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User Guide

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List of acronyms

AEM	Airborne ElectroMagnetic induction sounder
ALS	Airborne Laser Scanner
ASIRAS	Airborne (Ku-band) Synthetic aperture and Interferometric Radar Altimeter System
CReSIS	Centre for Remote Sensing of Ice Sheets
CryoTEMPO	CryoSat ThEMatic PrOducts
CryoVEx	CryoSat Validation Experiment
CSV	Comma-separated values
EASE	Equal-Area Scalable Earth
EO	Earth Observation
EOLIS	Elevation Over Land Ice from Swath
ESA	European Space Agency
FTP	file transfer protocol
GDAL	Geospatial Data Abstraction Library
ICESat-2	Ice, Cloud and Elevation Satellite-2
KAREN	Ka-Band Radar
KML	Keyhole Markup Language
LRM	Low Resolution Mode of the CryoSat-2 radar sensor
NASA	National Aeronautics and Space Administration
NetCDF	Network Common Data Form (binary file format)
OIB	Operation Ice Bridge
POCA	Point-Of-Closest-Approach
RGT	Reference Ground Track
SAR	Synthetic Aperture Radar
SARIn	The CryoSat-2 SAR Interferometry mode
STSE	Science, Technology, Society and Environment education
UoE	University of Edinburgh

1 Introduction

cs2eo provides the user with the ability to run high performance geospatial-temporal queries for Earth Observation data. It is available for use by the general public, without any requirement for registration or payment, at <https://cs2eo.org>. The user is able to search for raw data from a number of different sources and download them in a common NetCDF format. In addition, the user can search for intersections of data from multiple sources and download purely the intersecting data in the same format.

cs2eo was launched using data from the Cryo2Ice campaign (i.e. from CryoSat-2 and ICESat-2), but has since been augmented with data from a number of additional sources including the CryoVEx and Operation IceBridge airborne collection campaigns and the CryoTEMPO EOLIS product.

This user guide provides an overview of the website's functionality, explaining the many features and datasets made available, as well as its known limitations and plans to address them.

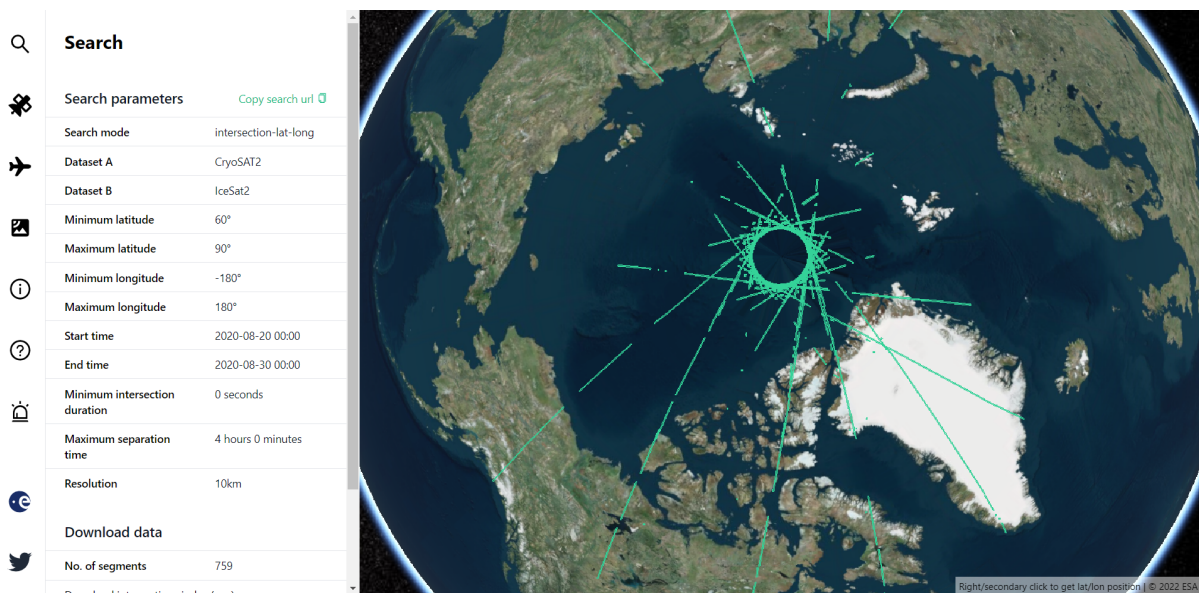


Figure 1: Result page for an intersection query between combined CryoSat-2 and ICESat-2 data products

2 Getting Started

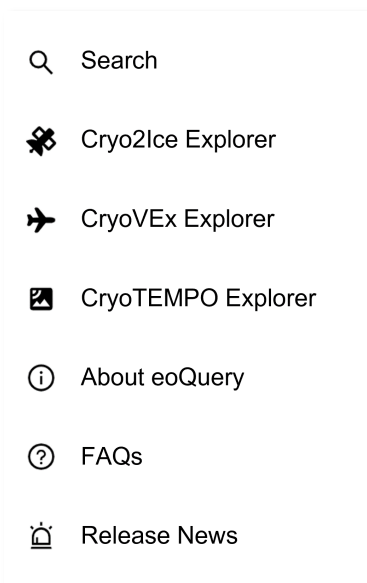


Figure 2 : Page icons

cs2eo is made up of four main and three auxiliary spaces, which can be switched between by clicking on icons on the left-hand side of the website. Figure 2 shows the icons and the pages they correspond to.

We recommend that new users start by running some ready-to-go queries from the Cryo2Ice Explorer page.

Once a query is selected, cs2eo will take a moment to retrieve data before displaying the results. An example result page can be seen in Figure 1 above. Note that cs2eo will navigate back to the Search page to display the results.

Details of the query are displayed under [Search Parameters](#) – these correspond to fields that can be filled in on the Search page of the explorer. A search URL is provided,

allowing users to easily share the query with others or run it again at a later time without having to re-enter the parameters. The URL can be acquired by clicking on “Copy search url”, seen in Figure 1 next to the Search Parameters, or by copying the URL directly from the address bar of a browser.

The [visualisation component](#) on the right-hand side of the website displays the query results on a globe. The user can zoom in to see the positioning and duration of result segments. If the user wishes to know more about a specific portion of the results, they can click on the appropriate segment – further details will be displayed. An example of these details can be seen in Figure 3. Note that the segments reflect cs2eo’s underlying grid rather than raw data, or the fields of field of regard of any particular sensor.

Please note that the positioning of the segment polygons is not exact and should only be treated as an approximation – more details on this in section 6.3.

The [Download Data](#) section, an example of which is shown in Figure 4, provides files meant to help users make the most of the computed query results. The download files are:

- CSV index file – this provides all the information necessary to retrieve data from the downloaded products. Each row corresponds to a segment displayed in the

Segment details		x
Segment ID	351	
CryoSAT2 duration	151.4 seconds	
CryoSAT2 start time	2020-08-23 19:29	
CryoSAT2 end time	2020-08-23 19:32	
IceSat2 duration	142.3 seconds	
IceSat2 start time	2020-08-23 16:31	
IceSat2 end time	2020-08-23 16:34	

Figure 3: Segment details

Download data

No. of segments	26
Download intersections index (.csv)	
Download segments (.kml)	
Download ICESat-2 ATL06 Land Ice Elevation Version 5 data	
Download CryoSat-2 SARIn L2 POCA Baseline D data	

[Download Combined Product Data](#)

Figure 4: Example Download data section, where Combined Product Data is available.

visualisation component. See section 5.5 for more information.

- KML file – this can be used to save the visualisation component of the results to view at a later time. We recommend loading the file into Google Earth: <https://earth.google.com/web/>.
- Python download scripts – these can be run in a default Python 3 environment to download relevant product files from NASA and ESA servers.

In addition, for some queries, a button labelled “Download Combined Product Data” appears at the bottom of the section. If available, this button allows the user to download cs2eo-generated NetCDF files that incorporate the query data from *both* datasets. These Combined Product Data files are intended to reduce the work the user has to do before they can make use of intersection data.

After running a query, the user may choose to modify some of the parameters. To do this, go back to the Search page by selecting the topmost icon in the left-hand, highlighted in Figure 5.

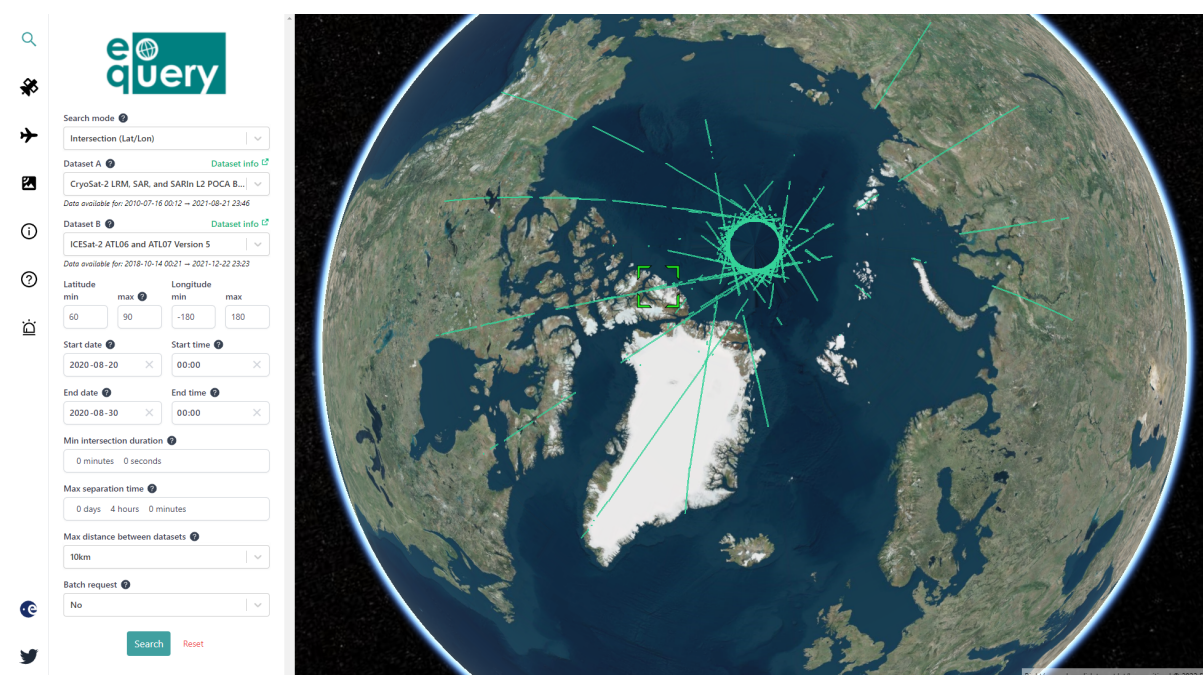


Figure 5: Updating search parameters of a query





The query fields automatically populate with parameters of the query ran just before, allowing the user to simply change the desired values and rerun the query by clicking “Search”. A “Reset” button is provided as well and can be used to clear the values altogether so that a completely new query can be run instead.

Query parameter fields available differ depending on the Search Mode chosen at the top of the page. Please refer to section 5.1 for details of mode options.

If the meaning of a field is unclear, please click on the ? icon beside it. An explanation of the parameter along with possible values will appear. More information on these can also be found in section 5.2 of this document as well as the FAQ page of the website.

3 Explorers

In addition to the search function, three different “Explorers” are provided. These Explorers provide additional detail, standard products and search examples for specific workflows. They are, in order of

appearance in the navigation menu, The Cryo2Ice Explorer , The CryoVEx Explorer  and The CryoTEMPO Explorer . Within each page, further information is available via the  icon.

3.1 Cryo2Ice Explorer

The Cryo2Ice Explorer provides Standard Products and Custom Query Examples intended for workflows focussed on the Cryo2Ice campaign. The Standard Products are provided for common long-running queries that span a whole month. For these products, NetCDF files are provided containing only the intersecting data from ICESat-2 and CryoSat-2. Each intersection comes in its own NetCDF, with segment ids matching those in the CSV file. The data format is identical to the original ICESat-2 and CryoSat-2 data with the addition of attributes describing the acquisition intersections for each segment.

3.2 CryoVEx Explorer

The CryoVEx explorer provides Custom Query Examples and a “Mission Information” section intended for workflows focussed on CryoVEx. The Mission Information section allows the user to download metadata for each specific CryoVEx mission, and serves as a list of the specific CryoVEx missions loaded into cs2eo. Note that this data can also be obtained from the search page when an appropriate query is submitted.

3.3 CryoTEMPO Explorer

The CryoTEMPO explorer provides Custom Query Examples that return EOLIS products and intersections between EOLIS products and other products available within cs2eo.

4 Datasets

cs2eo provides access to datasets from a variety of sources. Initially, following the orbit change of CryoSat-2 as part of the #CRYO2ICE campaign, a focus was put on making the intersections between the CryoSat-2 and ICESat-2 missions easily accessible. More recently, products from the Operation IceBridge and CryoTEMPO EOLIS projects were added as well.

gives a brief overview of missions currently available through the website.

Table 1: Overview of missions currently available through cs2eo

Mission	Information
CryoSat-2	ESA satellite mission launched in April 2010 with the objective of monitoring changes in the thickness of polar ice sheets and floating sea ice. With a nominal mission period of 3.5 years, CryoSat-2 has far exceeded its lifespan and still provides accurate measurements to this day. CryoSat-2 uses a SAR/Interferometric Radar Altimeter (SIRAL) to provide accurate elevation measurements.
ICESat-2	NASA satellite mission launched in September 2018 with the objective of measuring ice sheet elevations, sea ice thickness, land topography, vegetation characteristics and cloud coverage. ICESat-2’s main instrument, ATLAS, is optimised to measure elevation changes in polar sea ice and land ice. It implements laser altimetry, taking measurements every 2.3 feet, to measure elevation with high accuracy.
Operation IceBridge	NASA airborne mission aimed to bridge the gap between the ICESat satellite, which stopped collecting data in 2009, and the ICESat-2 Satellite, which was

	launched in 2018. The mission provides yearly insight into the changing features of the Greenland and Antarctic ice sheets and sea ice, with flights typically conducted over Greenland in March-May and Antarctica in October-November.
CryoTEMPO EOLIS	This ESA project consolidates the research and development undertaken during the CryoSat+ CryoTop / CryoTop evolution ESA STSE projects into operational products. The EOLIS products exploit CryoSat-2's SARIn mode and the novel Swath processing technique to deliver increased spatial and temporal coverage of time-dependent elevation over land ice.
CryoVEx	<p>The CryoSat Validation Experiment (CryoVEx) is a series of ground and airborne collection campaigns designed to generate validation data for CryoSat-2 and other ESA missions. CryoVEx campaigns have been held every 12-18 months since 2003. Most of them are focussed on the Northern Hemisphere (Greenland, Svalbard, Iceland, Lincoln Sea, Baffin Bay, Beaufort Sea), but Antarctic campaigns are regularly held every 3-4 years during the Austral Summer. Only missions from 2010 onwards are available in cs2eo.</p> <p>Several different photographic, radar and laser scanner sensors have been collecting data during these campaigns. See Table 2 for a more in-depth description of the radar and laser sensors, for which data is available via cs2eo.</p> <p>To complement the radar and laser data over sea ice, geolocated high resolution optical images are captured along nadir and slant sightlines. This photographic data (called PIX) is not yet available via cs2eo. We plan to make PIX data available in a later release.</p>

Due to the very different nature of these missions, query results can appear in distinct ways depending on the dataset chosen.

For satellite missions such as CryoSat-2 and ICESat-2, continuous data is combined into longer segments, showing the ground track of the satellite. An example of this can be seen in Figure 6.

For others, data may be displayed directly over the underlying grid. Grid resolutions vary across different products, with multiple options typically made available to the user. The resolution should be chosen based on the specific use case.

Figure 7 a) shows an IceBridge ATM L2 query, where data is displayed over a 10km resolution grid so that the path of the research aircraft is clearly visible. Figure 7 b), on the other hand, shows a CryoTEMPO EOLIS Point Product query displayed over a 100km resolution grid, which allows the coverage of the product over Greenland to be fully seen. A 10km resolution for this product is also available, although not recommended for single mode queries covering large areas due to the large number of results returned.

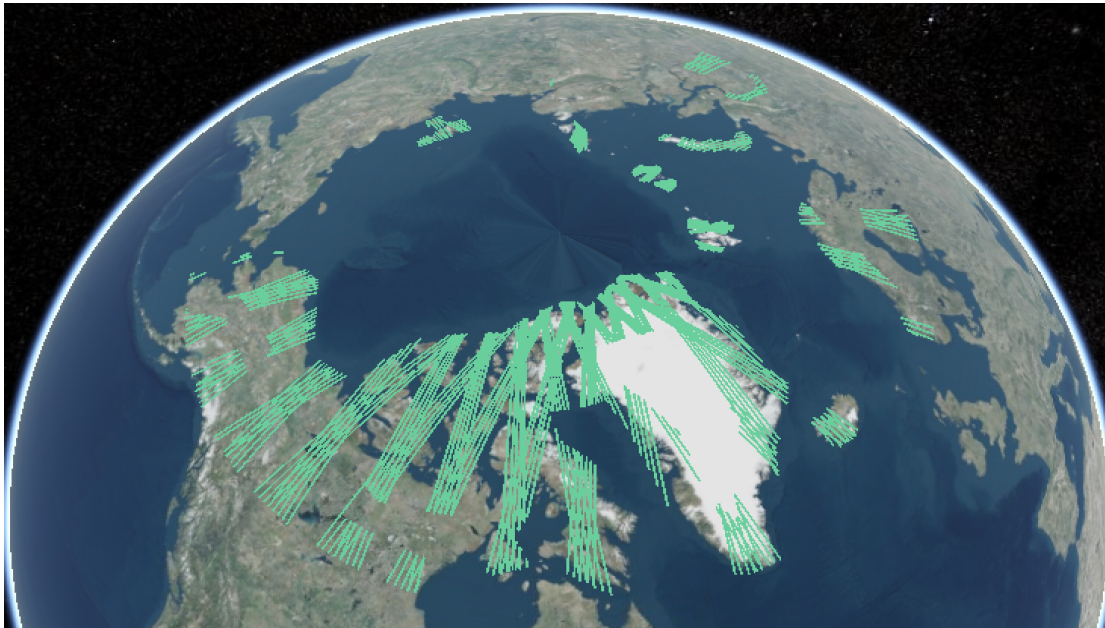


Figure 6: Single mode CryoSat-2 SARIn query



a)



b)

Figure 7: a) Operation IceBridge ILATM2 single mode query b) CryoTEMPO EOLIS Point Product single mode 100km resolution query

Table 2 lists the datasets currently available on the Cryo2Ice explorer along with brief descriptions. For most up-to-date information, please refer to the appropriate link given in the table.

Table 2: Overview of datasets currently available through cs2eo

Product	Description	Link
CryoSat-2 LRM L2 POCA	Dataset collected using the CryoSat-2 low-resolution mode (LRM), which is used for areas with a small slope, such as ice-sheet interiors and over the ocean.	CryoSat-2 products
CryoSat-2 SAR L2 POCA	Dataset collected using CryoSat-2 Synthetic Aperture Radar (SAR) mode, which is applied over sea-ice to enhance along track horizontal resolution using the Doppler effect.	CryoSat-2 products
CryoSat-2 SARIn L2 POCA	Dataset collected using CryoSat-2 SAR-Interferometric mode, which is used for areas with a high slope – mainly ice-sheet margins.	CryoSat-2 products
CryoSat-2 Predicted Ground Track	Generated using monthly CryoSat-2 Reference Ground Track KML orbit files, this dataset can be used to visualise past and future paths of planned CryoSat-2 orbits. There is no data download available for this product.	CryoSat-2 Ground Tracks
CryoSat-2 LRM, SAR and SARIn L2 Combined Product	A combined dataset of CryoSat-2 products available via the Cryo2Ice explorer. Queries ran on this dataset will return results for any of the Level 2 LRM, SAR and SARIn data products.	N/A
ICESat-2 ATL06	A land ice elevation dataset, acquired using the ATLAS instrument onboard ICESat-2.	ATL06 User Guide
ICESat-2 ATL07	A sea ice elevation dataset, acquired using the ATLAS instrument onboard ICESat-2.	ATL07 User Guide
ICESat-2 ATL10	A sea ice freeboard dataset, acquired using the ATLAS instrument onboard ICESat-2.	ATL10 User Guide
ICESat-2 ATL12	An ocean surface height dataset, acquired using the ATLAS instrument onboard ICESat-2.	ATL12 User Guide
ICESat-2 Predicted Ground Tracks	ICESat-2 time-specific orbit KML files are used to generate this dataset, which can be used to visualise past and future paths of planned ICESat-2 orbits. The KML files contain a date and timestamp every 420 kilometres along the reference ground track, which corresponds to roughly 1 minute of flight time. There is no data download available for this product.	ICESat-2 Ground Tracks
ICESat-2 ATL06 and ATL07	A combined dataset of ICESat-2 products available via the Cryo2Ice explorer. Queries ran on this dataset will return results for both the ATL06 and ATL07 data products.	ATL06 User Guide ATL07 User Guide
IceBridge ATM L2	A dataset of sea ice and land ice surface elevation in Greenland and the Antarctic, acquired using the Airborne Topographic Mapper (ATM) instrument.	ILATM2 User Guide
CryoTEMPO EOLIS Point Product	Dataset containing a cloud of elevations with an associated uncertainty in geo spatial units, currently available over Greenland and Antarctica. Due to the high volume of data, the data is split into tiles of 100 x 100km in size.	EOLIS products

CryoTEMPO EOLIS Gridded Product	Dataset containing a spatial interpolation of the EOLIS Point Product onto a uniform grid of elevation and uncertainty. A monthly 2km resolution DEM with data sourced from a rolling three-month window.	EOLIS products
CryoVEx KAREN	Land and Sea Ice altimetry data collected by an airborne Ka-band radar during CryoVEx campaigns. Files are in NetCDF format.	CryoVEx Campaigns
CryoVEx ALS	Land and Sea Ice altimetry data collected by an airborne laser scanner collected during CryoVEx campaigns. Files are in NetCDF format. The original binary files of pre-2016 missions have been converted to NetCDF. All variables remain the same as in the product handbook.	CryoVEx Campaigns
CryoVEx ASIRAS	Land and Sea Ice altimetry data collected by an airborne Ku-band interferometric radar altimeter during CryoVEx campaigns. Files have been converted from binary to NetCDF format. All variables remain the same as in the product handbook. Two useful variables have been added: <code>utc_time</code> and <code>two_way_time</code> .	CryoVEx Campaigns
CryoVEx AEM	Data collected by an airborne electromagnetic induction sounder during CryoVEx campaigns. EM sounding is a well-known geophysical method for measuring the distance between an EM instrument and the boundary between the resistive sea ice and the conductive sea water, i.e. its altitude above the ice/water-interface. AEM files have been converted from plain text to NetCDF. All variables remain the same as in the product handbook.	CryoVEx Campaigns
CryoVEx CReSIS	Land and Sea Ice altimetry data collected by an airborne dual-frequency (Ku- and Ka-band) radar altimeter provided by the CReSIS institute during CryoVEx campaigns. CReSIS files have been converted from MATLAB format to NetCDF. All variables remain the same as in the product handbook.	CryoVEx Campaigns

5 Functionality

cs2eo provides many features and options in order to make the service as flexible as possible, leaving many decisions up to the user. This section provides more details on features of particular interest.

5.1 Search Modes

A query can be run in one of four search modes, seen in Figure 9.

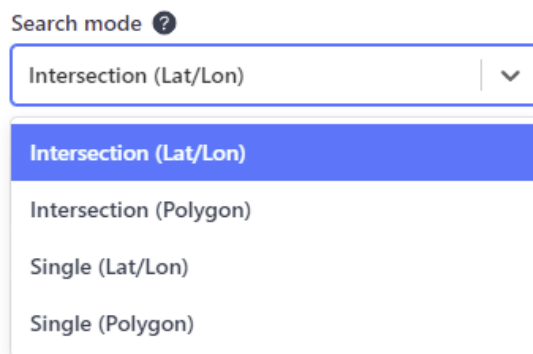


Figure 8: Available search modes

The first mode distinction is between Single and Intersection queries. Single mode can be used to search for data for one dataset while Intersection mode allows us to select two datasets and find coincident data between them. Support for n-dataset intersections may be added in the future.

The second distinction is between Lat/Lon and Polygon modes, which determines how the area of interest for the query is defined.

In Lat/Lon mode, the user sets the minimum and maximum latitude and longitude values to define the extent. Right-clicking on a point on the globe will display its lat/lon coordinates, which can be used to determine the desired values for these fields.

In Polygon mode, the user can draw a shape on the globe to select the desired area. This is done by clicking on the globe to mark the vertices of a polygon. The shape will fill in once three points are selected, but more can still be drawn. An example polygon drawn over Greenland can be seen in Figure 9.

Please note that intersecting polygons with crossing edges are not allowed. We recommend selecting the vertices in a clockwise or anti-clockwise order to avoid this. If the issue still appears, “Reset” and “Undo” buttons are provided in the top left corner of the globe element, seen in Figure 9, which allow a user to start over.

Additionally, note that polygon mode queries only return grid cells entirely within the drawn polygon.

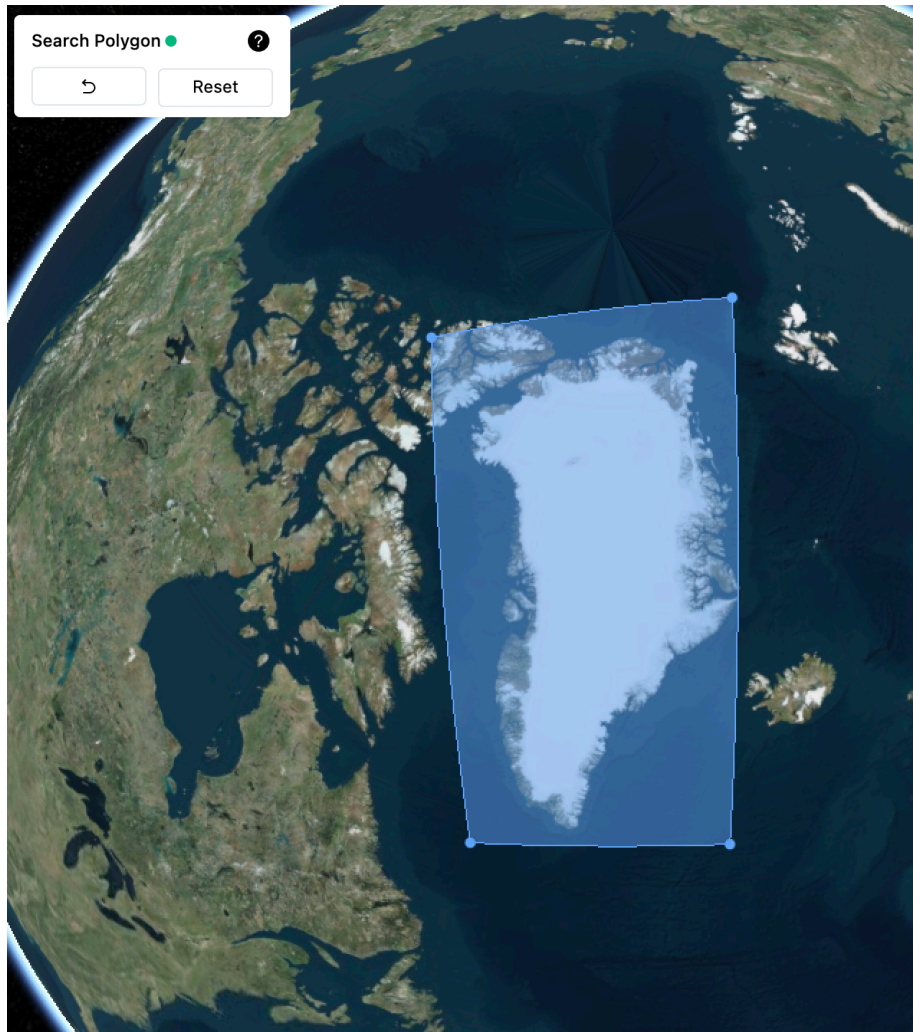


Figure 9: Selecting an extent for a polygon mode query

5.2 Search Parameters

A query is defined by parameters available on the Search page of the explorer. lists these along with brief descriptions. The fields differ depending on the chosen query search mode. Additional fields are necessary for Intersection mode queries to help users define the spatial and temporal coincidence of the chosen datasets - an asterisk (*) symbol has been put next to these.

Table 3: Search parameter fields

Parameter Name	Information
Dataset A/B product	Which datasets to run the query on. Once a dataset is chosen, information about what months of the data is available through eqQuery as well as a link to an external dataset website is displayed. Note that, if in intersection mode, the dropdown for the second dataset will populate based on the first - not all dataset pairs can be intersected.
Latitude/Longitude	The extent for the query when Lat/Lon mode is used.
Start/end time	The time span of the query in YYYY-MM-DD and HH:mm formats. Consider the dataset availability when setting these.

Batch request	This field can be toggled to run a query in the background and receive results via email. This is recommended for larger queries. More details can be found in section 5.4 Batch Mode .
Min intersection duration*	The minimum length of time for an intersection to last. The field can be used to filter out smaller, less significant intersections, such as cross-overs. Maximum value is 20 minutes.
Max separation time*	The maximum time between observations of two datasets for them to be considered coincidental in time. A minimum time of 3h is recommended in order to get parallel intersections as, once every 31 hours, the CryoSat-2 and ICESat-2 orbits take the same trajectory, with CryoSat-2 just under 3 hours behind IceSat-2. Maximum value is 28 days.
Max distance between datasets*/Resolution	The resolution of the data display on the map which corresponds to the grid underlying the data. For intersection queries, this field defines the maximum x and y distance between observations of two datasets for them to be considered coincidental in space.

5.3 Definition of an Intersection

cs2eo calculates data intersections without reference to the fields of regard or other sensor performance information associated with the input datasets. Instead, all of the input data is rendered as a geospatial-temporal point cloud and then binned into an [EASE Grid \(v2.0\)](#) with grid cell size 5km or 10km (selectable as the “Resolution” input in).

cs2eo considers data from two or more sensors to be intersecting if data from both sensors, recorded with a time delay less than or equal to the “max separation time” input defined in , falls within the same EASE Grid cell. Note that this intersection is evaluated on a measurement-by-measurement basis.

Intersections for satellite trajectories are handled similarly, with points along the satellite’s ground track being binned into the EASE Grid similarly to sensor data. For ICESat-2 data, points from each of its 6 beams are mapped onto the EASE Grid separately.

5.4 Batch Mode

For larger queries, spanning many months or a large area, results may take some time to prepare.

It is recommended that such queries are run in batch mode, which allows the results to be computed in the background. Batch mode can be enabled by toggling the batch request field in search parameters to “Yes”.

Once such a query is submitted, the user is asked to enter an email address to which they would like their results to be sent. The user email address is discarded once this is done.

Figure 10 shows an example result email. Query parameters are provided along with the usual download links. Note that it is not currently possible to view long running query results in the

visualisation component of the website - we recommend loading the KML file into Google Earth instead.

If viewing results directly on the website is particularly of interest, we recommend modifying some of the parameters to reduce the size of the query. Fields that have a particular impact on the running time of a query are the extent bounding box, the time window, as well as the max separation time.

Please note that, while some default queries will be recognised as long-running automatically, causing batch mode to be switched on, others may return a message asking the user to rerun in batch mode. It is therefore best for the user to select batch mode in search parameters directly if a query is likely to be large.

Dear User,

You have run a query on the eoQuery portal with the following parameters:

Dataset A: SIR_SAR_L2_E
Dataset B: ATL07
Min intersection duration: 0 minutes 0 seconds
Max separation time: 1 days 0 hours 0 minutes
Start time: 2021-10-01T00:00:00
End time: 2021-10-31T23:59:00
Extent: Min lat: 79.48 Max lat: 81.97 Min lon: -115.34 Max lon: -96.21
Max distance between datasets: 10

Your query has found 25 results. Here are your download links:

[Download KML file](#)
[Download SIR_SAR_L2_E data](#)
[Download ATL07 data](#)
[Download intersection index csv file](#)

You can open the KML file in Google Earth to get a display of the results.

Please do not respond to this email. If you have any questions, please refer to our [FAQ page](#) or email us at support@eoquery.org.

Figure 10: Batch mode result email

5.5 CSV Index File

The CSV index download file allows the user to retrieve relevant intersecting portions of data product files.

Each row defines a result segment. For intersection queries, each such segment corresponds to a pair of data product files from the two chosen datasets. The same product pair may appear in multiple rows if the product data intersects in separate non-continuous areas of the underlying data grid, or if a temporal gap in either of the data files is detected.

Table 4: CSV Index File Columns

Column name	Content	Format
Dataset A/B product	data product file name, as seen on NASA/ESA server	String
Dataset A/B start time	start time of portion of original data file determined to be relevant to query	UTC ISO String, rounded to nearest second (YYYY-MM-DDTHH:MM:SS+HH:MM)

Dataset A/B end time	end time of portion of original data file determined to be relevant to query	UTC ISO String, rounded to nearest second (YYYY-MM-DDTHH:MM:SS+HH:MM)
Dataset A/B duration	duration of result segment	Seconds
(bl lat. bl lon)	bottom left vertex of segment polygon	(lat. lon) pair expressed as (float. float)
(tl lat. tl lon)	top left vertex of segment polygon	(lat. lon) pair expressed as (float. float)
(tr lat. tr lon)	top right vertex of segment polygon	(lat. lon) pair expressed as (float. float)
(br lat. br lon)	bottom right vertex of segment polygon	(lat. lon) pair expressed as (float. float)
segment_id	same ID as one displayed in UI when segment is clicked	Integer between 1 and N, where N=number of query results

Table 4 describes the columns given in the CSV file. In addition to these, certain products may also have columns detailing orbit track information of the segment data file. The columns can be recognised by an “attributes” prefix in the name. At the time of writing this, these columns are:

1. For CryoSAT-2 LRM, SAR and SARIn datasets: ascending flag, equator cross time, equator cross long, abs orbit number, and cycle number.
2. For ICESat-2 ATL06 and ATL07 datasets: crossing time, longitude ascending node, cycle number, and RGT number.

Please refer to appropriate dataset websites for most up-to-date information on these.

6 Known Issues

cs2eo is frequently updated with new features, datasets, and improvements. This section describes some of the currently known limitations of the website as well as our plans to address them in the coming months.

6.1 Polygon results incorrect when drawn over the -180/180 longitude boundary

Polygons drawn over the -180/180 longitude boundary return incorrect results. Returned segments span the correct latitude extent given by the user, but the inverse of the chosen longitude extent. For example, where values should have been returned for longitude spans of (-175, -180) and (180, 175), the span of (-175, 175) is used instead. Figure 11 below show an example of the issue.

The issue is only present in the EASE temperate zone due to the cylindrical shape of the projection.

A solution of representing such a polygon as two, one on either side of the boundary, will be explored.

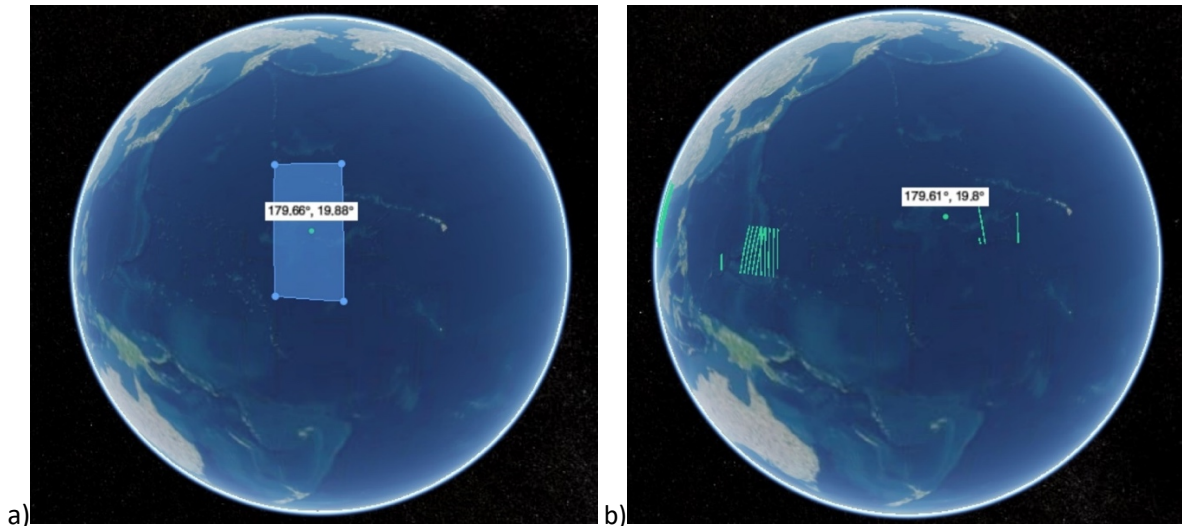


Figure 11: Polygon query ran over the -180/180 longitude boundary. a) shows the polygon drawn for the query, and b) displays the returned results. As can be seen, the two do not cover the same area.

6.2 Gaps at zone boundaries of RGT products

The ICESat-2 and CryoSat-2 Predicted Ground Track products have gaps at zone boundaries, as shown in Figure 12.

The discontinuity of results for these products should be ignored, as it is due to an internal data ingestion issue and does not correspond to any planned behaviour of ICESat-2 or CryoSat-2.

A solution of injecting additional points along the satellite paths will be explored.

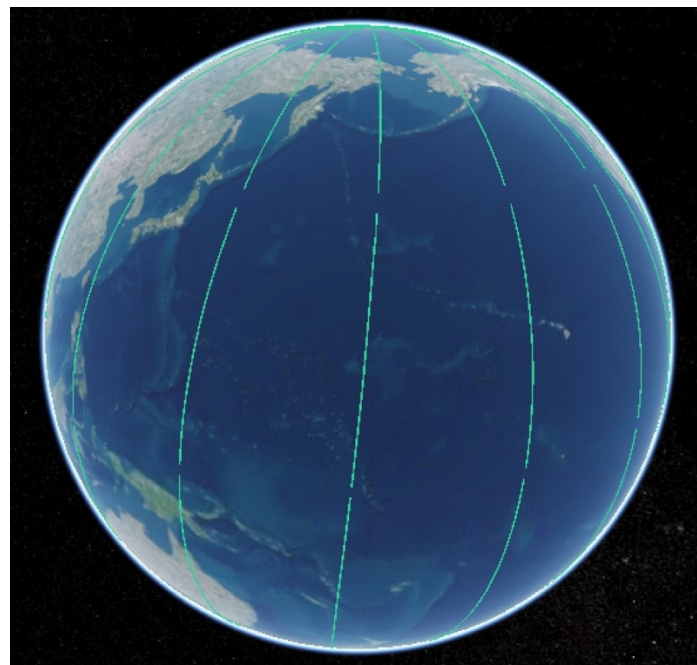


Figure 12: Results of a single mode CryoSat-2 RGT query. Gaps in data near zone boundaries can be seen.

6.3 Segment display inaccuracy

Each displayed result segment is represented by a polygon with four vertices. This can cause the displayed path of the polygon along the globe to be slightly inaccurate for longer segments. Polygons displayed over the poles are affected more severely.

To help with this effect, segments are broken into smaller ones with a maximum duration of 150 seconds. This value was chosen to give a reasonably accurate visualisation, whilst still providing a readable interface. If the exact location of the data display is of interest, it is recommended to run a query with a very small extent to get a visual as close to the underlying data grid as possible. Still, the exact positioning of the segments should be treated as indication only.

An alternative solution of defining more points along the path of the polygon will be explored.

7 Contact

Feedback or questions about cs2eo are welcomed. Please use the following contact details:

e-mail: info@cs2eo.org

Website: <https://cs2eo.org>