



Mapping and Monitoring Lakes and Reservoirs with Satellite Observations

Michael Jasinski and Sabrina Delgado Arias

February 23, 2021

Updated 11 Dec. 2025



Training Outline

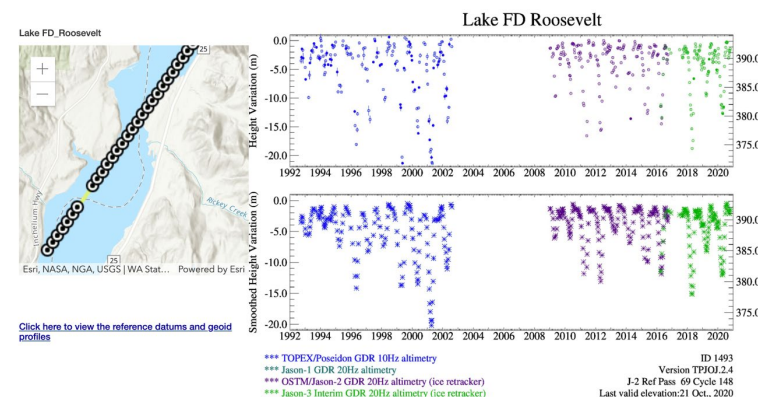
February 9, 2021



Remote Sensing Observations for Monitoring Water Extent, Water Level Height, and Bathymetry in Lakes and Reservoirs

<https://global-surface-water.appspot.com/#data>

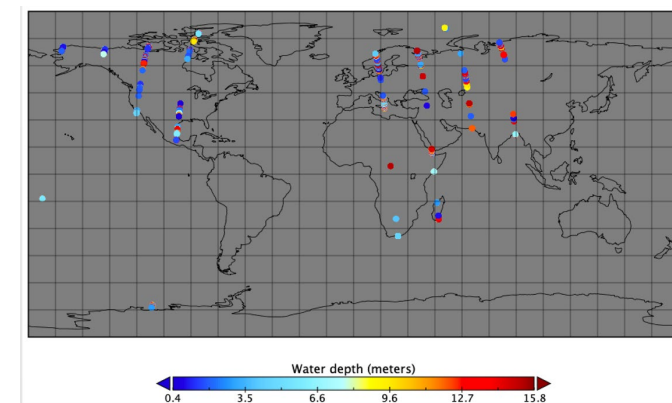
February 16, 2021



Water Level Height Data for Lakes and Reservoirs Using Radar Altimetry

https://ipad.fas.usda.gov/cropexplorer/global_reservoir/gr_regional_chart.aspx?regionid=us&reservoir_name=FD_Roosevelt

February 23, 2021



Surface Water Heights and Bathymetry for Lakes, Reservoirs, Rivers and Coasts Using ICESat-2 Laser Altimetry

[DAAC at National Snow and Ice Data Center OpenAltimetry](#)



Homework and Certificate

- One homework assignment:
 - Answers must be submitted via Google Form
 - Due date: March 23, 2021
- A certificate of completion will be awarded to those who:
 - Attend all live webinars
 - Complete the homework assignment by the deadline (access from [website](#))
 - You will receive a certificate approximately two months after the completion of the course from: marines.martins@ssaihq.com





Analysis of Surface Water Heights and Bathymetry for Lakes, Reservoirs, Rivers and Coasts Using ICESat-2

Michael Jasinski
NASA Goddard Space Flight Center

February 23, 2021

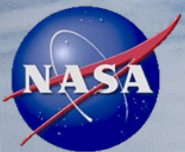




Outline



- **ICESat-2 mission overview and science data products**
- **Inland Water (ATL13) data products**
- **ICESat-2 Analysis Tools**
- **Example Case: Eagle Lake, CA, October 19, 2018**
- **Applications to 2-D bathymetry**
- **Summary**



Mission Overview



Status

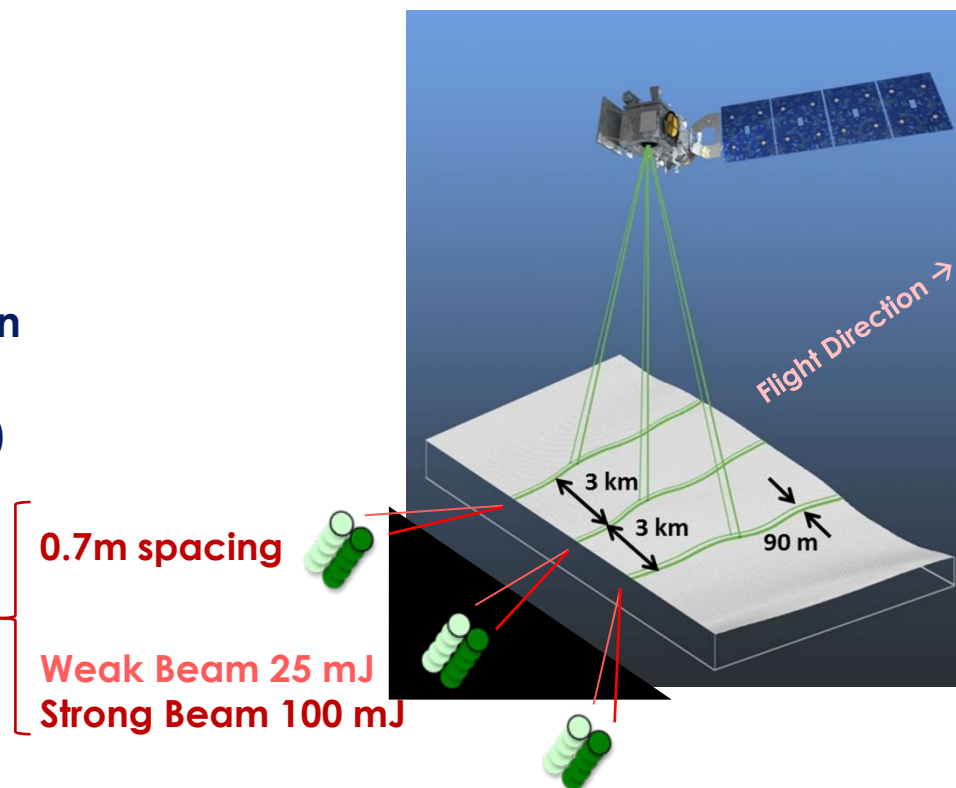
- Launched Sept 15, 2018
- Data products since Oct 15, 2018

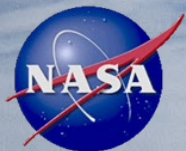
Instrument:

- Advanced Topographic Laser Altimeter System (ATLAS)
- Micro-pulse 532 nm lidar, 10 kHz pulse rate, single-photon detection
- 6 beams: 3 pairs of “Strong” & “Weak” energy (100/25 mJ)
- Footprint: 11m
- Ground speed: 7000m/s

Polar Orbit:

- 496 km, non-sun-sync, 92° inclination
- 91 day repeat cycle, ~30-day sub cycle
- Geolocation knowledge: 6.5 m





ICESat-2 Data Products



	<u>ID</u>	<u>NAME</u>	<u>DESCRIPTION</u>
Along Track ↑	ATL03	Geolocated photons	Precise latitude, longitude and elevation for every received photon
	ATL04	Uncalibrated Backscatter Profiles	Along-track atmospheric backscatter
	ATL06	Land Ice Elevation	Surface height for each beam with along- and across-track slopes
	ATL07	Arctic/Antarctic Sea Ice Elevation	Height of sea ice and open water leads at varying length scale
	ATL08	Land and Vegetation Height	Height of ground including canopy surface & cover percentage
	ATL09	Atmosphere Backscatter & Clouds	Along-track cloud and other atmosphere layer heights, blowing snow, optical depth.
	ATL10	Arctic/Antarctic Sea Ice Freeboard	Sea ice freeboard @ specific spatial scales. Statistics of sea surface and sea ice heights.
	ATL11	Antarctica / Greenland Ice Sheet Heights	Time series of height at points on the ice sheet,
	ATL12	Ocean Elevation	Surface height at specific length scale, including height distribution
	→ ATL13	Inland Water Products	Along-track surface water height distribution and associated water properties
	ATL14	Antarctica/Greenland Ice Sheet H(t) Gridded	Height maps of each ice sheet for each year based on all available elevation data.
	ATL15	Antarctica/Greenland Ice Sheet dh/dt Gridded	Height change maps for each ice sheet, for each mission year
Gridded ↓	ATL16	ATLAS Atmosphere Weekly	Polar cloud fraction, blowing snow frequency, ground detection frequency.
	ATL17	ATLAS Atmosphere Monthly	Polar cloud fraction, blowing snow frequency, ground detection frequency.
	ATL18	Land/Canopy Gridded	Gridded ground surface height, canopy height, and canopy cover estimates.
	ATL19	Mean Sea Surface (MSS)	Gridded ocean height product.
	ATL20	Arctic / Antarctic Gridded Sea Ice Freeboard	Gridded sea ice freeboard.
	ATL21	Arctic/Antarctic Gridded SSH w/in Sea Ice	Gridded monthly sea surface height inside the sea ice cover.
	→ ATL22	Mean Inland Water Body Products	Means for each water body ID type and transect.

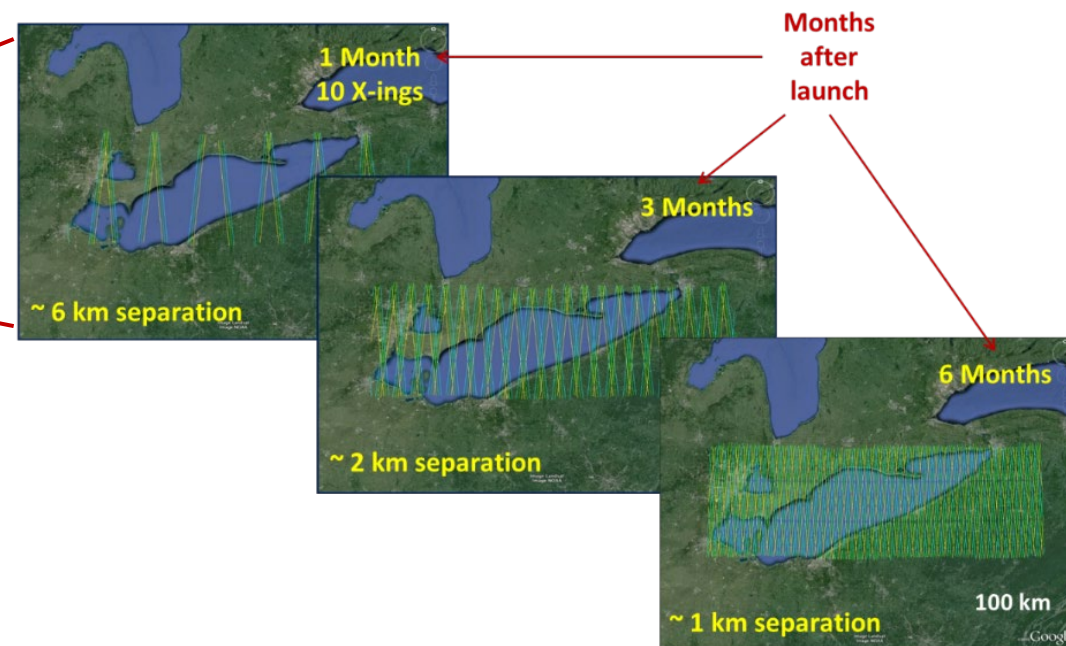


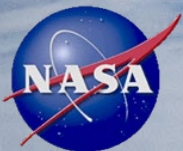
ICESat-2 Observation Strategy for Polar vs Non-Polar Regions



Observations in non-polar regions

E.g., Lake Erie, USA ~42 deg N





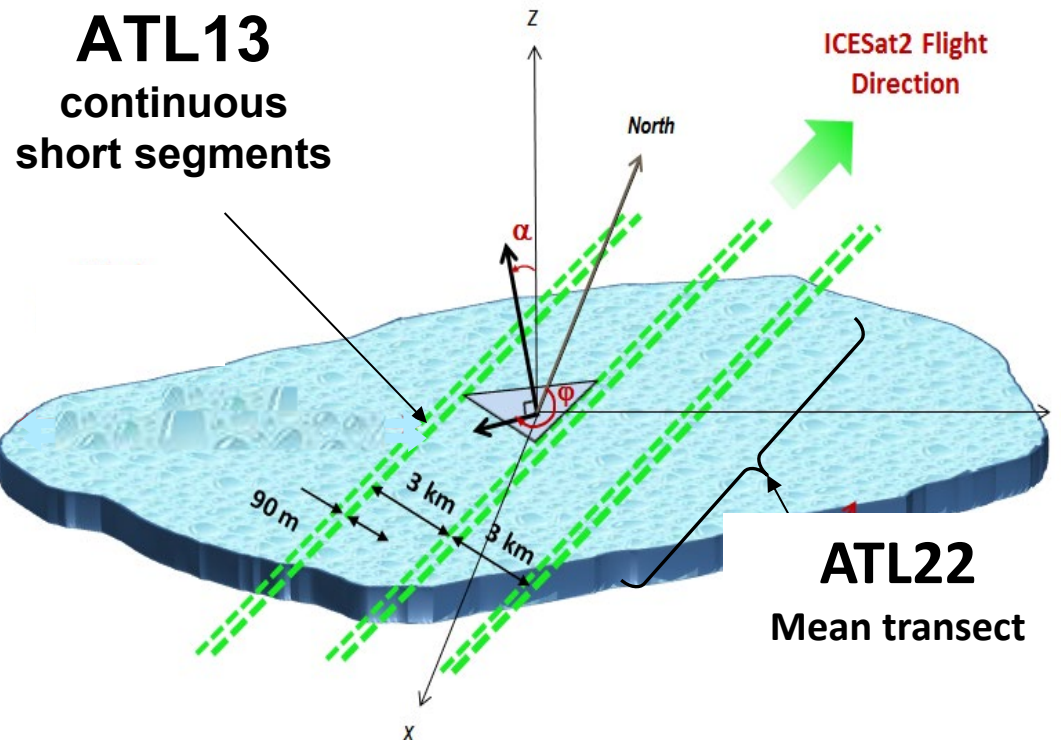
ATL13 & ATL22

Operational Inland Water Products



Main Geophysical Products

Name	Units
ht_water_surf	m
ht_ortho	m
subsurface_attenuation	m^{-1}
segment_slope_trk_bdy	-
stdev_water_surf	m
sig_wv_ht	m
water_depth	m
u_derived	m/s



Quality Flags

Name	Units
QF_lwP	-
QF_Cloud	-
QF_Bckgrd	-
Ice_Flag	-
QF_Ice	-
QF_Subsurf_Anom	-
QF_Bias_Fit	-
QF_Bias_EM	-
QF_Spec_Width	-
QF_Sseg_Length	-
QF_Lseg_Length	-
met_wind10_ATL09	m/s
met_wind10_ATL13	m/s
met_ts_ATL09	K
snow_ice_ATL09	-
Cloud_Flag_ASR_ATL09	-
Cloud_Flag_Atm_ATL09	-
Layer_Flag_ATL09	-

[DAAC at NSIDC ATL13 product page](#)



ATL13 Domain

Global Inland Water Coverage



Water Body Types

- Lakes and Reservoirs $\geq 0.1 \text{ km}^2$
- Rivers $> \sim 100 \text{ m}$
- Transitional water including estuaries, bays & near coast



Identification

ATL13 inland water mask defined by $\sim 1.4 \text{ M}$ shapes defined, each w/unique ID
(derived from HydroLAKES, GRWL, GSHHG Shoreline, etc)



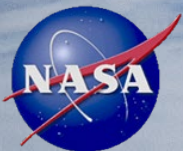
Evolution of the ATL13 Operational Product



Version	Release Date	Water Body Types (Number of unique IDs)	Description and Principal/Added Features
1	May 2019	Lakes & reservoirs > 10 km ² (19,634)	<ul style="list-style-type: none">- Surface water height statistics (mean, StdDev, slope), subsurface attenuation, and supporting variables at short segment length- Employs GLWD (Lehner & Doll 2004)
2	November 2019	Lakes & reservoirs ≥ 10 km ² (19,800) Estuaries, bays, and near shore 7 km buffer (~3500)	<ul style="list-style-type: none">- Employs HydroLAKES (Messenger & Lehner, 2016)- Adds transitional waters; Named Marine Water Bodies (ESRI) GSHHG Shoreline (Wessel et al, 1996)- Adds significant wave height- coarse bathymetry algorithm- Adds dynamic shore finding
3	March 2020	Lakes & reservoirs ≥ 0.1 km ² (~1,400,000) Estuaries, bays, near shore buffer (7m) (~3500) Rivers ≥ ~50-100 m wide (10,300)	<ul style="list-style-type: none">- Adds river mask using GRWL (Allen and Pavelsky, 2018)- Adds wind speed for all crossings- Adds Ice on/off flag from multi-sensor NOAA product- Corrects first photon bias error- Adds cloud confidence flag
4	Dec 2021	All water bodies	<ul style="list-style-type: none">- Improves photon classification- Refines parameter estimates- Added DEMs
ATL22 Ver 1	Dec 2021	All water bodies	<ul style="list-style-type: none">- Transect mean quantities and supporting parameters

**Current version -
Data Oct 2018 thru March 2021**

New in 2021!



ATL13 Inland Water Data Access



FileEditViewHistoryBookmarksToolsHelp

National Snow and Ice Data C X

Microsoft Word - ICESat2ATL13 X


+

←→↺🏠

🔒https://nsidc.org/data/ATL13

📄80%⋮🛡️★

📖🔍👤➡️⋮

Data Set ID: ATL13

ATLAS/ICESat-2 L3A Inland Water Surface Height, Version 3 ← **Get latest version!**

✉Mailing List

🖨️Print

This data set (ATL13) contains along-track water surface heights and descriptive statistics for inland water bodies. Water bodies include lakes, reservoirs, bays, and estuaries. Descriptive statistics include along-track surface slope (where data permit), mean and standard deviation, subsurface signal (532 nm) attenuation, wave height, and coarse depth to bottom topography.

This is the most recent version of these data.

Version Summary: [See more ▼](#)


[DAAC at NSIDC ATL13 Product page](#)

OverviewDownload DataCiting These DataUser GuideTechnical ReferencesSupport

Parameter(s):	SURFACE WATER > SURFACE WATER FEATURES > LAKES/RESERVOIRS > Elevation
Spatial Coverage:	N: 90, S: -90, E: 180, W: -180
Spatial Resolution:	Varies
Temporal Coverage:	13 October 2018 to present
Temporal Resolution:	91 day
Data Contributor(s):	Michael Jasinski, Jeremy Stoll, David Hancock, John Robbins, Jyothi Nattala, et al

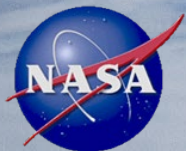
Data Format(s):	HDF5
Platform(s):	ICESat-2
Sensor(s):	ATLAS
Version(s):	V3
Metadata XML:	View Metadata Record

Geographic Coverage



🔧 Support

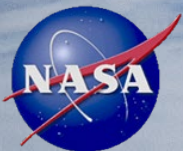
/23/2021



ICESat-2 Analysis Tools

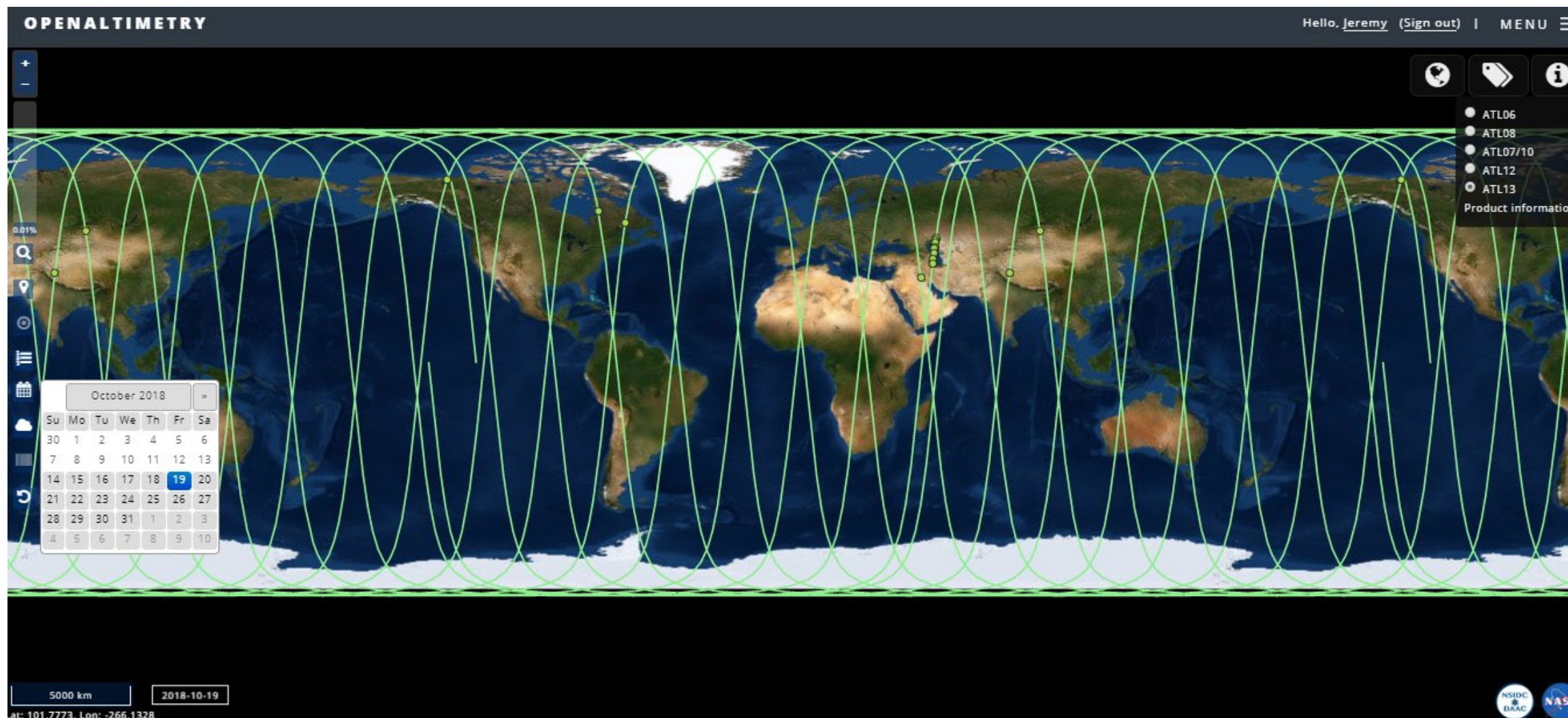


Name	Description	Access Type	Service Outputs	Source
OpenAltimetry	Discover, access, and visualize ICESat and ICESat-2 data. Key functions include on-the-fly plotting of segment elevations and photon clouds based on date and region of interest, ground track filtering and visualization, and data access in CSV or subsetted HDF5 format.	Web application	<ul style="list-style-type: none"> •Downloadable elevation and photon plots •Spatially subsetted HDF5 data •CSV output of key parameters 	A NASA funded collaborative project between the Scripps Institution of Oceanography, San Diego Supercomputer Center, NSIDC DAAC, and UNAVCO.
NASA Earthdata Search	Search, visualize, and access data across thousands of Earth science data sets, including ICESat, IceBridge, and ICESat-2. Customization services are available for most ICESat-2 data sets, including subsetting and reformatting.	Web application	<ul style="list-style-type: none"> •Data access via shell script and zip links •Visit this page for details on subsetting and reformatting services available for each ICESat-2 data set. 	NASA EOSDIS , supported by NSIDC DAAC .
Data Subscription	Subscribe to have new ICESat-2 data automatically delivered to you as they become available at NSIDC. Customization services including subsetting and reformatting can be applied to your subscription request.	Online subscription request form	<ul style="list-style-type: none"> •Automated emailed data delivery •Visit this page for details on subsetting and reformatting services available for each ICESat-2 data set. 	NSIDC DAAC
Data Access and Service API	The NSIDC DAAC's Application Programming Interface, or API, provides spatial and temporal filtering as well as customization options as a single access command, without the need to script against our data directory structure.	API	<ul style="list-style-type: none"> •Visit this page for details on subsetting and reformatting services available for each ICESat-2 data set. 	NSIDC DAAC
NSIDC DAAC Data Access Jupyter Notebook	A Jupyter notebook exploring data coverage, size, and customization service availability along with direct data download utilizing the NSIDC DAAC's access and service API.	Downloadable tool	<ul style="list-style-type: none"> •Visit this page for details on subsetting and reformatting services available for each ICESat-2 data set. 	NSIDC DAAC
Panoply	Plot arrays and geo-referenced data from NetCDF and HDF files.	Downloadable tool	<ul style="list-style-type: none"> •Downloadable plots as GIF, JPEG, PNG, TIFF bitmap images, PDF, or PostScript graphics files, as well as lon-lat map plots as KMZ files. •Animations as MP4 video or as a collection of individual frame images. 	NASA Goddard Institute for Space Studies
HDFView	Browse, visualize, and edit HDF (HDF5 and HDF4) files. Key functions include viewing HDF file hierarchy in a tree structure, opening data and metadata arrays, image creation, and HDF file modification.	Downloadable tool	<ul style="list-style-type: none"> •Save data values to a text or binary file •Save HDF image to JPEG, GIF, PNG, or BMP file 	The HDFGroup



Data Access:

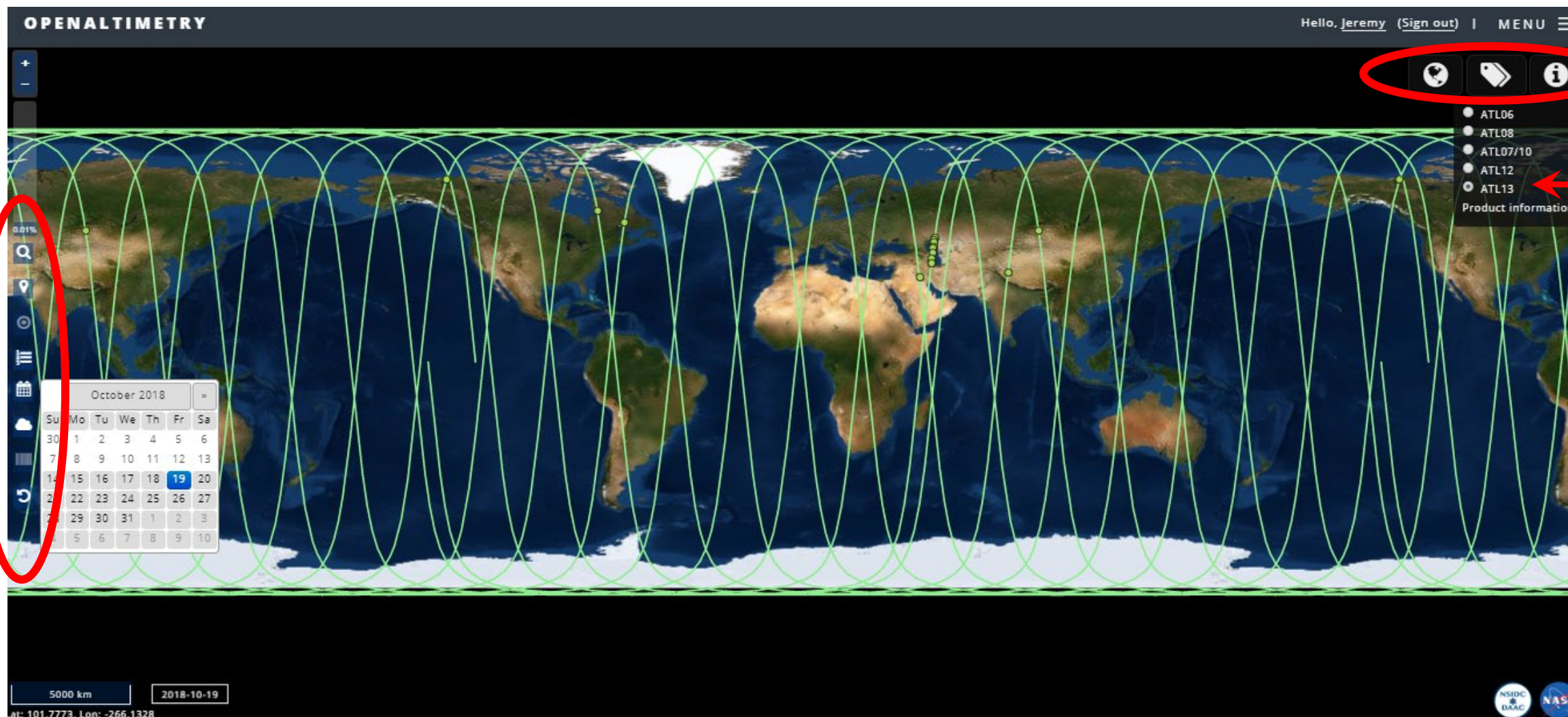
<https://nsidc.org/openaltimetry>





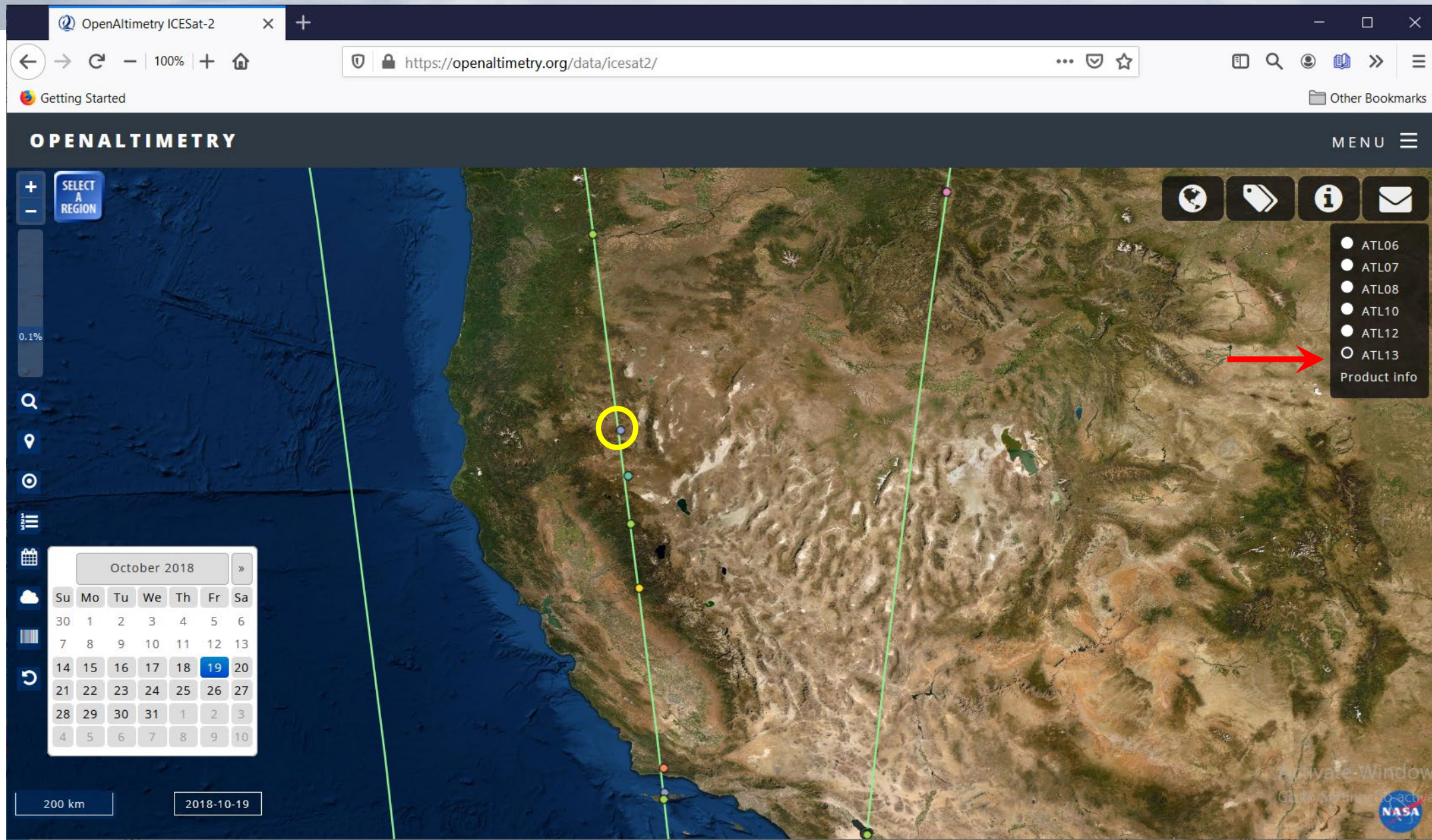
Data Access:

<https://nsidc.org/openaltimetry>



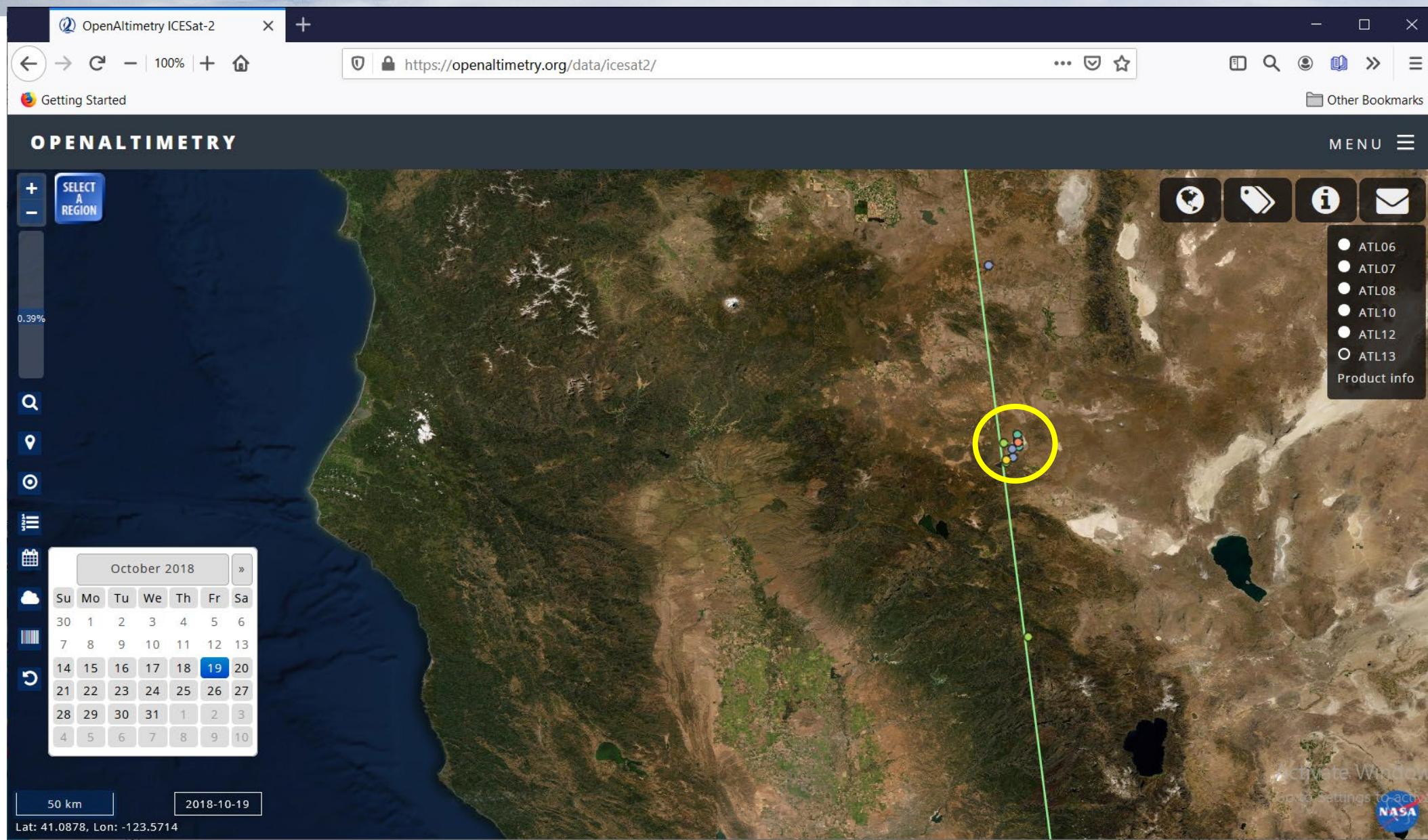


Example: Eagle Lake CA, October 19, 2018



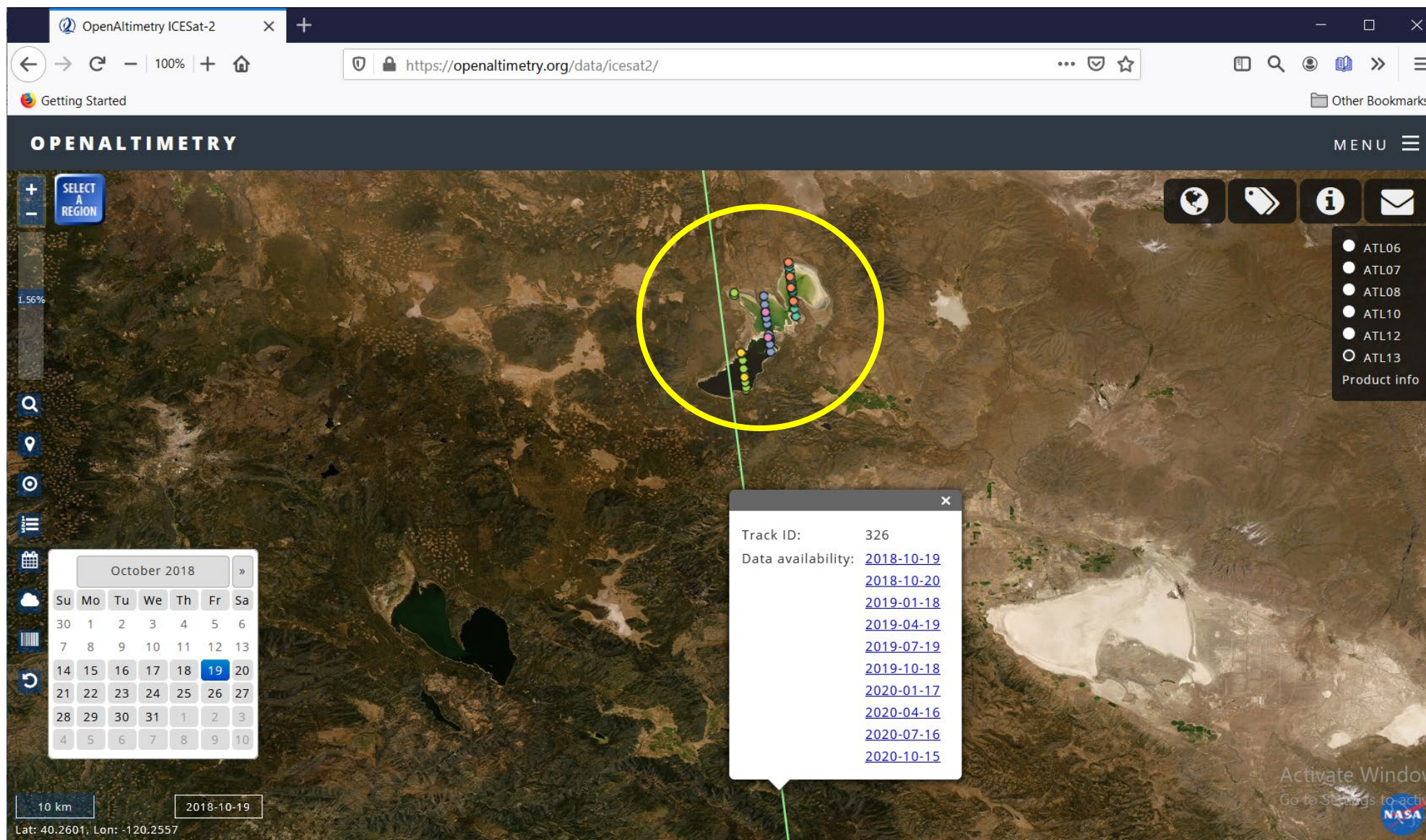


Example: Eagle Lake CA, October 19, 2018





Example: Eagle Lake CA, October 19, 2018





Data Access:



OpenAltimetry ICESat-2

Getting Started

Other Bookmarks

OPENALTIMETRY

MENU

SELECT A REGION

3.13%

October 2018

Su	Mo	Tu	We	Th	Fr	Sa
30	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3
4	5	6	7	8	9	10

5 km

2018-10-19

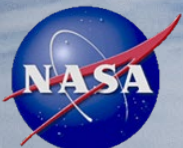
Lat: 40.4173, Lon: -120.5731

ATL06
ATL07
ATL08
ATL10
ATL12
ATL13
Product info

View Elevation profile
View signal Photons
Close

Activate Windows
Go to Settings to activate Windows

NASA



OpenAltimetry: ATL13 Data Browsing:



OPENALTIMETRY

MENU

Date: [2018-10-19](#) | [2018-10-20](#) | [2019-01-18](#) | [2019-04-19](#) | [2019-07-19](#) | [2019-10-18](#) | [2020-01-17](#) | [2020-04-16](#) | [2020-07-16](#) | [2020-10-15](#)

← Overpass Dates

ELEVATION PROFILE

ATL03 PHOTON HEIGHTS

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

← Beams

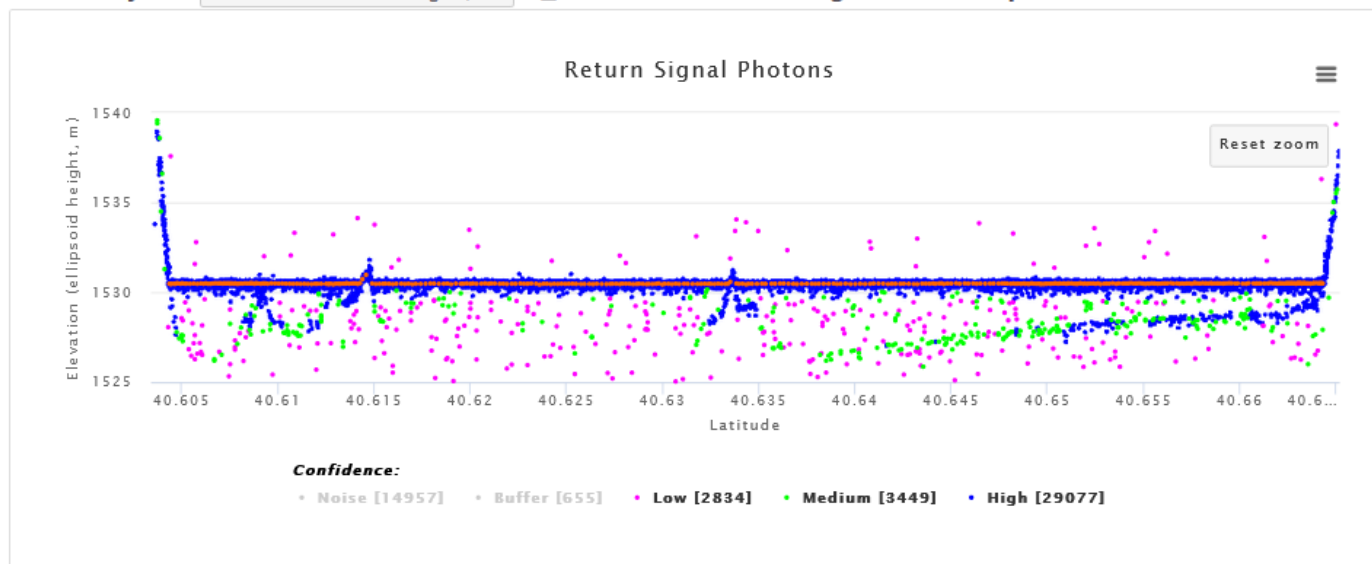
Track ID: 326 - Beam: gt2r - Showing 33.33% data sample rate - [View all data \(Requires Login\)](#)

Total number of photons: 152,915 - Total segments: 1,502 - Segment range: [224,703 - 226,204]

☒ **Overlay L3A** [ATL13 inland water height \(WC\)](#)

Drag zoom on the plot below to view more detail.

← Sampling Profile



← Zoomable Quick-Look

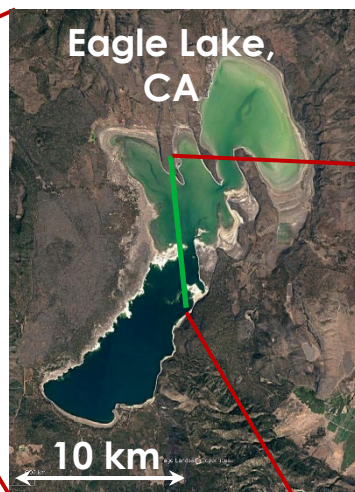
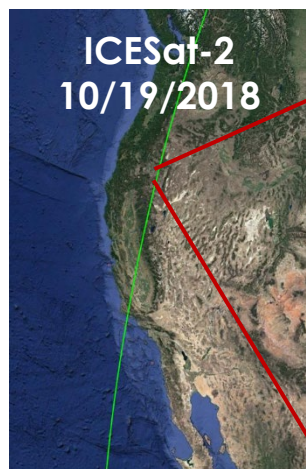
← Signal Confidences

[Download data as CSV](#) [Download subsetting HDF5 \(via NSIDC\) \(Requires Login\)](#)

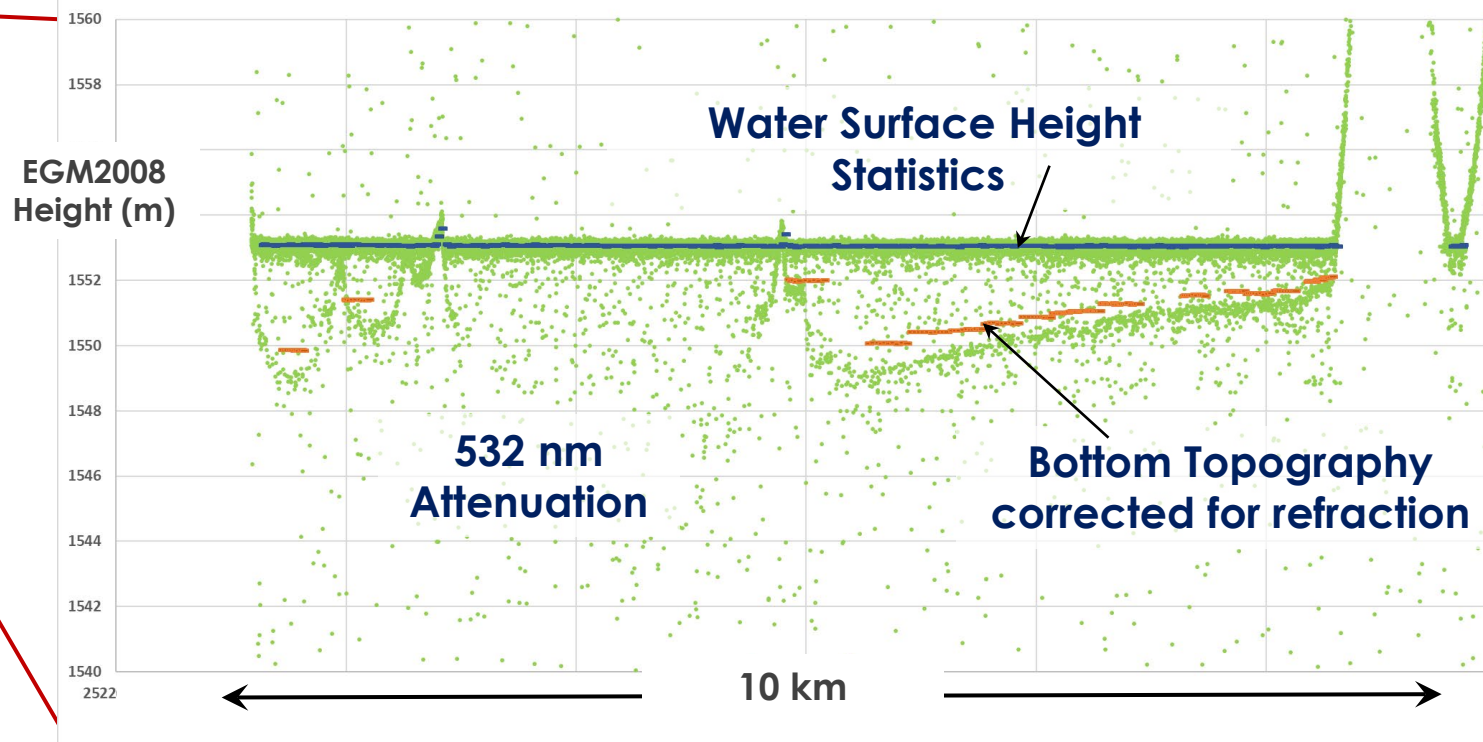
[Get API URL \(Binder example\)](#) [3D Viewer](#)

← Acquisition Options

Products, 2/23/2021

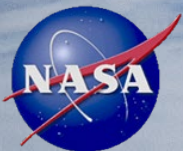


Results for beam gt2r on 10/19/2018

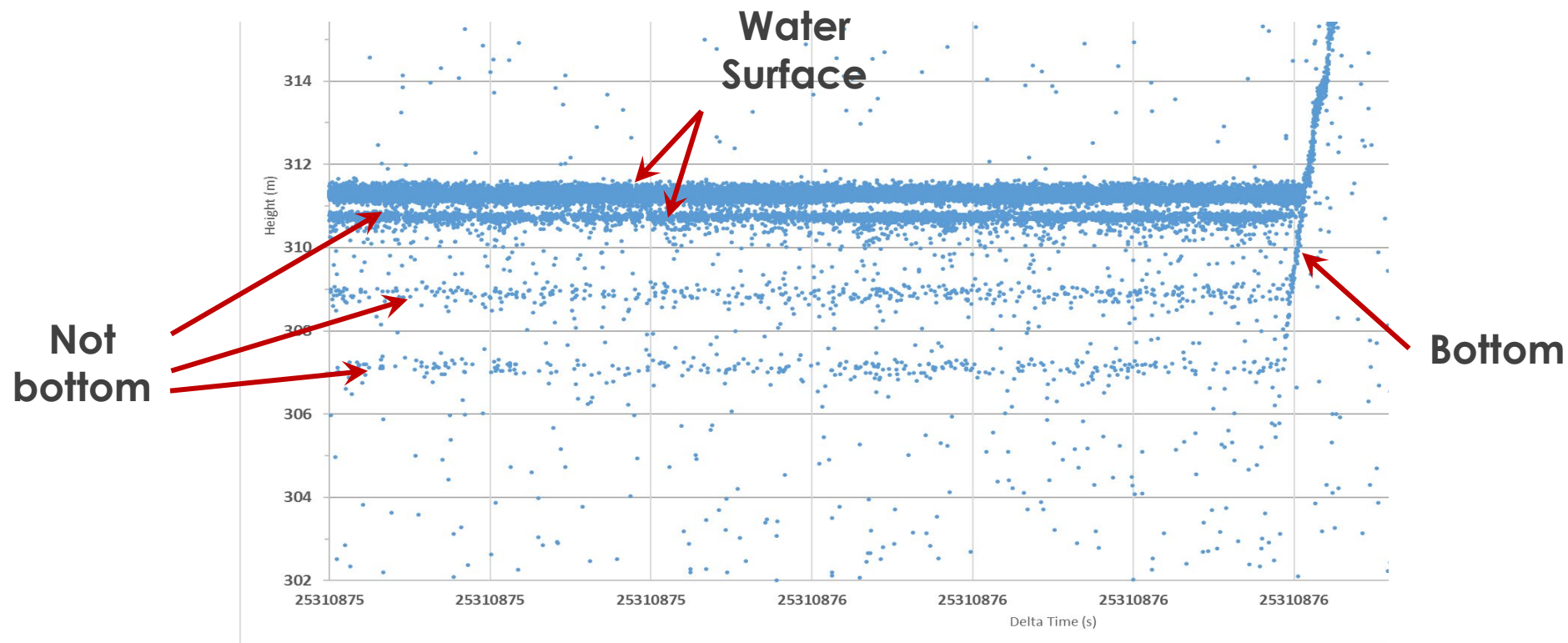


Jasinski, Stoll, and Coauthors. 2020: *ICESat-2 Inland Water ATBD*,
<https://doi:10.5067/L870NVUK02YA>

*Water Surface Height RMSE < 0.058m when compare against in situ data over two years



Known ATLAS Instrument Issue: Occasional extra photons





ICESat-2 Tools & Services



Browser window showing the NSIDC website: <https://nsidc.org/data/icesat-2/tools>

Getting Started | Other Bookmarks

EARTHDATA | Other DAACs

NSIDC National Snow & Ice Data Center

DATA | RESEARCH | NEWS | ABOUT

SEARCH [] Web pages []

NASA Distributed Active Archive Center (DAAC) at NSIDC

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

Overview | ICESat-2 Data Sets | Product Descriptions | Level-1 | Level-2 | Level-3A | Level-3B | Tools | Knowledge Base | ICESat/GLAS Data | IceBridge Data

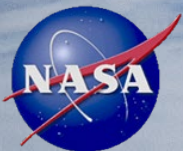
ICESat-2 Tools and Services

The following table lists the tools and services available for ICESat-2 data.

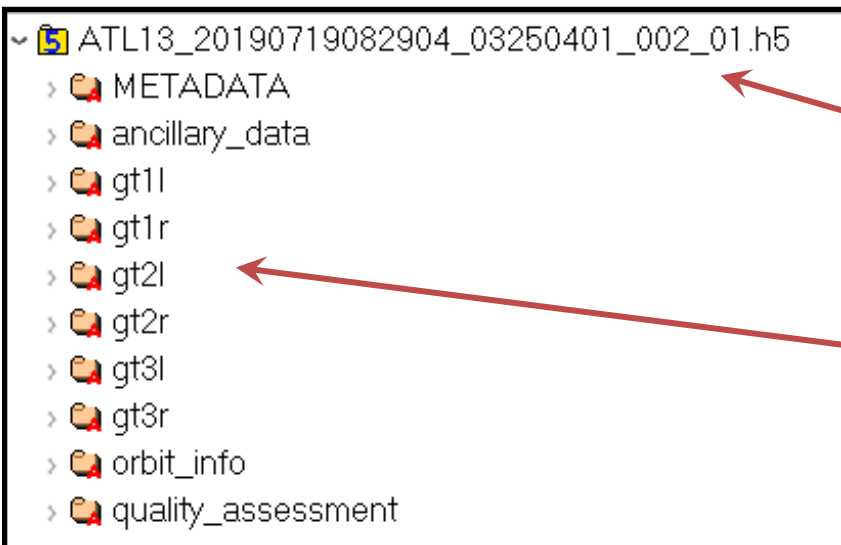
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Support

NISDC DAAC tutorial video (YouTube)



Data Format: Product Layout



GRANULE DELINEATION

- ~5 files per day (several RGTs)
- data exist only over water bodies

NAMING CONVENTION

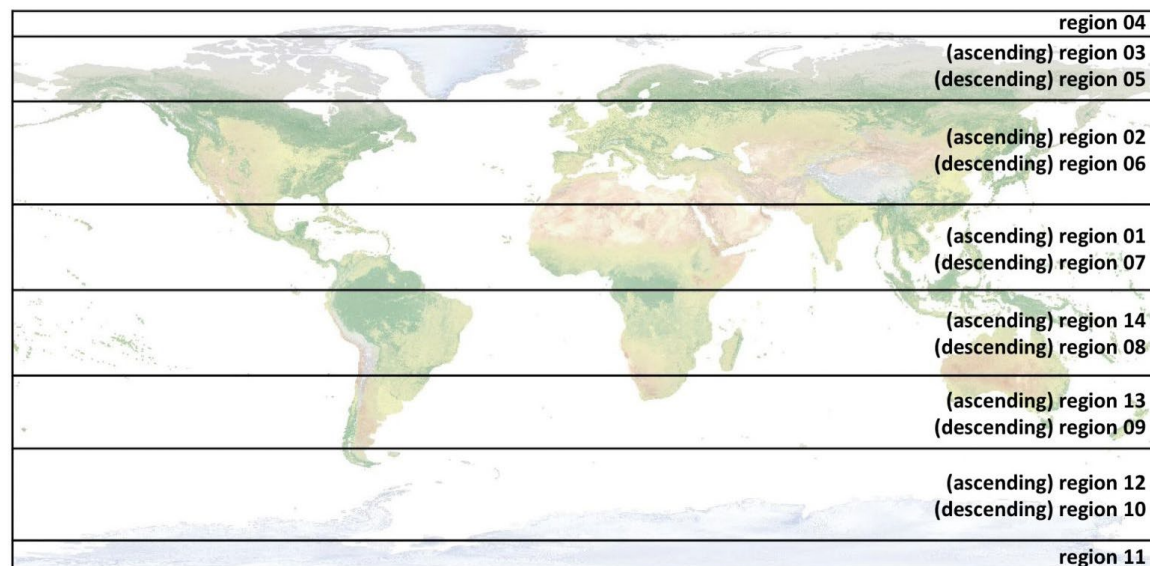
- date+time, RGT, cycle, segment, release, version

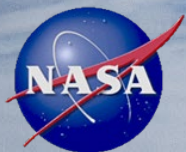
6-BEAM STRUCTURE

- along-track hierarchy

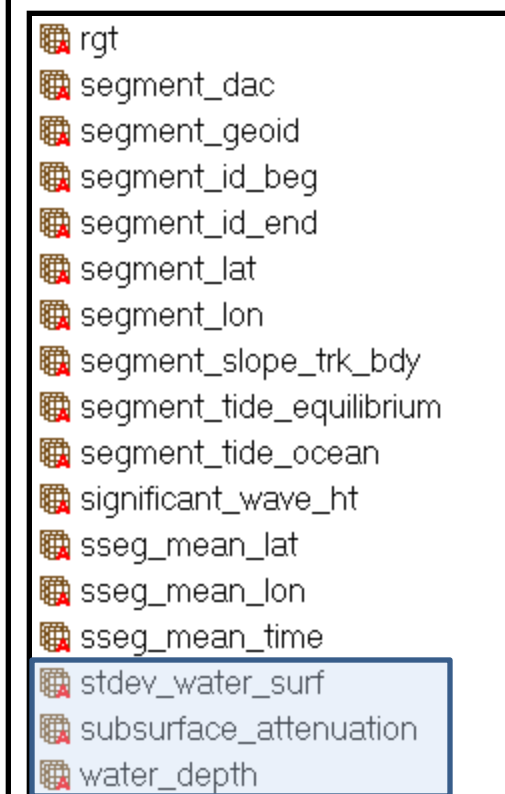
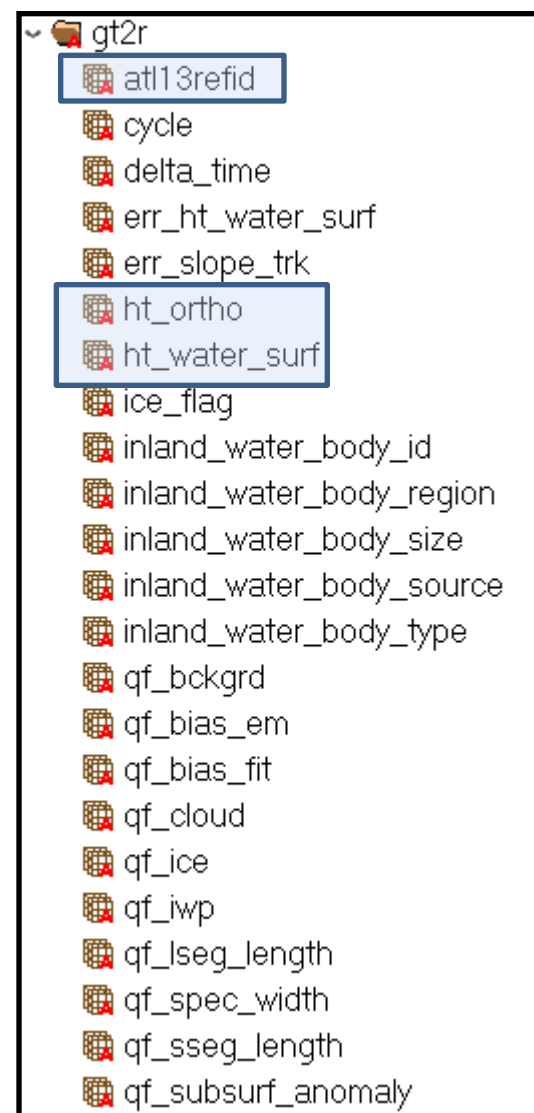
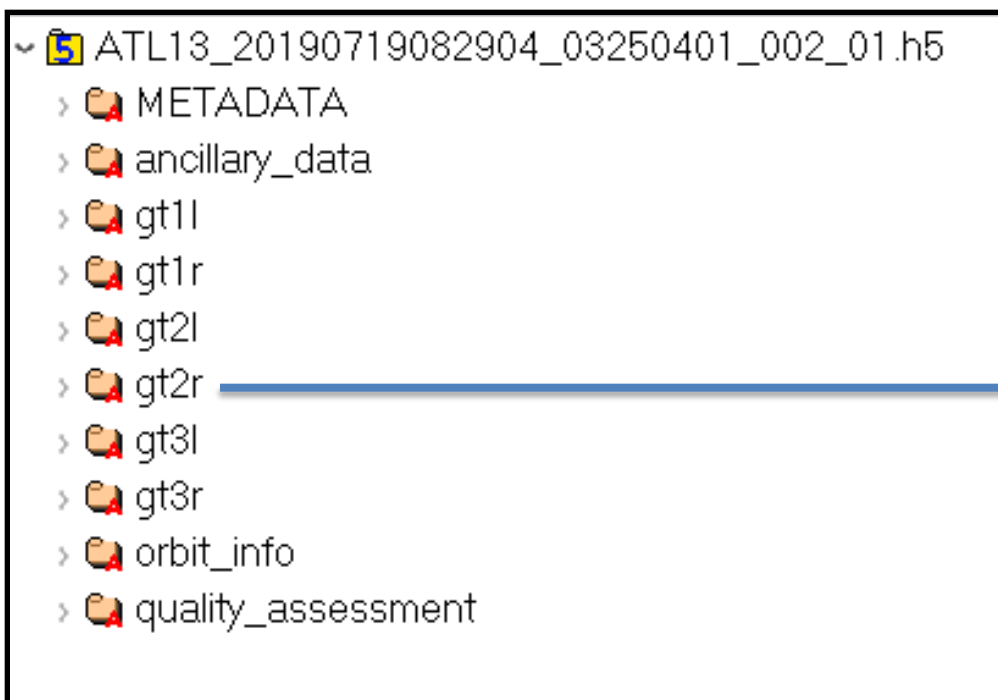
IMPORTANT METADATA

- ancillary_data > RGT, time start & end
- orbit_info > sc_orient





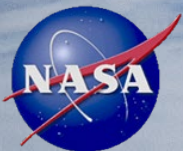
Data Format: Product Layout



Product Highlights

at13refid
ht_ortho
ht_water_surf
stdev_water_surf
subsurface_attenuation
water_depth

Unique water body identifier
Water ht above EGM2008
Water ht above WGS84
Water surface standard dev
Water profile ph attenuation
[ht – corrected bottom ht]



Data Format: Product Rate



ATL13refid

ht_ortho

stdev_water_surf

81	1410003682
82	1410003682
83	1410002095
84	1410002095
85	1410002095
86	1410002095
87	1410002095
88	1410002095
89	1410002095
90	1410002095
91	1410002095
92	1410002095
93	6033000122
94	6033000122

81	237.68318
82	237.65822
83	23.176842
84	23.179201
85	23.164207
86	23.173082
87	23.140081
88	23.16066
89	23.16881
90	23.1775
91	23.172443
92	23.184858
93	0.13068293
94	0.18919733

81	3.4028235E38
82	3.4028235E38
83	0.065
84	0.065
85	0.065
86	0.065
87	0.065
88	0.065
89	0.065
90	0.065
91	0.065
92	0.065
93	0.125
94	0.125

- Short Segment rate
- 1-D arrays
- Mapped by ATL13refid
- Long Segment-derived products repeat



Summary



ATL13 delivers:

- water surface elevation RMSE ~ < 5-10 cm under most conditions:
- other ATL13 products are consistent w/above
- bathymetry products retrieved mainly in clear waters and near shorelines
 - best examples in coastal zones ~ 20-30 m
 - good cases for reservoirs ~10-15 m
 - full 2-D bathymetry requires merging with multispectral imagery
- ATL13 continuous products → suitable for detailed hydrologic analysis
- ATL22 transect mean products → More useful to applied science users
- especially water resources applications
- calibration of other satellite altimeters including radar

Thank you!

Acknowledgements

ATL13 Team:

Jeremy Stoll (SSAI)

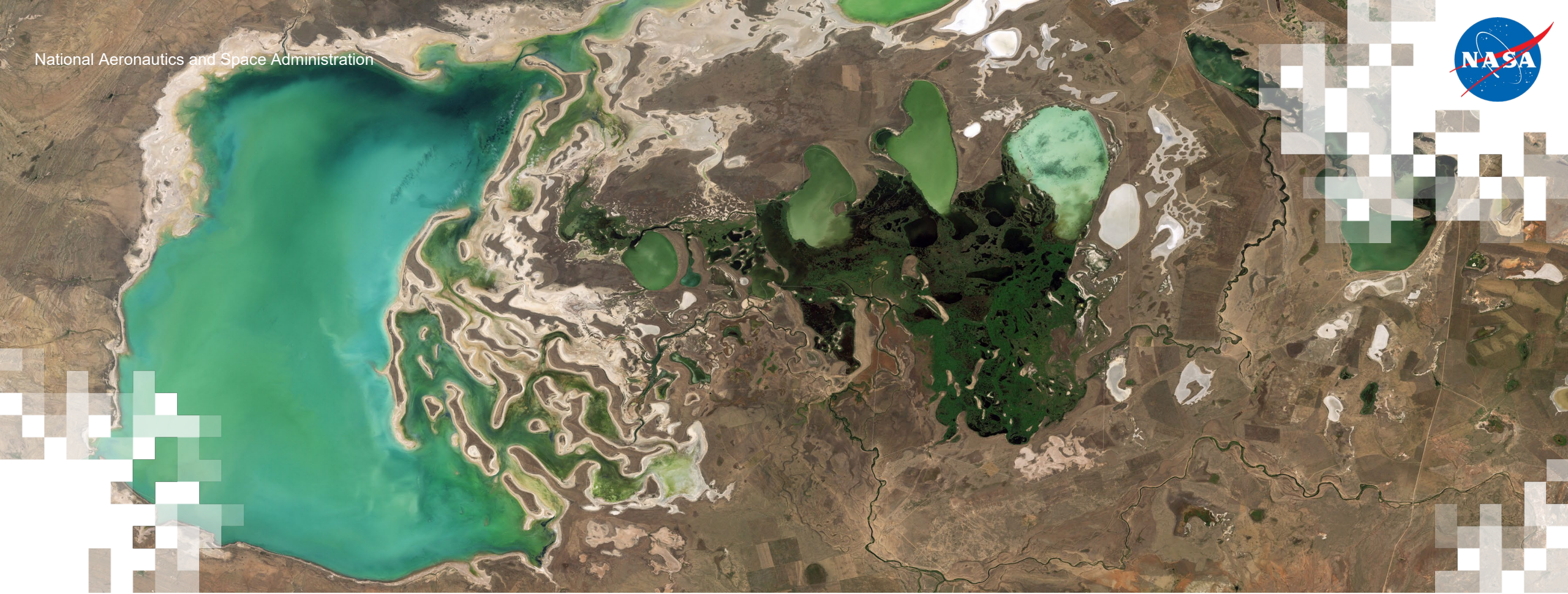
John Robbins (Craig Technologies)

David Hancock (KBR)

Jyothi Nattala (SSAI)

ICESat-2 Project Office, NASA GSFC

NASA Cryosphere Program



ICESat-2 Applications Program

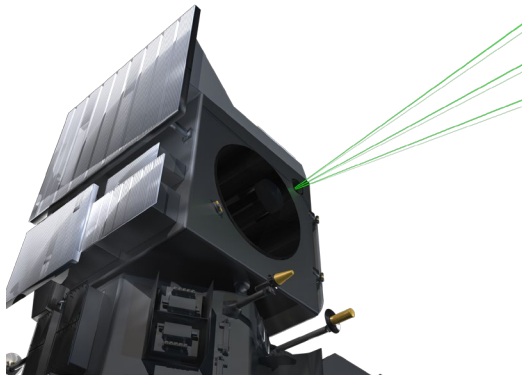
Sabrina Delgado Arias (SSAI, NASA GSFC)
on behalf of ICESat-2 Applications Team

February 23, 2021

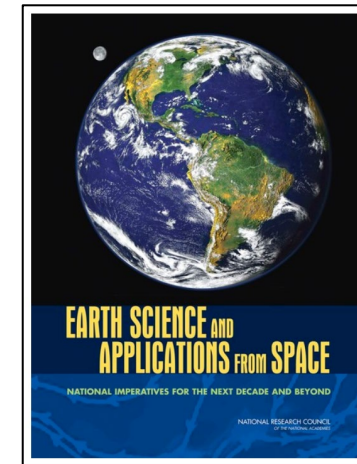
NASA Mission Applications

Why Mission Applications?

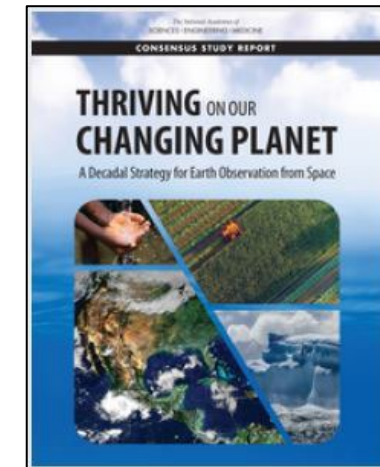
- Key component of the NASA Applied Sciences program
- Recommended as a priority by first Decadal Survey for Earth Science in 2007
- Recommended as a priority by second Decadal Survey for Earth Science in 2018



NASA's Applied Remote Sensing Training Program



National Research Council Decadal Survey Report, **Earth Science and Applications from Space** (2007)

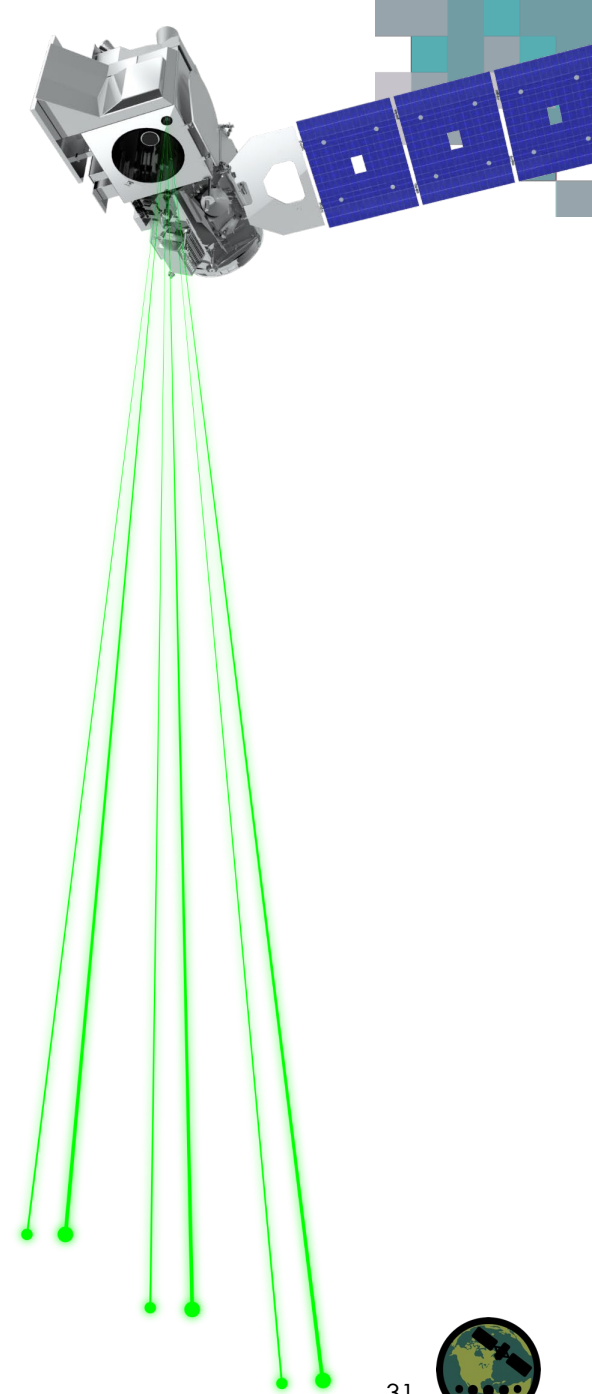


National Research Council Decadal Survey Report, **Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space** (2018)



ICESat-2 Applications Team

Role in ICESat-2 Mission	Members	Affiliation
ICESat-2 Program Applications Coordinator	Sabrina Delgado Arias	Science Systems and Applications Inc (SSAI), NASA's Goddard Space Flight Center (GSFC)
ICESat-2 Program Applications Scientist	Molly Brown	University of Maryland
ICESat-2 Science Team Member (Hydrology) & ST Applications Liaison	Michael Jasinski	NASA GSFC
ICESat-2 Project Scientist	Tom Neumann	NASA GSFC
ICESat-2 Science Team Leader	Lori Magruder	University of Texas
NASA Headquarters Program Applications Lead	Woody Turner	NASA Headquarters (HQ)

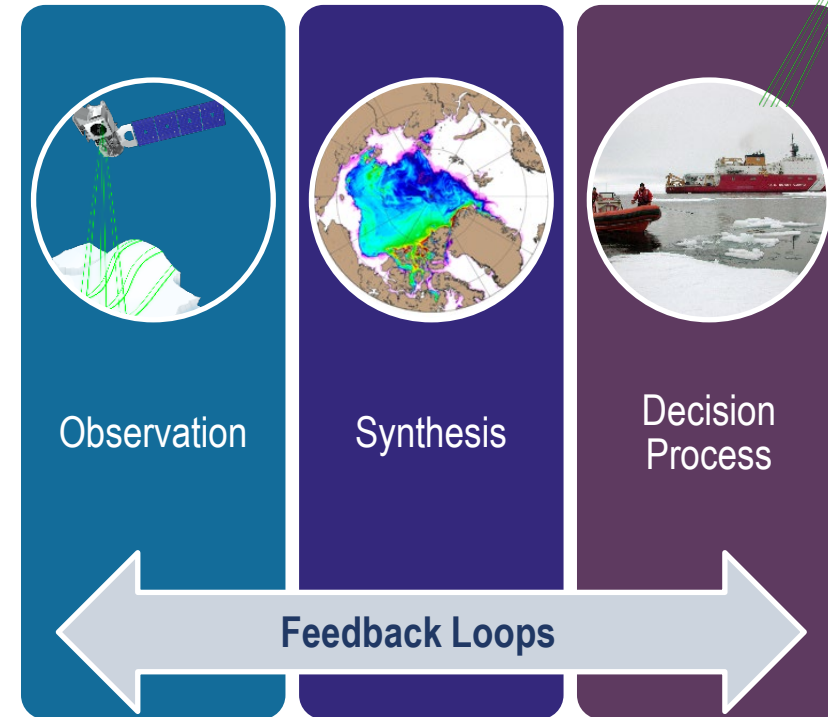


NASA ICESat-2 Applications

Program Overview

- Applications research provides fundamental knowledge of how mission data products can be scaled and integrated to inform resource management, policy development, and decision making.
- We define applications as innovative uses of mission data products in decision-making activities for societal benefit

Identify and strengthen links between:



<https://icesat-2.gsfc.nasa.gov/applications>

Enhance Applications Research | Increase Collaboration | Accelerate Applications



ICESat-2 Key Data Characteristics

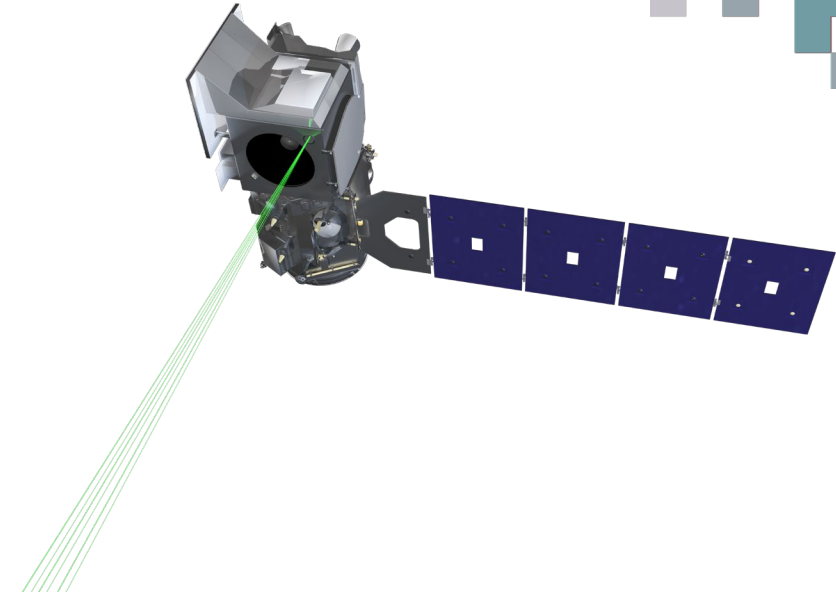
Lifetime: 3 years, with consumables for 5+

- Fuel should not be a limiting factor
- Operating on primary laser at energy level 4
- Equipped with redundant laser

Resolution: 6 beams, arranged in 3 pairs

- Single-photon sensitive detection, 532 nm wavelength
- 10 kHz pulse-rep. rate
- 11 m footprint
- spaced 0.7m along-track (1 measurement every 70 cm)
- Height accuracy currently better than 10 cm

Data Latency: 45 days for higher level data products

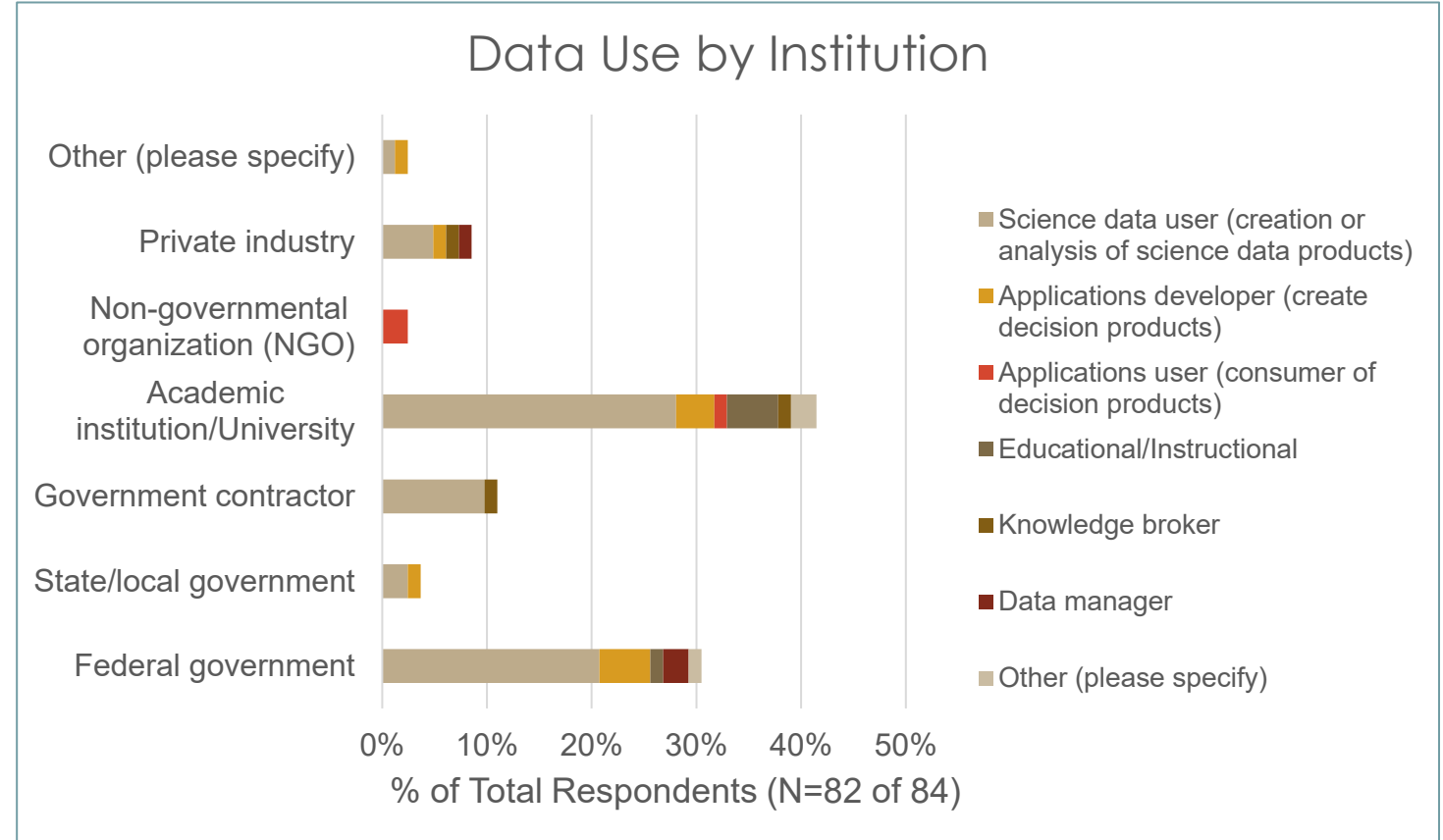


What opportunities and challenges exist in integrating ICESat-2 data for your application?



ICESat-2 Applications Community

- The ICESat-2 Applications community consists of 651 individuals who have expressed interest in the practical use of ICESat-2 data by either signing up to the community mailing list or through actual engagement with the mission via the various outreach events and the Early Adopter/Applied Users programs.



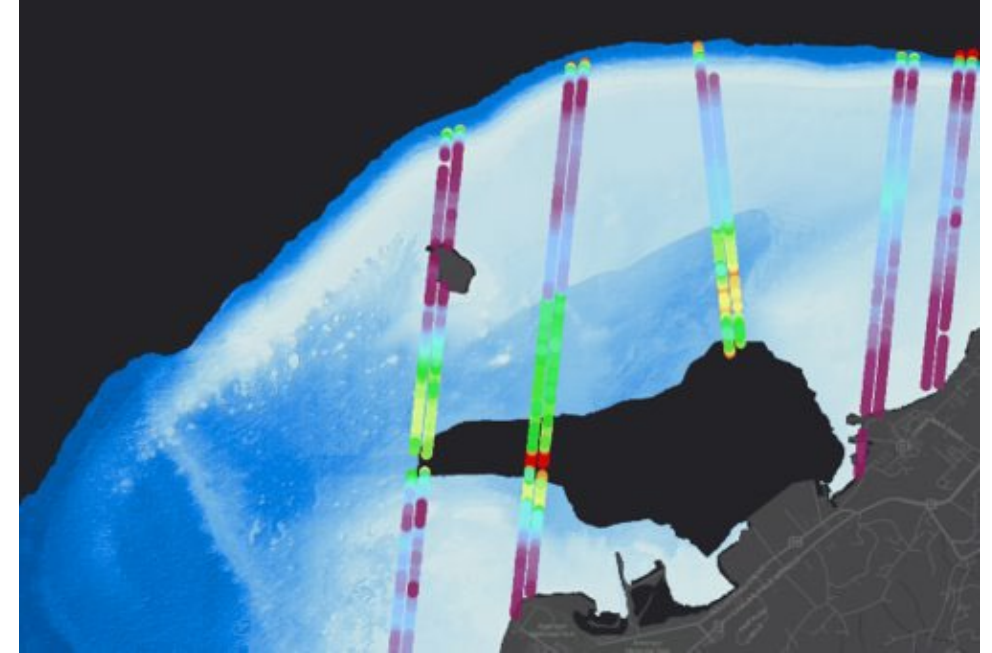
Join our ICESat-2 Applications Community!



ICESat-2 Applications Examples

Applied User Spotlight: PI – Ross Smith, TCarta

- TCarta Marine, a global provider of marine maps, is using machine learning and artificial intelligence to estimate seafloor depth using data from ICESat-2.
- ICESat-2 has mapped over 147,925 km² of coastal regions, gauging seafloor depths down to 100 ft with a +/- 1.2 ft accuracy. Using this new tool, TCarta derived over 10.8 million depth measurements in over 45 locations around the world during 2020.



ICESat-2 paths off the coast of Saipan measure seafloor depth, used to calibrate & validate a 2-meter satellite-derived bathymetry model using Maxar WorldView-2 and other satellites. Learn more: [NSF Story Map](#)



ICESat-2 Applications Examples

Early Adopter Spotlight: PI – Rodrigo Paiva, Hydraulic Research Institute, Federal University of Rio Grande do Sul, Brazil

Water Resources Research

RESEARCH ARTICLE
10.1029/2018WR024010

Key Points:

- Different past/present/future satellite altimetry missions are used for estimating effective river bathymetry through data assimilation
- It is introduced a Kalman filter method with hydraulically based variance and covariance for altimetry data assimilation
- Greater spatial coverage of satellite altimetry missions improves data assimilation performances to a limit

Supporting Information:

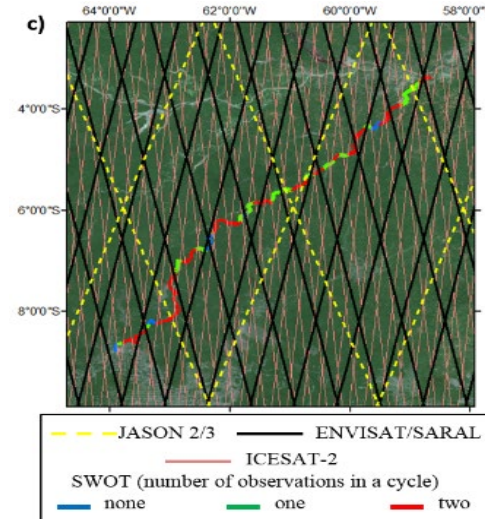
- Supporting Information S1
- Movie S1
- Movie S2

Assimilation of Satellite Altimetry Data for Effective River Bathymetry

J. P. L. F. Brêda¹, R. C. D. Paiva¹, J. M. Bravo¹, O. A. Passaia¹, and D. M. Moreira²

¹Instituto de Pesquisas Hidráulicas, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil, ²Companhia de Pesquisa de Recursos Minerais, Rio de Janeiro, Brazil

Abstract One of the main problems of hydrologic/hydrodynamic routing models is defining the right set of parameters, especially on inaccessible and/or large basins. Remote sensing techniques provide measurements of the basin topography, drainage system, and channel width; however current methods for estimating riverbed elevation are not as accurate. This paper presents methods of altimetry data assimilation (DA) for estimating effective bathymetry of a hydrodynamic model. We tested past altimetry observations from satellites ENVISAT, ICESAT, and JASON 2 and synthetic altimetry data from satellites ICESAT 2, JASON 3, SARAL, and Surface Water and Ocean Topography to assess future/present mission's potential. The DA methods used were direct insertion, linear interpolation, the Shuffled Complex Evolution-University of Arizona optimization algorithm, and an adapted Kalman filter developed with



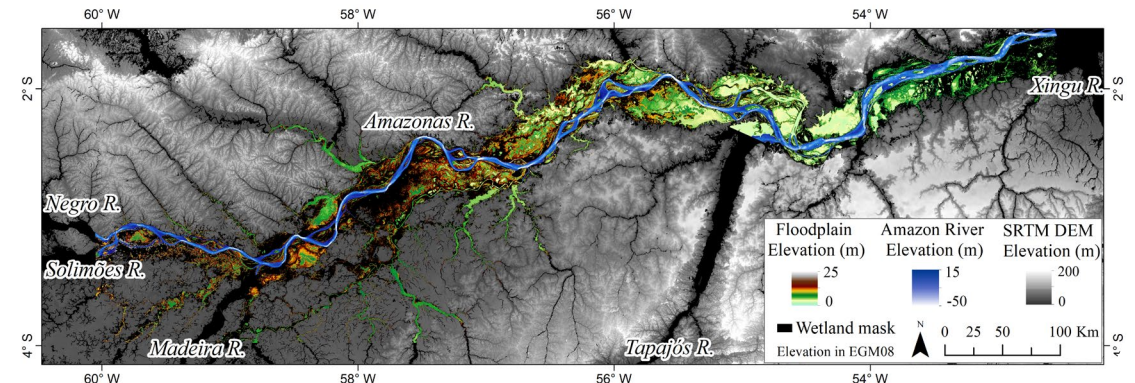
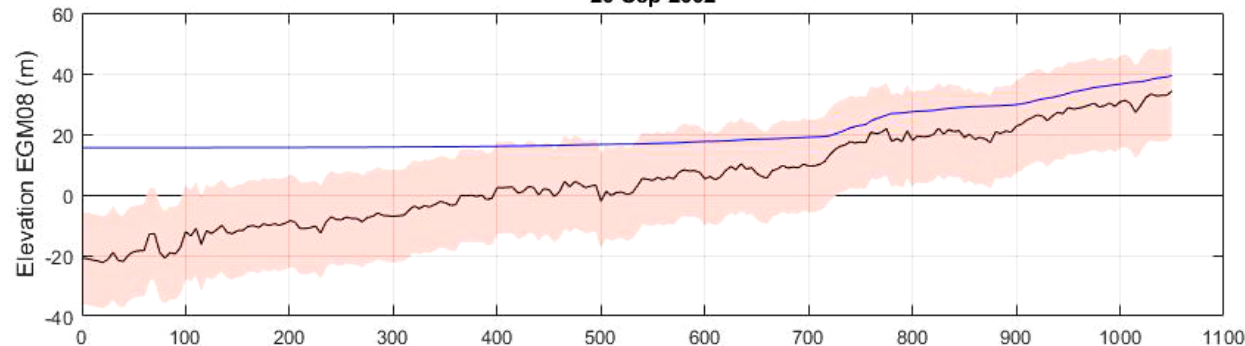
“High resolution mapping of floodplain bathymetry from space: a case study in the Amazon”

Fassoni-Andrade A., Paiva, RCD, Rudorff, C. et al Remote Sensing of Environment,

<https://doi.org/10.1016/j.rse.2020.112065>

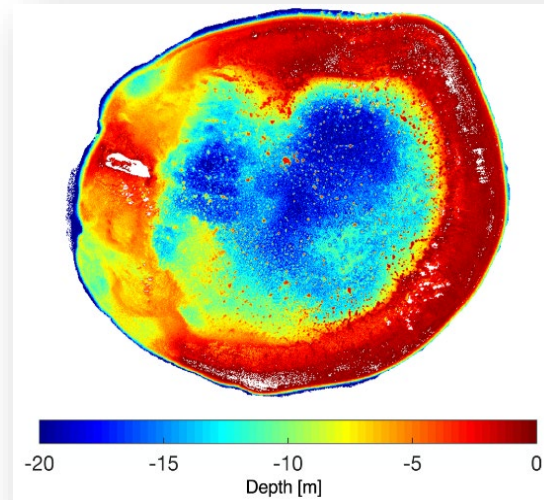
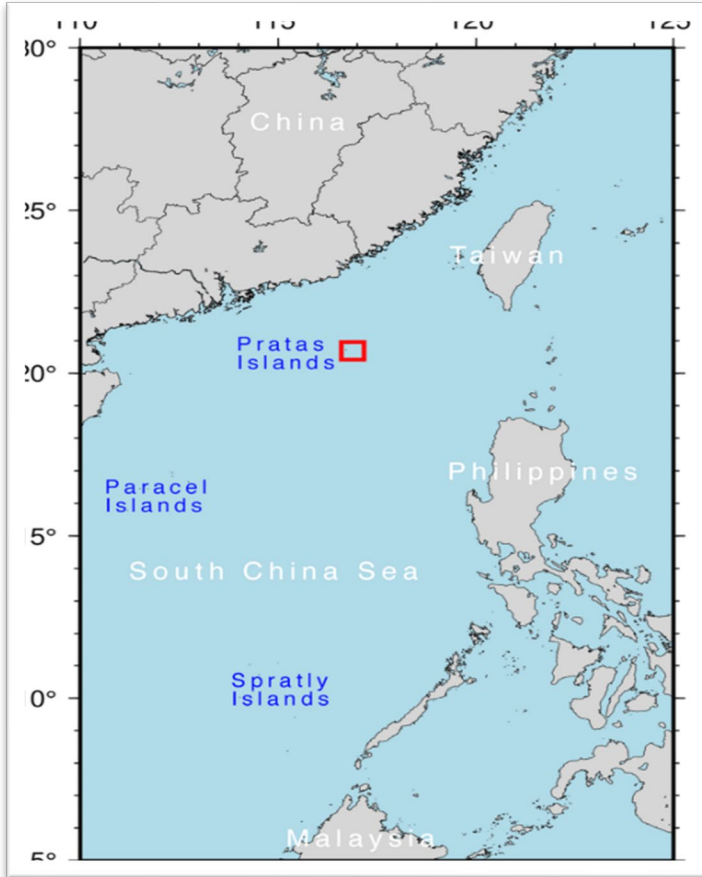
Madeira River Profile

20-Sep-2002



ICESat-2 Applications Examples

Early Adopter Spotlight: PI – Steven Kuo-Hsin Tseng, Taiwan National Central University, Center for Space and Remote Sensing Research

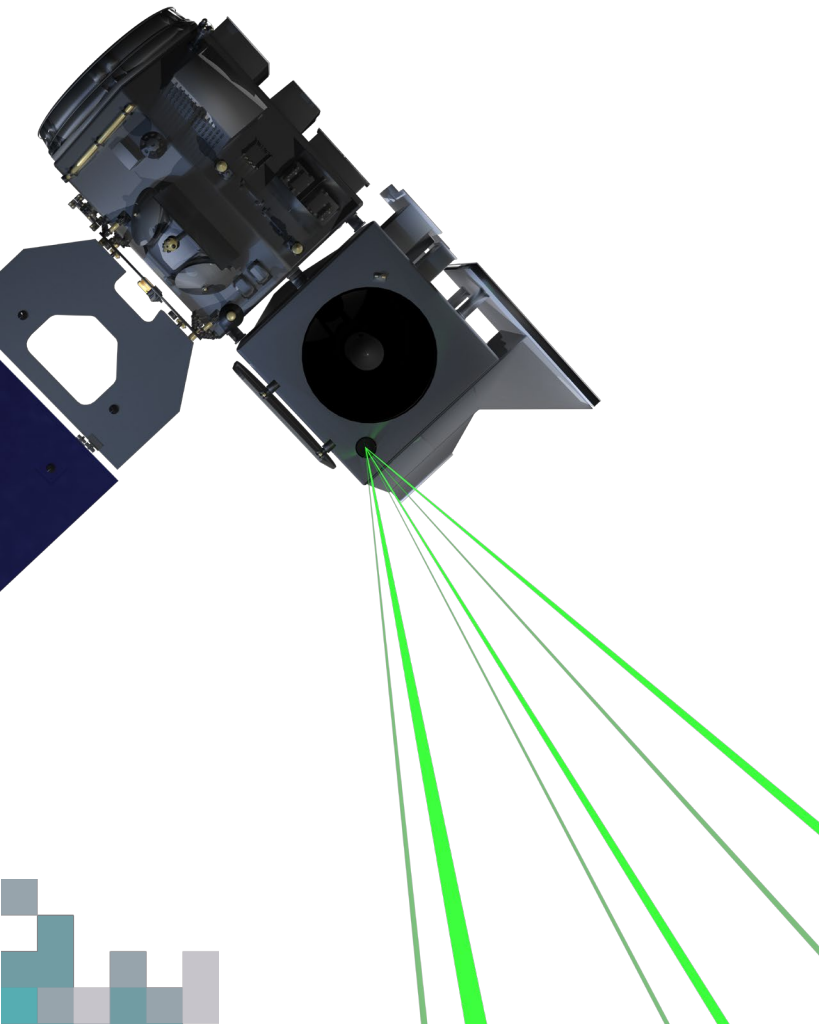


- How can we improve Electronic Navigation Charts for navigation in South China Sea if we integrate water depth data from ICESat-2 with optical imagery from Sentinel-2?
- Water clarity in the South China Sea allows for penetration of photons down to 20-30 meters making it possible to model underwater terrain.



Get Involved!

ICESat-2 Applied Users Program



Partner with ICESat-2 mission scientists in your discovery of ICESat-2 data.

YOUR BENEFITS

- Get support from a Science Definition Team (SDT) or Project Science Office (PSO) member
- Participate in quarterly webinars
- Be in the know about ICESat-2
- Get access to calibration and validation (cal/val) data
- Reference lessons learned

POC: sabrina.delgadoarias@nasa.gov
https://icesat-2.gsfc.nasa.gov/get_involved



Questions

- Please enter your questions in the Q&A box. We will answer them in the order they were received.
- We will post the Q&A to the training website following the conclusion of the webinar.



Source: <https://earthobservatory.nasa.gov/images/6034/pothole-lakes-in-siberia>



Contact

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 - Sabrina Delgado
sabrina.delgadoarias@nasa.gov
- Training Webpage:
 - <https://appliedsciences.nasa.gov/join-mission/training/english/mapping-and-monitoring-lakes-and-reservoirs-satellite-observations>

