stewards a dynamic, heterogeneous collection of satellite, airborne, field campaign, and derived data

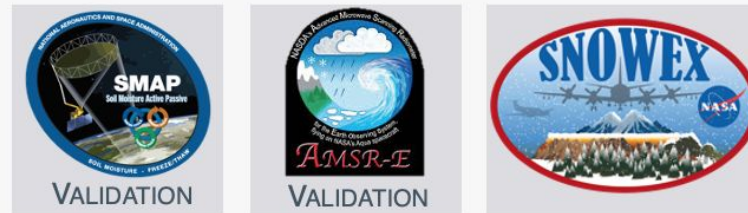
## SATELLITE



## AIRBORNE



## FIELD



## DERIVED



# ICESAT-2 DATA SETS

Geolocated Photon Data (ATL03) input for along-track and gridded data sets:



-  Land ice height (ATL06/11/14/15)
-  Sea ice height (ATL07/20/21)
-  Sea ice freeboard (ATL10/20/21)
-  Land and vegetation height (ATL08)
-  Inland surface water (ATL13)
-  Ocean surface height (ATL12/19/23)
-  Atmospheric layer characteristics (ATL04/09/16/17)

- 21 mission data sets
- Temporal coverage: 26 December 2018 – 31 August 2024
- Data latency: ~45 days
- Repeat cycle: 91 days
- Spatial coverage: 88°N - 88°S
- Spatial resolution: data set dependent (laser pulses separated by .7m on ground)



# ICESAT-2 DATA SETS

Geolocated Photon Data (ATL03) input for along-track and gridded data sets:



Land ice height (ATL06/11/14/15)



Sea ice height (ATL07/20/21)



Sea ice freeboard (ATL10/20/21)



Land and vegetation height (ATL08)



Inland surface water (ATL13)



Ocean surface height (ATL12/19/23)



Atmospheric layer characteristics (ATL04/09/16/17)

- Current data set version: 6
- Version 7 is expected in Spring 2025 with cloud-optimized ATL03 and others
- Future data sets on bathymetry (ATL24), lake ice (ATL25) and gridded vegetation height (ATL18) are under development

# ICESAT-2 DATA SETS - QUICK LOOKS



Sea ice height (ATL07QL)



Sea ice freeboard (ATL10QL)



Land and vegetation height (ATL08QL)



Inland surface water (ATL13QL)



Atmospheric layer characteristics (ATL09QL)

## \*Quicklooks\*

Low-latency (~3 days) version of mission datasets to meet the needs of applications users.

Higher geolocation and height uncertainty

Future quicklook data sets on geolocated photons (ATL03QL) gridded sea ice freeboard (ATL20QL), and lake ice (ATL25QL) are under development



# NSIDC DAAC ICESat-2 MISSION PAGE

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

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

**ICESat-2 Data Products**

**LEGEND**

Level 0	Level 3A
Level 1	Quicklook
Level 2	Level 3B

**ICESat-2 Product Overviews**

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

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





# NSIDC DAAC ICESat-2 MISSION PAGE

EARTHDATA Other DAACs -

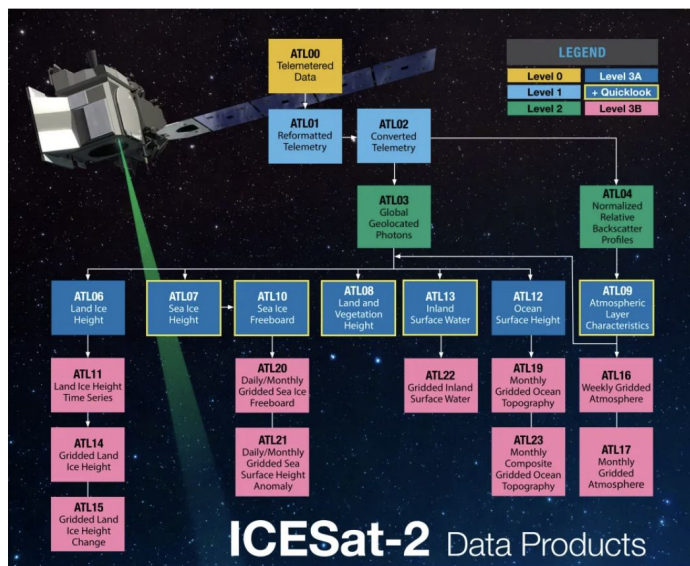
NSIDC National Snow and Ice Data Center  
a part of CIRES at the University of Colorado Boulder

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

Home > Data > ICESat-2

## ICESat-2

The Ice, Cloud, and land Elevation Satellite-2



Overview

Documentation

Help Articles

Data Tools

Data Announcements

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](mailto:nsidc@nsidc.org)

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



# 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 text block states "This is the most recent version of these data. Version Summary". The "Overview" section contains a paragraph describing the data set. A sidebar menu lists "Overview", "Data Access & Tools", "Documentation", and "Help Articles". A "Support" button is located at the bottom right of the sidebar.

**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

## Subscribe:

Sign up to receive email updates of the data set

<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 title is "ATLAS/ICESat-2 L2A Global Geolocated Photon Data, Version 6" with a NASA logo. Below the title are the data set ID (ATL03) and DOI (10.5067/ATLAS/ATL03.006). A row of icons includes USER GUIDE, CITATION, SUBSCRIBE, and SERVICE. The "Data Access & Tools" section features a warning that a NASA Earthdata Login account is required, with a "Learn More" link. A "HTTPS File System" card offers a "Get Data" button and a link to the "NASA Earthdata Cloud Data Access Guide". A sidebar on the right contains links for Overview, Data Access & Tools, Documentation, and Help Articles, along with a "Support" button.

Access and tools for the data product

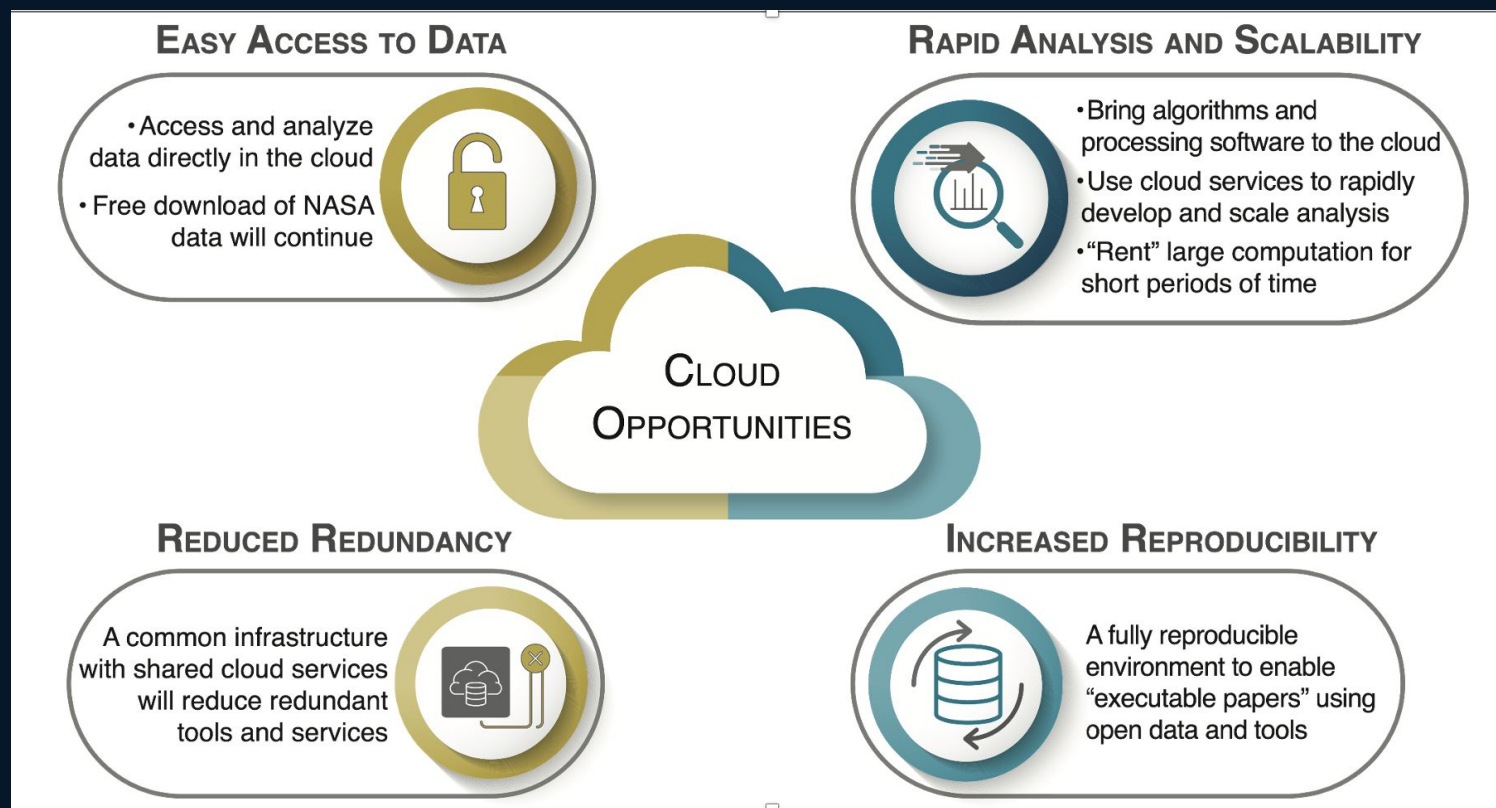
Known issues, ATBDs, Data Dictionaries, User Guides

Help articles for the data product



# 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 local hardware and cloud
- Transformation services (subsetting & reformatting) available for download from local hardware
- Established critical transformation services in the cloud
- Supporting user transition to cloud data access

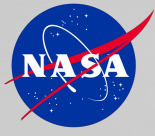
## Next 1-2 Years

- ICESat-2 Quicklook and related datasets made available in the cloud
- Shut off data access and transformation services from local hardware

- All data are available for download from 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](https://nsidc.org/data/user-resources/help-center/nasa-earthdata-cloud-data-access-guide)  
(<https://nsidc.org/data/user-resources/help-center/nasa-earthdata-cloud-data-access-guide>)
  - Tutorials on [NSIDC GitHub](https://github.com/nsidc/NSIDC-Data-Tutorials/tree/main/notebooks/ICESat-2_Cloud_Access)  
([https://github.com/nsidc/NSIDC-Data-Tutorials/tree/main/notebooks/ICESat-2\\_Cloud\\_Access](https://github.com/nsidc/NSIDC-Data-Tutorials/tree/main/notebooks/ICESat-2_Cloud_Access))
- ICESat-2 specific resources in the CryoCloud Cookbook:
  - [Introduction to NASA Earthdata Cloud and ICESat-2](https://book.cryointhecloud.com/tutorials/NASA-Earthdata-Cloud-Access/1.Intro-Earthdata-Cloud.html)  
(<https://book.cryointhecloud.com/tutorials/NASA-Earthdata-Cloud-Access/1.Intro-Earthdata-Cloud.html>)
  - [NASA Earthdata Cloud and data access using earthaccess and icepyx](https://book.cryointhecloud.com/tutorials/NASA-Earthdata-Cloud-Access/3.earthaccess.html)  
(<https://book.cryointhecloud.com/tutorials/NASA-Earthdata-Cloud-Access/3.earthaccess.html>)
- [NASA Openscapes Earthdata Cloud Cookbook](https://nasa-openscapes.github.io/earthdata-cloud-cookbook/)  
(<https://nasa-openscapes.github.io/earthdata-cloud-cookbook/>)
  - Very comprehensive resource
  - Includes resources on learning how to work with data in the cloud, tutorials, workshop content, etc.



National Aeronautics and  
Space Administration

# ICESAT-2 DATA ACCESS AND TOOLS AT NSIDC DAAC

Dr. Mikala Beig, NSIDC DAAC Data Support Specialist ([nsidc@nsidc.org](mailto:nsidc@nsidc.org))

# ICESAT-2 DATA ACCESS TOOLS

- Graphical user interfaces and map widgets
  - NASA Earthdata Search
  - NSIDC DAAC Data Access Tool
  - OpenAltimetry
  
- Programmatic access
  - earthaccess Python library
  - icepyx Python library
  - SlideRule Earth web service

**Discover and Explore**

**Automate and Analyze**



# DATA ACCESS - HOW TO FIND TOOLS AND METHODS

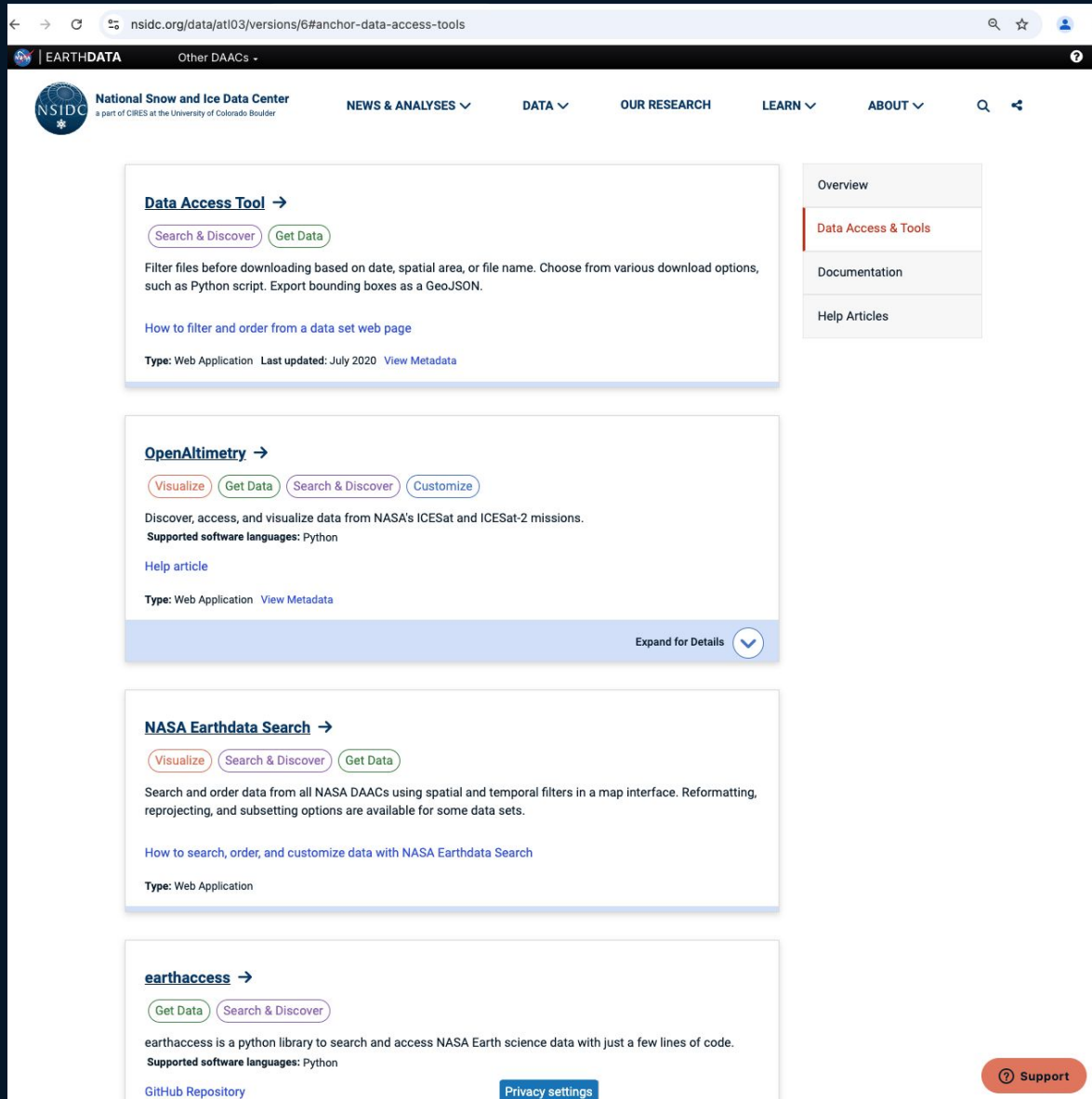
The screenshot shows the NSIDC website interface. At the top, there is a navigation bar with the NSIDC logo and the text "National Snow and Ice Data Center a part of CIRES at the University of Colorado Boulder". The main navigation menu includes "NEWS & ANALYSES", "DATA", "OUR RESEARCH", "LEARN", and "ABOUT". A sidebar menu on the right contains "Overview", "Data Access & Tools", "Documentation", and "Help Articles". The "Data Access & Tools" option is highlighted with a red box and a red arrow. The main content area features a "Overview" section with a detailed description of the data set, including parameters, platform, sensor, data format, temporal coverage, temporal resolution, spatial resolution, spatial reference system, and spatial coverage. A "Support" button is located at the bottom right of the page.

Navigate to a data set landing page (e.g. <https://nsidc.org/data/atl03>)

Click on Data Access & Tools in the sidebar menu



# DATA ACCESS - HOW TO FIND TOOLS



The screenshot shows the NSIDC website's 'Data Access Tools' page. The browser address bar shows 'nsidc.org/data/at103/versions/6#anchor-data-access-tools'. The page header includes the NSIDC logo, 'National Snow and Ice Data Center', and navigation menus for 'NEWS & ANALYSES', 'DATA', 'OUR RESEARCH', 'LEARN', and 'ABOUT'. A search icon is also present.

The main content area features four tool cards:

- Data Access Tool**: Includes buttons for 'Search & Discover' and 'Get Data'. Description: 'Filter files before downloading based on date, spatial area, or file name. Choose from various download options, such as Python script. Export bounding boxes as a GeoJSON.' Includes a link 'How to filter and order from a data set web page' and metadata: 'Type: Web Application Last updated: July 2020 View Metadata'.
- OpenAltimetry**: Includes buttons for 'Visualize', 'Get Data', 'Search & Discover', and 'Customize'. Description: 'Discover, access, and visualize data from NASA's ICESat and ICESat-2 missions. Supported software languages: Python'. Includes a link 'Help article' and metadata: 'Type: Web Application View Metadata'. An 'Expand for Details' button is at the bottom right.
- NASA Earthdata Search**: Includes buttons for 'Visualize', 'Search & Discover', and 'Get Data'. Description: '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.' Includes a link 'How to search, order, and customize data with NASA Earthdata Search' and metadata: 'Type: Web Application'.
- earthaccess**: Includes buttons for 'Get Data' and 'Search & Discover'. Description: 'earthaccess is a python library to search and access NASA Earth science data with just a few lines of code. Supported software languages: Python'. Includes a link 'GitHub Repository', a 'Privacy settings' button, and a 'Support' button.

A right-hand sidebar contains a menu with 'Overview', 'Data Access & Tools' (highlighted), 'Documentation', and 'Help Articles'.

Each data set has a list of tool and service “cards” associated with it

# DATA ACCESS - HOW TO FIND TOOLS AND METHODS

[NASA Earthdata Search](#) →

Links

Visualize

Search & Discover

Get Data

Capabilities

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.

Description

How to search, order, and customize data with NASA Earthdata Search

Type: Web Application

# NASA Earthdata Search

The screenshot displays the NASA Earthdata Search interface. On the left, there are search filters for spatial (SW: 7757537, NE: 84.89644) and temporal (Start: 2023-01-07, End: 2023-01-09) ranges. The main area shows search results for 'ATLAS/ICESat-2 L3A Land Ice Height V006', listing 20 granules with their IDs and start/end dates. A map on the right shows Antarctica with green lines indicating data coverage. The bottom of the interface features a monthly timeline and navigation links.

- Discover, visualize, and access petabytes of Earth observing data from all NASA DAACs
- Filter data by mission, keyword, spatial and temporal range, filename, etc.
- Provides customization services (e.g. subsetting) for select data sets

## NASA Earthdata Search →

Visualize Search & Discover Get Data Customize

What can I do with this tool?

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

<https://search.earthdata.nasa.gov/search>



# NSIDC DAAC Data Access Tool

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

NEWS & ANALYSES DATA OUR RESEARCH LEARN ABOUT

Note: To select a different data set, close this window (or tab) and navigate to the data set landing page you want.

Data Set: ATLAS/ICESat-2 L3A Land Ice Height, Version 6  
Data Set ID: ATL06  
Data Set Summary: This data set (ATL06) provides geolocated, land-ice surface heights (above the WGS 84 ellipsoid, ITRF2014 reference frame), plus ancillary parameters that can be used to interpret and assess the quality of the height estimates. The data were acquired by the Advanced Topographic Laser Altimeter System (ATLAS) instrument on board the Ice, Cloud and land Elevation Satellite-2 (ICESat-2) observatory.

Mikala Beig Logout

Filter by date: From 01/08/2023 To 01/09/2023 Temporal filter

Filter spatially by bounding box: W -52.2 S 76.37 E -17.7 N 84.01

Filter spatially by drawing a bounding box or polygon:  
Note: Blue-green overlay shows the dataset coverage, unless it is global.

Draw, import, export polygons

13 files selected (~600 MB) Text filter with \*wildcards\* Search file names

File Name	Size (MB)	Start Time	End Time
ATL06_20230110065919_03161804_006_02.h5	21.4	2023-01-10 06:03:35	2023-01-10 06:04:29
ATL06_20230110043011_03151805_006_02.h5	95.6	2023-01-10 04:30:11	2023-01-10 04:34:40
ATL06_20230110042501_03151804_006_02.h5	25.2	2023-01-10 04:29:09	2023-01-10 04:30:11
ATL06_20230109155043_03071804_006_02.h5	21.0	2023-01-09 15:50:43	2023-01-09 15:51:35
ATL06_20230109154518_03071803_006_02.h5	84.3	2023-01-09 15:46:47	2023-01-09 15:50:44
ATL06_20230109141626_03061804_006_02.h5	25.4	2023-01-09 14:16:26	2023-01-09 14:17:30
ATL06_20230109141101_03061803_006_02.h5	15.9	2023-01-09 14:11:53	2023-01-09 14:16:27
ATL06_20230109045551_03001805_006_02.h5	90.1	2023-01-09 04:55:52	2023-01-09 05:00:57
ATL06_20230109045042_03001804_006_02.h5	25.9	2023-01-09 04:54:47	2023-01-09 04:55:52
ATL06_20230108161622_02921804_006_02.h5	17.9	2023-01-08 16:16:23	2023-01-08 16:17:06
ATL06_20230108161057_02921803_006_02.h5	104.7	2023-01-08 16:11:24	2023-01-08 16:16:24
ATL06_20230108144205_02911804_006_02.h5	26.2	2023-01-08 14:42:06	2023-01-08 14:43:11
ATL06_20230108143640_02911803_006_02.h5	47.5	2023-01-08 14:37:38	2023-01-08 14:42:06

13 files selected (~600 MB)

Multiple ordering options Download Script Order Files Large/Custom Order

- Intuitive and simple way to quickly filter and access data from the NSIDC website
- Provides multiple ways to place your order -e.g. Python script or pre-configured Earthdata Search order

## Data Access Tool →

Search & Discover Get Data

Filter files before downloading based on date, spatial area, or file name. Choose from various download options, such as Python script. Export bounding boxes as a GeoJSON.

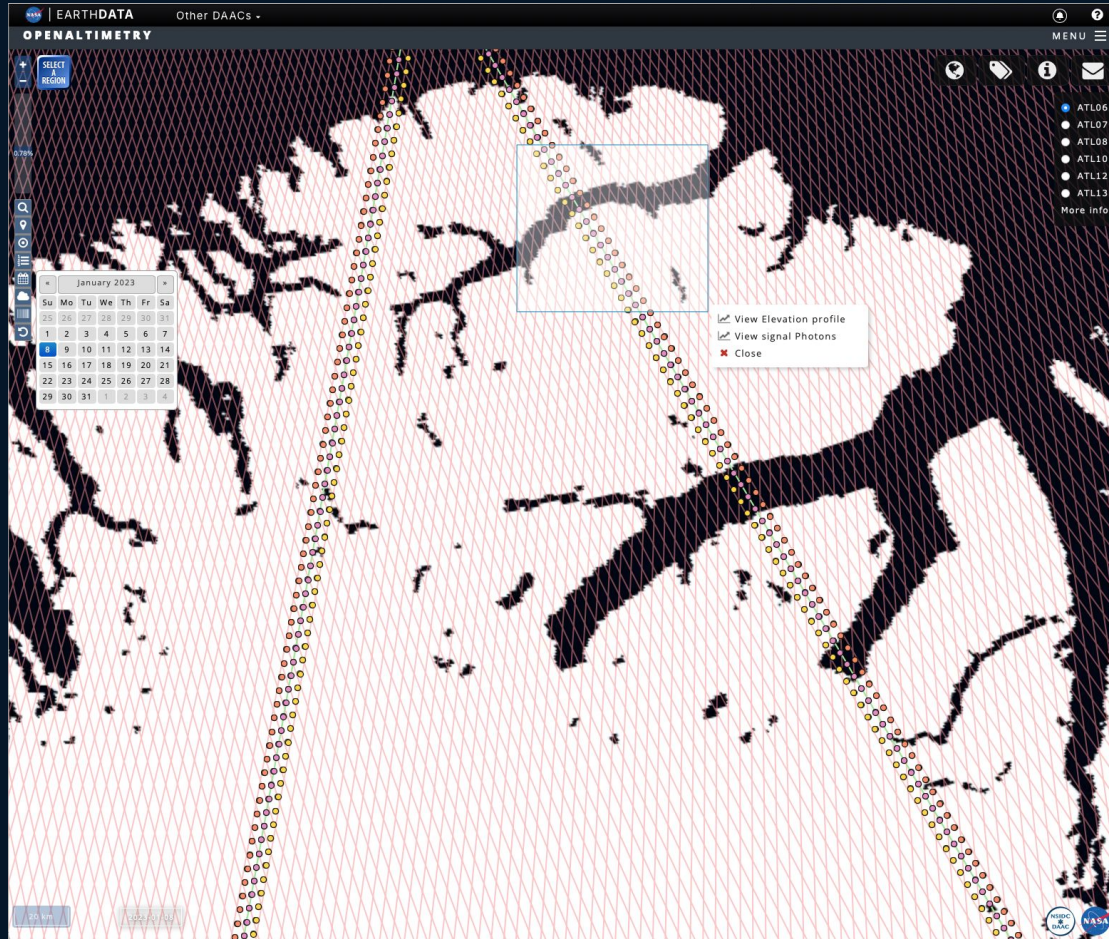
How to filter and order from a data set web page

Type: Web Application Last updated: July 2020 View Metadata

<https://nsidc.org/data/data-access-tool/ATL06/versions/6>



# OpenAltimetry



- Removes technical hurdles for visualizing TB's of ICESat-2 data
- Provides a quick snapshot of data location and values
- OpenAltimetry is an ideal tool for getting to know ICESat-2 data

## 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](#)

Type: Web Application [View Metadata](#)

Expand for Details

How to use:

<https://nsidc.org/data/user-resources/help-center/how-us-e-openaltimetry-icesat-2-data-products>

Where to access:

<https://openaltimetry.earthdatacloud.nasa.gov>





earthaccess

Search

nsidc/earthaccess v0.11.0 414 82

earthaccess

What is earthaccess?

Quick start

Work with us

Resources

USER GUIDE

HOW-TO

TUTORIALS

USER REFERENCE

Quick Start

## Installing earthaccess

The latest release of earthaccess can be installed with mamba, conda or pip. We recommend using mamba because it is faster.

You will need Python 3.8 or higher installed.

**Using mamba**

```
mamba install -c conda-forge earthaccess
```

**Using conda**

```
conda install -c conda-forge earthaccess
```

**Using pip**

```
python -m pip install earthaccess
```

Check earthaccess is installed

This should run seamlessly (fingers-crossed). To check earthaccess is correctly installed you can start a python interpreter (either python or ipython) and run the following code.

```
$ python
Python 3.12.1 | packaged by conda-forge | (main, Dec 23 2023, 08:03:24) [GCC 12.3.0]
Type "help", "copyright", "credits" or "license" for more information.
>>> import earthaccess
>>> earthaccess.__version__
'0.8.2'
```

Note: Your python and earthaccess versions may be different.

## Get Data in 3 Steps

earthaccess allows you to search for and access data in as little as three steps. We give a very quick example below. These three steps allow you to get data whether you are working in the cloud or on your local laptop or workstation. Read the [User Guide](#) for more information. If you

- Authenticate, search, and access data with 4 lines of code
- Use the same code to access both cloud-hosted data sets and the legacy archive (“on premises”)
- Supported by a welcoming community of contributors across ESDIS and the user community

## 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](#)

earthaccess documentation

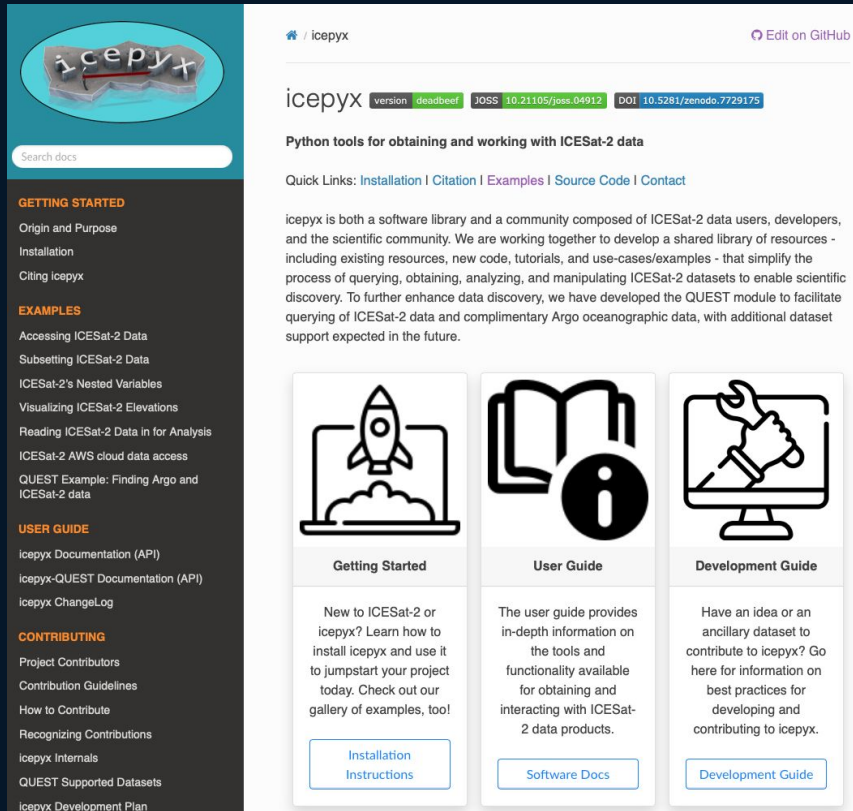
<https://earthaccess.readthedocs.io/>

NASA Earthdata Tech Spotlight

[https://www.youtube.com/watch?v=EIr3j1\\_wDc0](https://www.youtube.com/watch?v=EIr3j1_wDc0)



# icepyx



icepyx

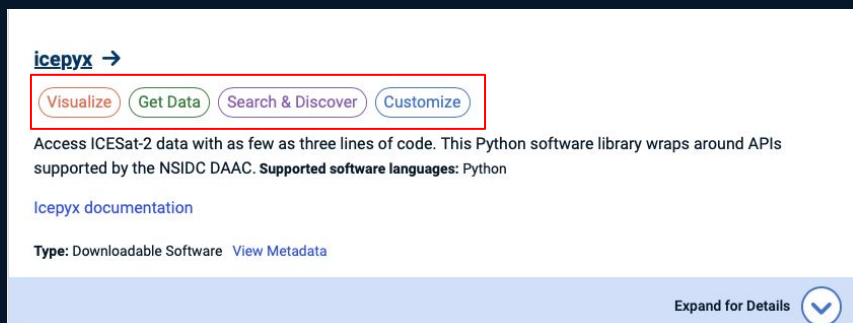
Python tools for obtaining and working with ICESat-2 data

Quick Links: [Installation](#) | [Citation](#) | [Examples](#) | [Source Code](#) | [Contact](#)

icepyx is both a software library and a community composed of ICESat-2 data users, developers, and the scientific community. We are working together to develop a shared library of resources - including existing resources, new code, tutorials, and use-cases/examples - that simplify the process of querying, obtaining, analyzing, and manipulating ICESat-2 datasets to enable scientific discovery. To further enhance data discovery, we have developed the QUEST module to facilitate querying of ICESat-2 data and complimentary Argo oceanographic data, with additional dataset support expected in the future.

Getting Started	User Guide	Development Guide
New to ICESat-2 or icepyx? Learn how to install icepyx and use it to jumpstart your project today. Check out our gallery of examples, too!	The user guide provides in-depth information on the tools and functionality available for obtaining and interacting with ICESat-2 data products.	Have an idea or an ancillary dataset to contribute to icepyx? Go here for information on best practices for developing and contributing to icepyx.
<a href="#">Installation Instructions</a>	<a href="#">Software Docs</a>	<a href="#">Development Guide</a>

- Community-developed Python library that started as an ICESat-2 Hackweek project
- “Shared library of open source resources that simplify the process of querying, obtaining, analyzing, and manipulating ICESat-2 datasets to enable scientific discovery”
- Enables subsetting for data volume reduction



icepyx →

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

Access ICESat-2 data with as few as three lines of code. This Python software library wraps around APIs supported by the NSIDC DAAC. **Supported software languages:** Python

[Icepyx documentation](#)

Type: Downloadable Software [View Metadata](#)

Expand for Details

<https://icepyx.readthedocs.io/en/latest/>





# SlideRule



**SlideRule**

Process Earth science datasets in the cloud through REST API calls to SlideRule web services.

**Latest Version:** v4.3.1, [http://slideruleearth.io/web/rtd/release\\_notes/release\\_notes.html](http://slideruleearth.io/web/rtd/release_notes/release_notes.html)  
**GitHub:** <https://github.com/ICESat2-SlideRule/sliderule>  
**Web:** <https://slideruleearth.io/web/>  
**PyPI:** <https://pypi.org/project/sliderule/>  
**Conda:** <https://anaconda.org/conda-forge/sliderule>  
**Node.js:** <https://www.npmjs.com/package/@sliderule/sliderule>

SlideRule is a web service for on-demand science data processing, which provides researchers and other Earth science data systems low-latency access to customized data products using processing parameters supplied at the time of the request. SlideRule runs in AWS us-west-2 and has access to ICESat-2, GEDI, Landsat, ArcticDEM, REMA, and other datasets stored in S3 (see [Assets](#) for a full list).

"Using SlideRule" typically means running a Python script you've developed to analyze Earth science data, and in that script calling functions in the `sliderule` Python package to make processing requests to SlideRule web services to perform some of the data intensive parts of your analysis. Most of the documentation and examples we provide are focused on this use-case. We do provide other means of interacting with SlideRule (most notably the current demo and future web client), but those features are still under development and documentation for them is sparse.

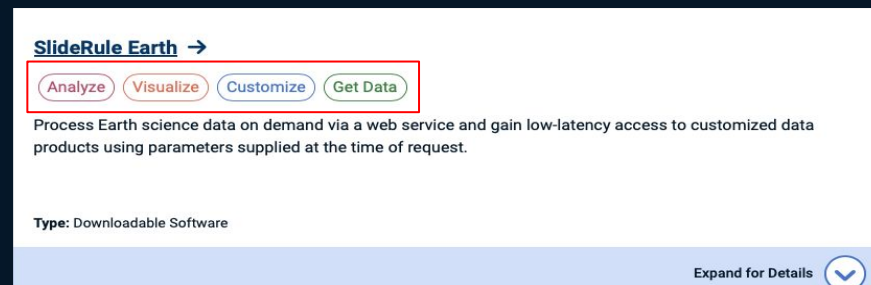
### Where To Begin

SlideRule Demo	Examples	Getting Started
Try out an interactive widgets demo.	Jump right in and learn from examples.	Walkthrough what SlideRule can do.
<a href="#">Run Demo</a>	<a href="#">Examples</a>	<a href="#">Getting Started</a>

- Web service for processing ICESat-2 and other data, and returning results
- Provides on-demand data processing using custom algorithms

Development of SlideRule is led by the University of Washington in conjunction with NASA's ICESat-2 program

<https://slideruleearth.io/>



**SlideRule Earth** →

Analyze Visualize Customize Get Data

Process Earth science data on demand via a web service and gain low-latency access to customized data products using parameters supplied at the time of request.

Type: Downloadable Software

Expand for Details



# NASA Earthdata Cloud



## NASA Earthdata Cloud Cookbook



- Welcome
- When To Cloud
- Our Cookbook
- Glossary & Cheatsheets
- Cloud Environment Setup
- How do I... >
- Tutorials >
- Workshops & Hackathons >
- Policies & Administration >
- In Development >
- Contributing >
- Appendix >

## When To 'Cloud'

Is in-cloud access and analysis for you?

AUTHOR  
NASA OpenScapes Team

PUBLISHED  
November 7, 2024

Cloud adoption often has a steep learning curve and can feel overwhelming. There are times when using the cloud is effective and times when the download model is more appropriate. Here we aim to help you decide what's best for your use case.

### What does it mean to be in The Cloud?

## What is The Cloud?

Anywhere that isn't your computer



Image by Alexis Hunzinger, GES DISC

At a basic level, "The Cloud" is somewhere that isn't your computer. We all interact with data and services and that live in "The Cloud" in our daily lives. When we store photos in iCloud or Google accounts instead of on our cell phones, we are using cloud storage. When we watch movies and tv shows on streaming services like Netflix or Hulu, we are using the cloud. In these cases, we are interacting with "the cloud" without knowing it, though we, the user, are not in "the cloud".

## What is The Cloud?

Example: Movie/TV streaming

### On this page

- [What does it mean to be in The Cloud?](#)
- [Questions to ask yourself To Cloud...](#)
- [Not To Cloud...](#)
- [Challenges](#)
- [Considerations](#)

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# OPENALTIMETRY

NASA EARTHDATA Other DAACs ▾

OPENALTIMETRY MENU ☰

**OPENALTIMETRY**

VISUALIZE AND DOWNLOAD SURFACE ELEVATION DATA FROM ACROSS THE EARTH, OVER TIME

ICESAT DATA ICESAT-2 DATA

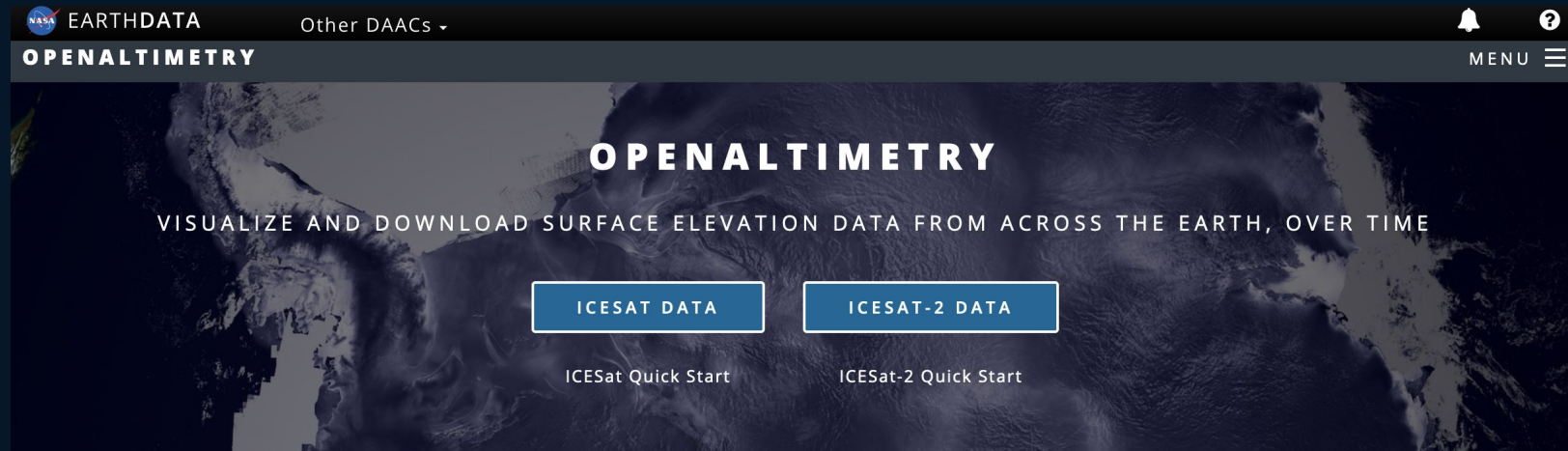
ICESat Quick Start ICESat-2 Quick Start

## ICESat-2 and ICESat data discovery and visualization

[Siri Jodha S. Khalsa](#) [Adrian Borsa](#) [Viswanath Nandigam](#) [Minh Phan](#) [Kai Lin](#) [Christopher Crosby](#) [Helen Fricker](#) [Chaitan Baru](#) [Luis Lopez](#) OpenAltimetry - rapid analysis and visualization of Spaceborne altimeter data. *Earth Sci Inform* (2020). <https://doi.org/10.1007/s12145-020-00520-2>.



# OPENALTIMETRY → NASA'S EARTHDATA CLOUD



## HISTORY

OpenAltimetry began as an Advancing Collaborative Connections for Earth System Science (ACCESS) Program-funded collaboration between Scripps Institution of Oceanography, San Diego Supercomputer Center UC San Diego, NSIDC, and EarthScope Consortium (formerly @UNAVCO).

## NEWS

In October 2023 OpenAltimetry became a NSIDC DAAC / NASA ESDS supported application in NASA's Earthdata Cloud environment

## ACCESS

<https://openaltimetry.earthdatacloud.nasa.gov>



# DOCUMENTATION AND ACCESS

Documentation on NSIDC website

<https://nsidc.org/openaltimetry>

Access on earthdatacloud.nasa.gov website

<https://openaltimetry.earthdatacloud.nasa.gov/>

Questions?? Send an email to [nsidc@nsidc.org](mailto:nsidc@nsidc.org)



# OPENALTIMETRY DEMO

Search

Select

Visualize

Download



## OPENALTIMETRY

VISUALIZE AND DOWNLOAD SURFACE ELEVATION DATA FROM ACROSS THE EARTH, OVER TIME

ICESAT DATA

ICESAT-2 DATA

ICESat Quick Start

ICESat-2 Quick Start

### OVERVIEW

NASA's OpenAltimetry (OA) is a free and powerful map-based data visualization and discovery tool for exploring surface elevation profiles from ICESat and ICESat-2 satellite mission altimetry data. Use OA explore how different types of surface heights have changed across the Earth over time. You can also easily download the data without the need for any special software or scripts; all you need is a web browser.

### DATA AVAILABILITY

OA's ICESat-2 elevation data include observations from 2018 to present. The data show multiple photon beams, one day at a time, and users can easily select different dates and overlay MODIS cloud cover data. Types of altimetry data include:

- Land ice height
- Sea ice height
- Land and vegetation height
- Sea ice freeboard
- Ocean surface height
- Inland water surface data

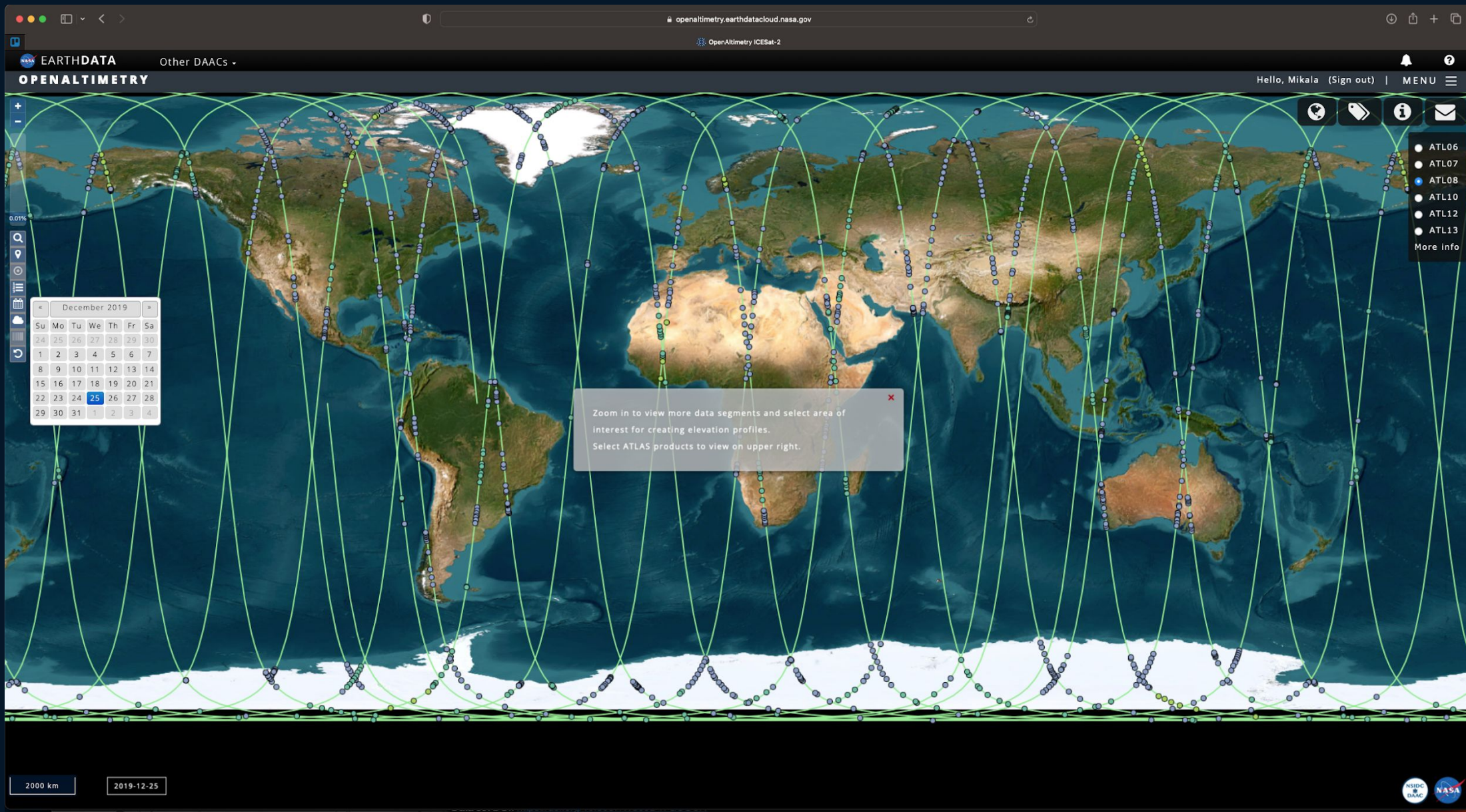
ICESat elevation data: This data set is GLAH06 Global Elevation Data. ICESat is the predecessor to ICESat-2 and collected data from 2003 through early 2010.

### WHERE TO FIND USER SUPPORT

OA has become a NASA Earth science application maintained and supported by the [NASA National Snow and Ice Data Center Distributed Active Archive Center \(NSIDC DAAC\)](#). For assistance with OA, [contact NSIDC User Services](#) with questions and user-support requests.

### OA HISTORY

OA started as an Advancing Collaborative Connections for Earth System Science (ACCESS) Program-funded collaboration between Scripps Institution of Oceanography, San Diego Supercomputer Center at the University of California San Diego, National Snow and Ice Data Center, and EarthScope Consortium (formerly @UNAVCO).

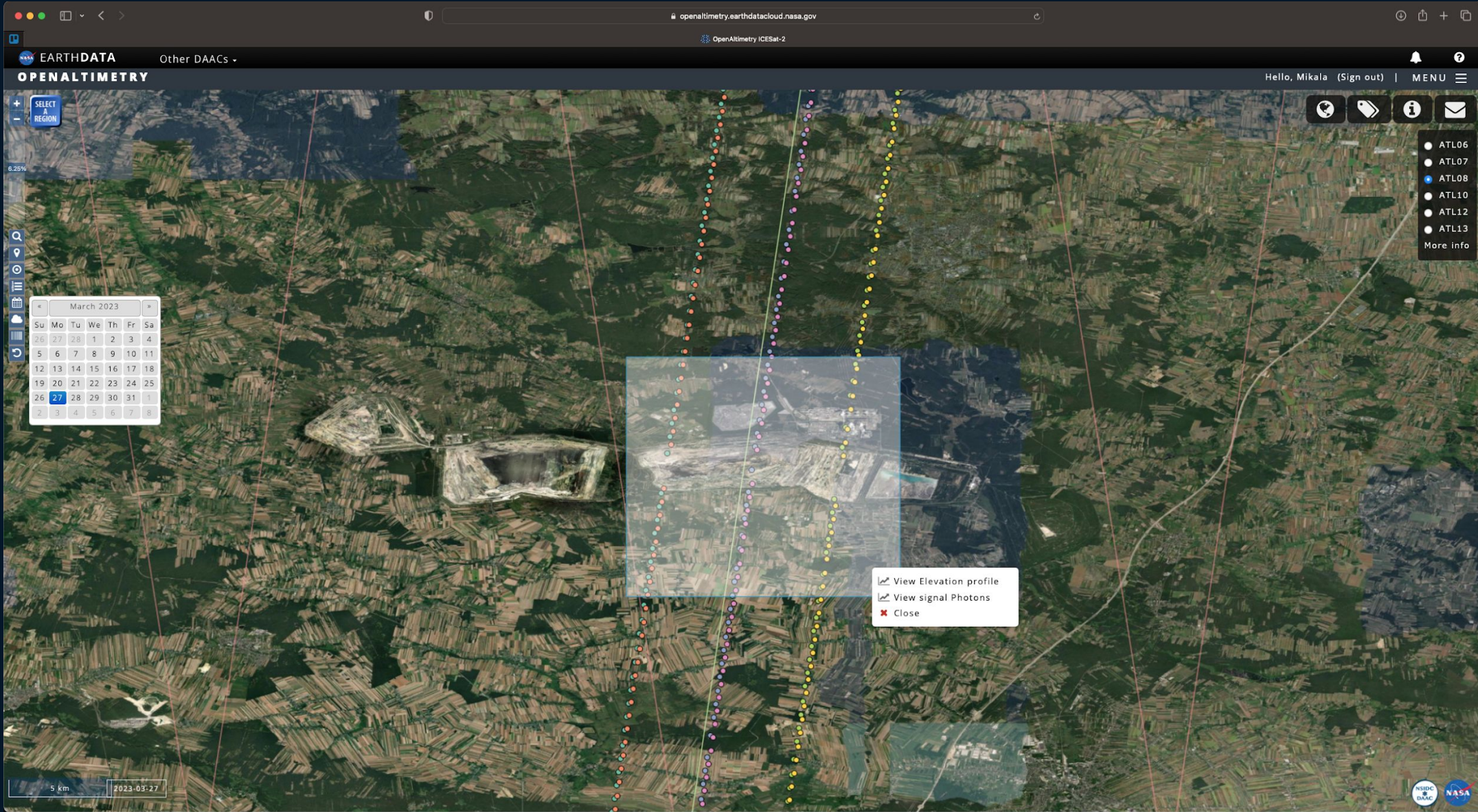


Search

ICESat-2 – overview of available tracks for a particular date



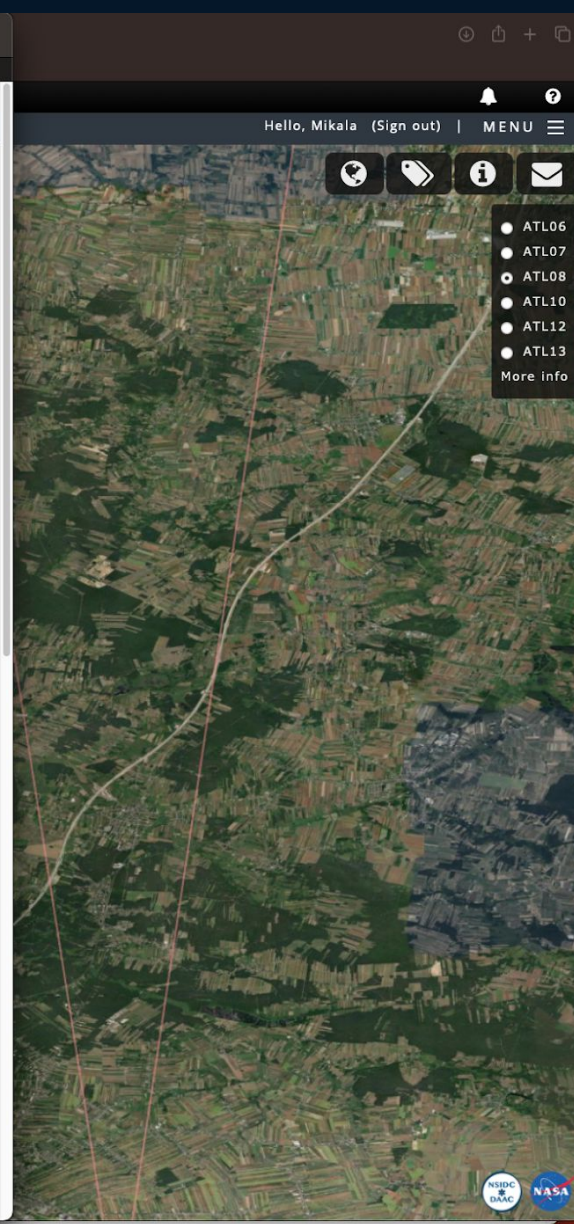
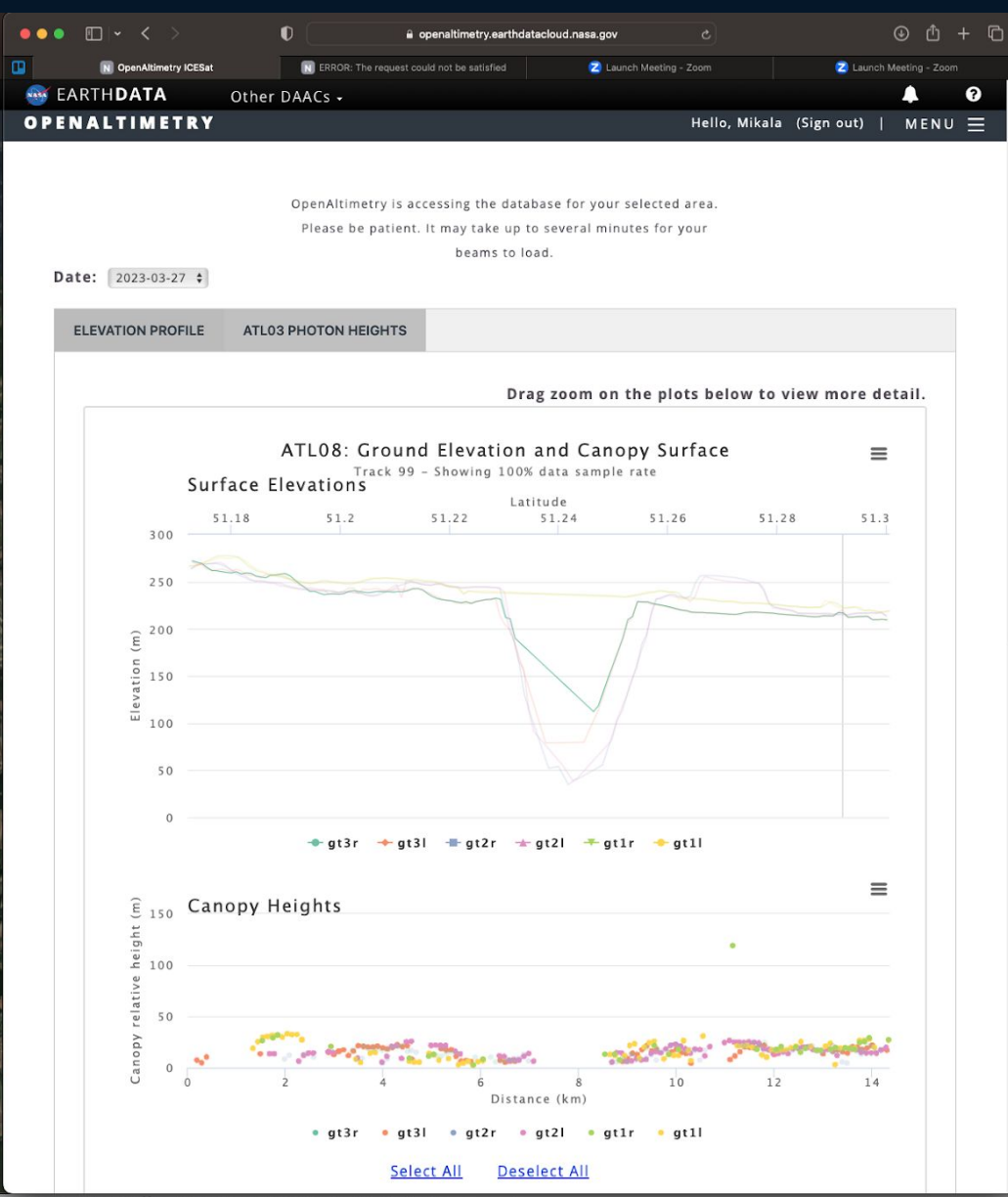
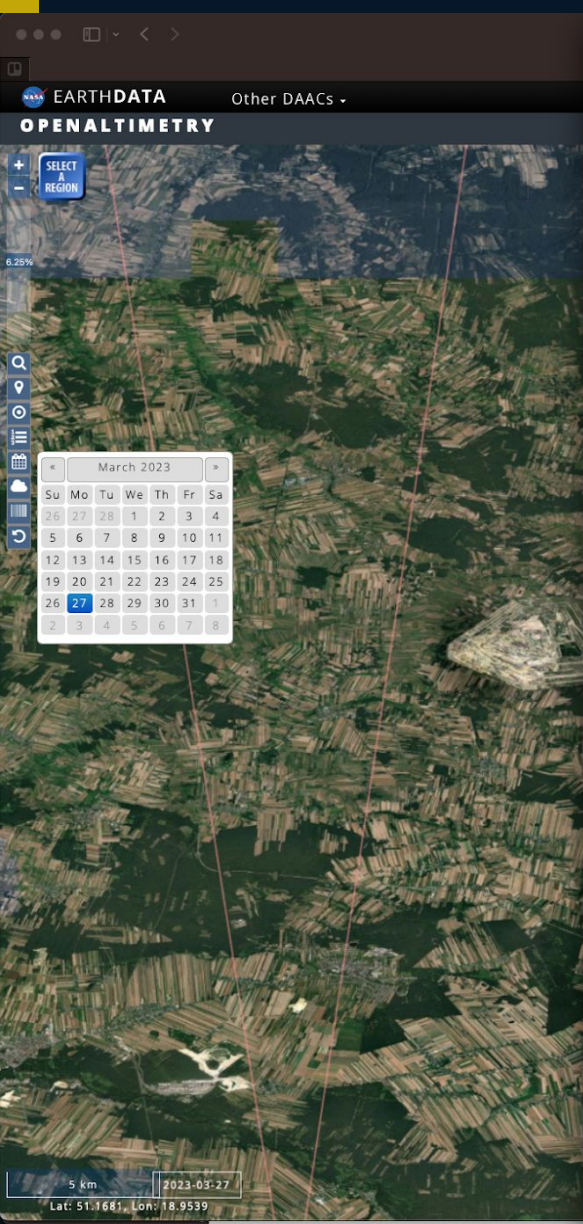




Select

Zoom in for a detailed look over an area of interest  
(Elektrownia Bełchatów – largest coal-fired power plant in Europe)





Visualize

Plot the elevation profile from the selected region.



Date: 2023-03-27

ELEVATION PROFILE

ATL03 PHOTON HEIGHTS

Select ATLAS beam [gt3r\(weak\)](#) | [gt3l\(strong\)](#) | [gt2r\(weak\)](#) | [gt2l\(strong\)](#) | [gt1r\(weak\)](#) | [gt1l\(strong\)](#)

Track ID: 99 - Beam: gt3l - Showing 100.00% data sample rate

Total number of photons: 11,737 - Total segments: 714 - Segment range: [716,863 - 717,576]

Overlay L3A

ATL08 terrain height

Drag zoom on the plot below to view more detail.

Confidence: High [10519]

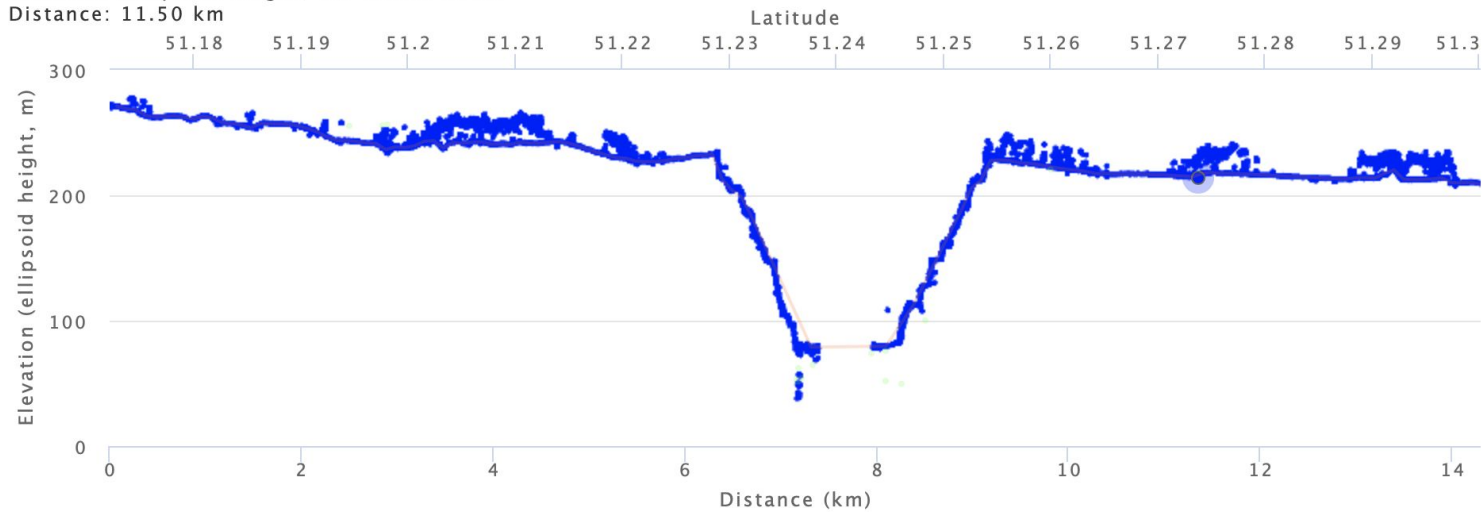
Latitude: 51.273675

Longitude: 19.229459

Elevation (ellipsoid height, m): 215.07196m

Distance: 11.50 km

### Return Signal Photons



Confidence:

• N/A [1081] • Noise [84] • Buffer [0] • Low [36] • Medium [17] • High [10519]

Visualize

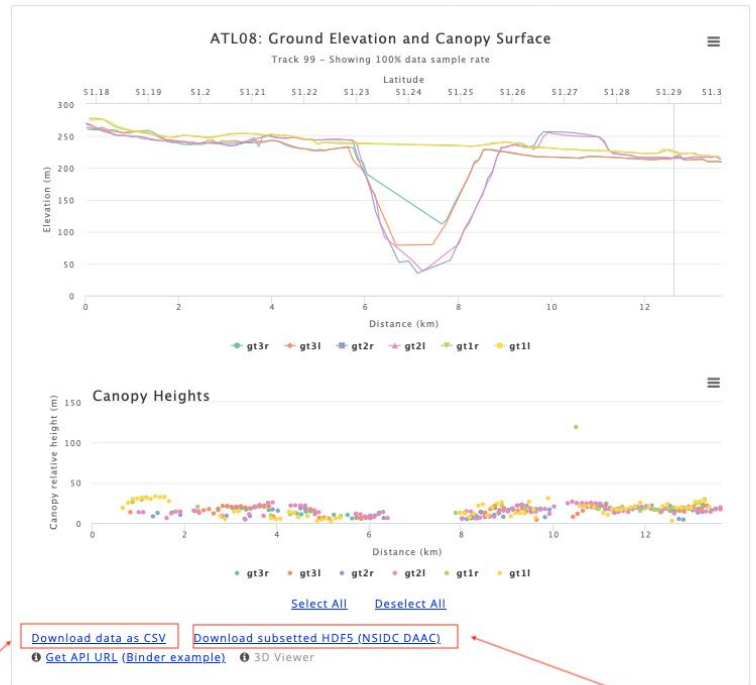
View underlying ATL03 photon heights and overlay ATL08 surface



Date: 2023-03-27

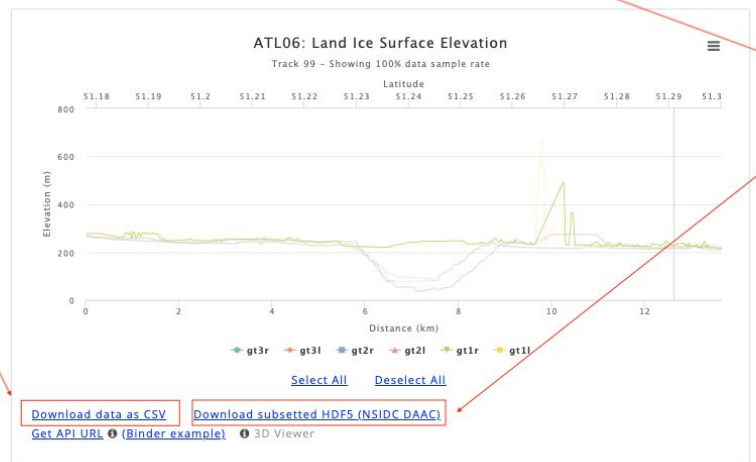
ELEVATION PROFILE    ATL03 PHOTON HEIGHTS

Drag zoom on the plots below to view more detail.



Download csv files

Download hdf5 files



Download



OpenAltimetry is accessing the database for your selected area. Please be patient. It may take up to several minutes for your beams to load.

Date: 2023-03-27

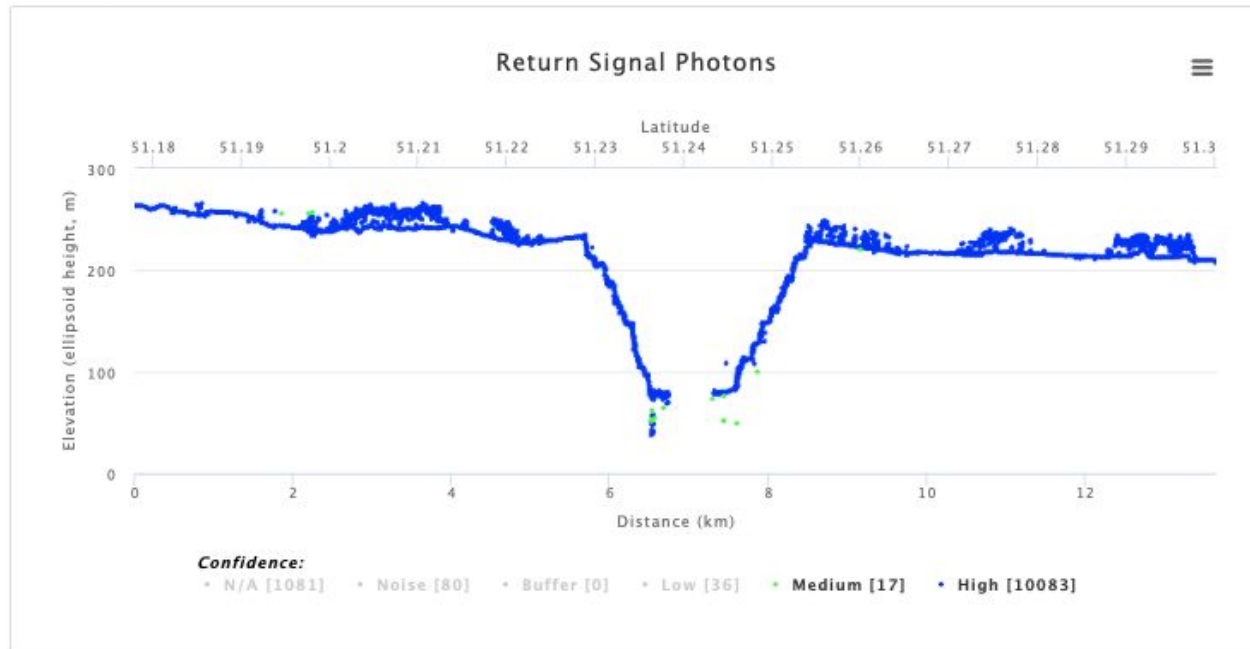
ELEVATION PROFILE ATLO3 PHOTON HEIGHTS

Select ATLAS beam [gt3r \(weak\)](#) | [gt3l \(strong\)](#) | [gt2r \(weak\)](#) | [gt2l \(strong\)](#) | [gt1r \(weak\)](#) | [gt1l \(strong\)](#)

Track ID: 99 - Beam: gt3l - Showing 30.15% data sample rate

Total number of photons: 33,889 - Total segments: 682 - Segment range: [716,863 - 717,544]

Overlay L3A [ATLO6 land ice height](#)



Download csv

[Download data as CSV](#)

[Download subsetted HDF5 \(NSIDC DAAC\)](#)

Download hdf5

[Get API URL \(Binder example\)](#) [3D Viewer](#)

Download

# API ENDPOINTS

The screenshot shows the Swagger UI for the OpenAltimetry API. The browser address bar displays `openaltimetry.earthdatacloud.nasa.gov`. The Swagger logo is in the top left, and the URL `/data/openapi/v3/api-docs` is in the top right. A green "Explore" button is also present. The main heading is "OpenAltimetry API" with version "1.0" and "OAS 3.0" tags. Below the heading, it states "Services for ICESat-2 ATL03, ATL06, ATL07, ATL08, ATL10, ATL12 and ATL13 data collections." A "Servers" dropdown menu is set to "https://openaltimetry.earthdatacloud.nasa.gov/data - Generated server url". Under the "Public" section, four endpoints are listed:

- GET** `/api/icesat2/{product}` Access ICESat-2 elevation data. Note - requests are limited to 5x5 degree spatial bounding box selection.
- GET** `/api/icesat2/atl03` Access global geolocated photon data (ATL03). Note - requests are limited to 1x1 degree spatial bounding box selection unless "sampling" is set to true.
- GET** `/api/icesat2/getTracks` Get a list of ICESat-2 tracks given a spatial bounding box selection.
- GET** `/api/icesat2/level3a` COMING SOON (Not yet available): Access up to 1 year of ICESat-2 Level-3A product data. Note - requests are limited to 5x5 degree spatial bounding box selection.