



ESA Coastal Erosion Project
European Space Agency



Space for Shore

Portal for viewing and downloading
data on the position
and dynamics of the coastline
on the European scale

Getting Started User Guide



Space for Shore

ESA EOEP-5

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Portal for viewing and downloading data on
the position and dynamics of the coastline at
the European scale

Getting Started User Guide

<https://space4shore.staging.services4eo.com/home>

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1 FOREWORD: SPACE FOR SHORE PROJECT

Coastal erosion

For decades now, coastal areas have been submitted to intense urbanisation and population growth. However, these attractive areas are among the most dynamic on Earth and suffer from severe coastal hazards due to storm activity and sea level rise.

Even if natural processes and coastal erosion are nonlinear phenomena showing successive phases of erosion/accretion, even sometimes shifting trends upon the decades, the issue of coastal retreat appears everywhere around the world under the effect of those natural processes further aggravated by climate change and human activities.

To help coastal authorities ensure the attractiveness of coastal cities while meeting the challenge of sustainable coastal management, shoreline monitoring actions need to be undertaken to improve knowledge of coastal dynamics.

A need for new tools for coastal monitoring

Today, a variety of techniques is available and currently used by scientists and coastal managers for monitoring beach and shoreline change. It includes field surveys using DGPS, terrestrial scanning and/or UAV photogrammetry which offer the best accuracy but is time consuming and restricted to small areas. Airborne surveys using LIDAR have the preference for larger areas, but the cost is too prohibitive to allow repetitive surveys, and the data processing is too long for a majority of coastal stakeholders who need rapid delivery for immediate decision support.

A need has emerged for alternative large-scale and affordable techniques, this is what satellite remote sensing can offer.

Why an ESA Coastal Erosion project?

In the framework of the Earth Observation Envelope Program (EOEP-5), ESA has decided to target the Coastal Erosion issue by funding a 2-yr project in 2019 and 2020.

The project focuses on the prototyping of coastal erosion products derived from past and current Earth Observation missions, including Copernicus Sentinel-1/2 which offer biweekly revisit all over Europe.

The Coastal Erosion project is end-user driven. Coastal managers are central: (i) they have defined the required products; (ii) they have been sharing their ground truth datasets issued from their current monitoring program; and (iii) they will finally test the new products and give feedback about their relevance.



The Space for Shore vision

Led by i-Sea, the Space for Shore consortium is one of two consortia selected by ESA.

Our philosophy is based on mutual cooperation between different specialists in SAR and optical remote sensing in order to produce the most relevant erosion indicators, as required by European coastal managers. The ambition is to set up a range of validated satellite products covering all types of European coasts.



2 PORTAL ACCESS

The portal can be consulted by clicking on the following link:

<https://space4shore.staging.services4eo.com/home>

Figure 1 summarises the key steps for displaying and downloading the data available on the portal. Further details are given on the following pages. The numbers in the scheme refer to the sections of the guide.

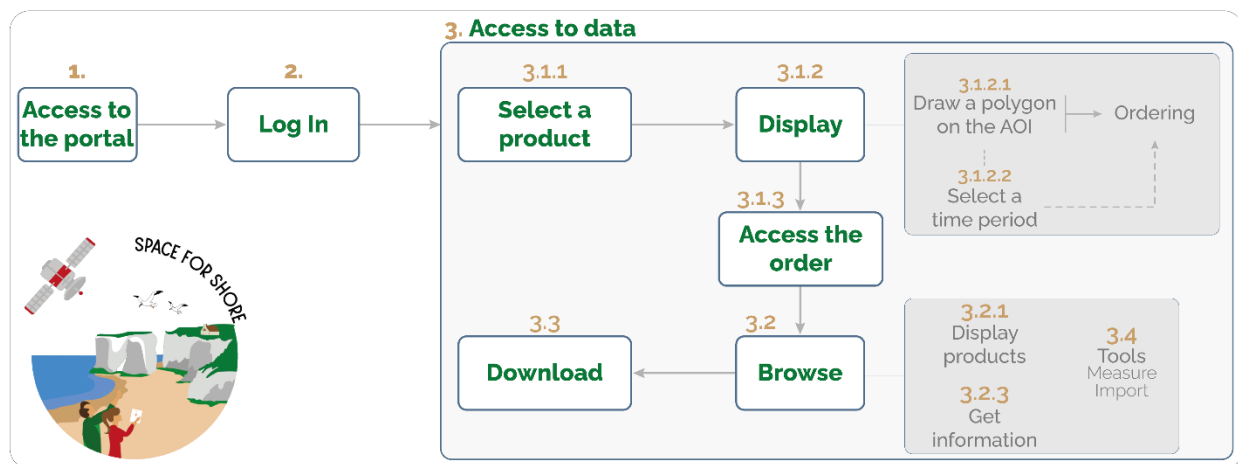


Figure 1 — Overview of steps to access project data.



3 HOMEPAGE

The homepage provides access to all the features available on the Space for Shore portal. It is organised like a classic online data visualisation tool and allows you to navigate through the different data collections available, display them and download them.

To access the full functionality of the portal, you need to have a user account and be logged in. For more details on user accounts, see page 8.

Table 1 and the associated Figure 2 give a synthetic description of the different components of the homepage.

Table 1 - Description of the portal homepage items

Homepage			
N°	Name	Description	Details
1	Display space	View and browse the available data.	p. 9
2	Data collections	List of all data collections available on the portal.	p.16
3	Mapping tools	Mapping tools for linear and surface measurements.	p.15
4	Help	Access online support and request technical assistance.	/
5	Language	Select language	/
6	Sign-in	Log in to your user account (required to view and download data).	p.8
7	Background map	Select a background map.	/
8	Consortium logos	Logos of the partners involved in the Space For Shore consortium	/



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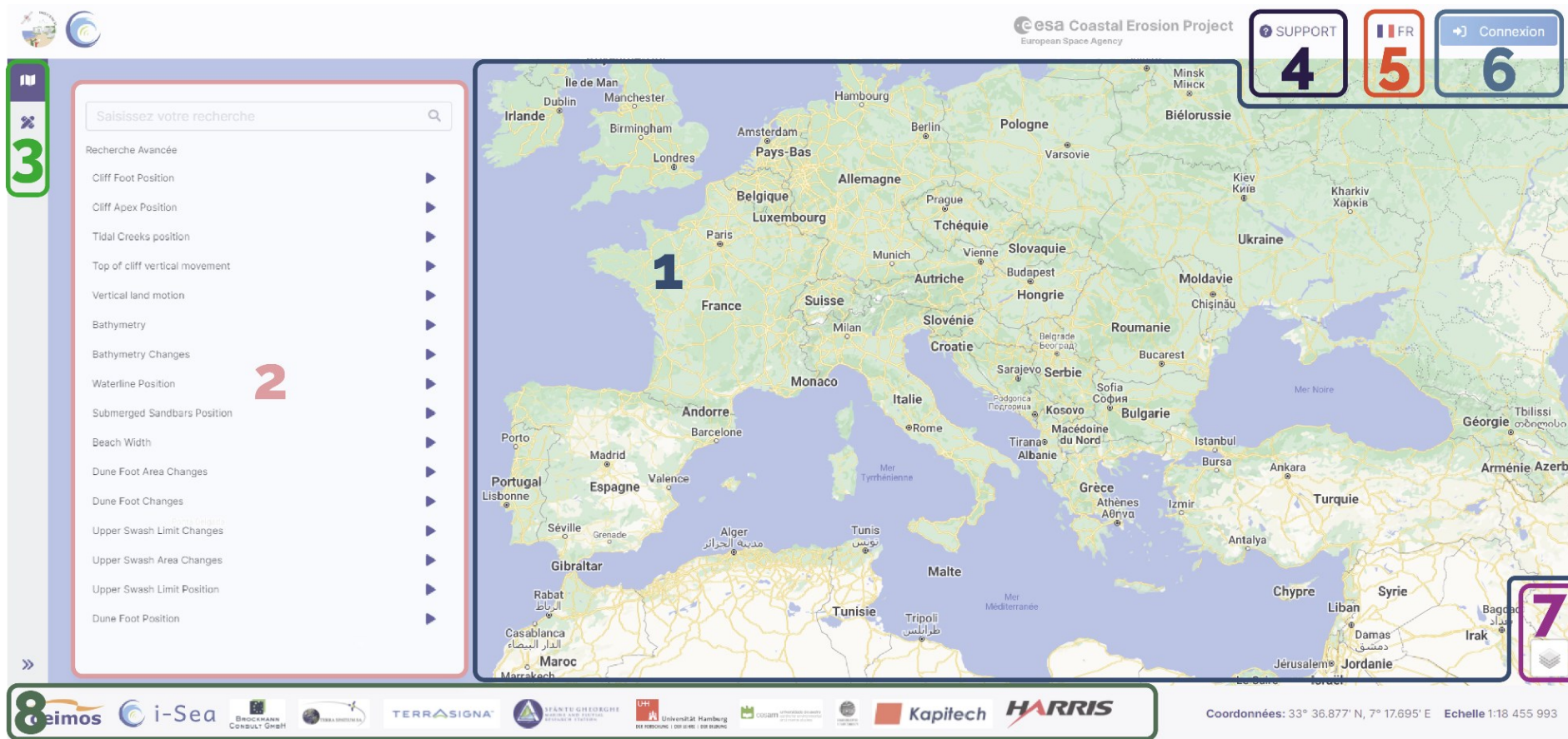


Figure 2 — Space for Shore portal homepage.



4 USER ACCOUNT

Access to all the functionalities of the data viewing and downloading portal is available through a **user account**.

4.1 You have received a user account

If you have received your login details, use them to log in to the portal. This information is provided by email.

In the email you will find:

- A username
- A secure and automatically generated password

Refer to section 4.3 (p.9) for details on how to log in.

4.2 Creating a user account

If you do not have a user account, it is necessary to make a request by email to the following address:

valentin.pillet@i-sea.fr

To create your account, the following informations have to be provided in the email (Table 2).

Table 2 – Required information for user account creation requests

Creating an account	
Information	Detail
Identity	Name, First name
Contact details	email address
	Telephone number
Institution/Company/Organisation	Employer, University, Laboratory
Position/Function	Job title, Position



4.3 Login

To log in to your user account, go to the **LOG IN** tab on the homepage (6, Figure 2). On the login page (Figure 3), enter your username and password and click LOGIN.

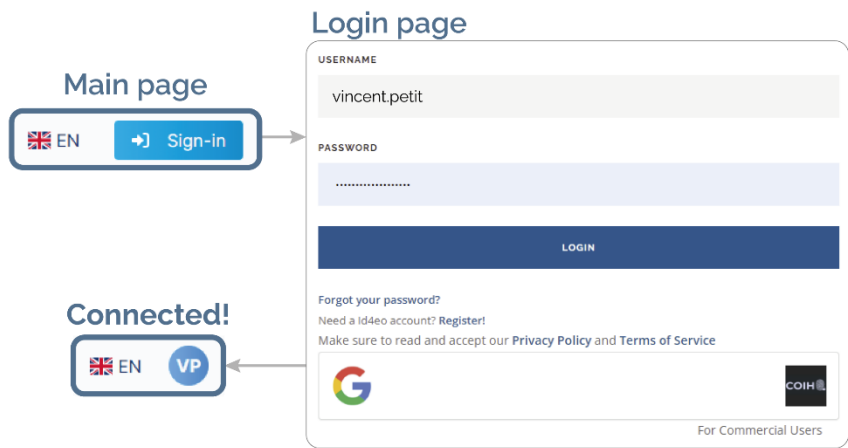


Figure 3 – Login steps

5 ACCESS TO DATA

5.1 Displaying the data

5.1.1 Viewing details and information about data collections

The data collections, which correspond to the different indicators of coastal product dynamics, are listed in the left panel on the home page (2, Figure 2). To access the information of each collection, click on the **PLAY** symbol (1, Figure 4). A pop-up window appears on the right side of the screen. This information window contains different tabs, described in Table 3.

Table 3 - Information box tabs

Information window		
N°	Name	Description
1	PLAY	Display information about data collections.
2	DETAIL	Details of the selected data collection.
3	INSTRUCTIONS	Steps to follow to display the data.
4	ORDER	Selection of the area and time span of the data to be displayed (details p.10)



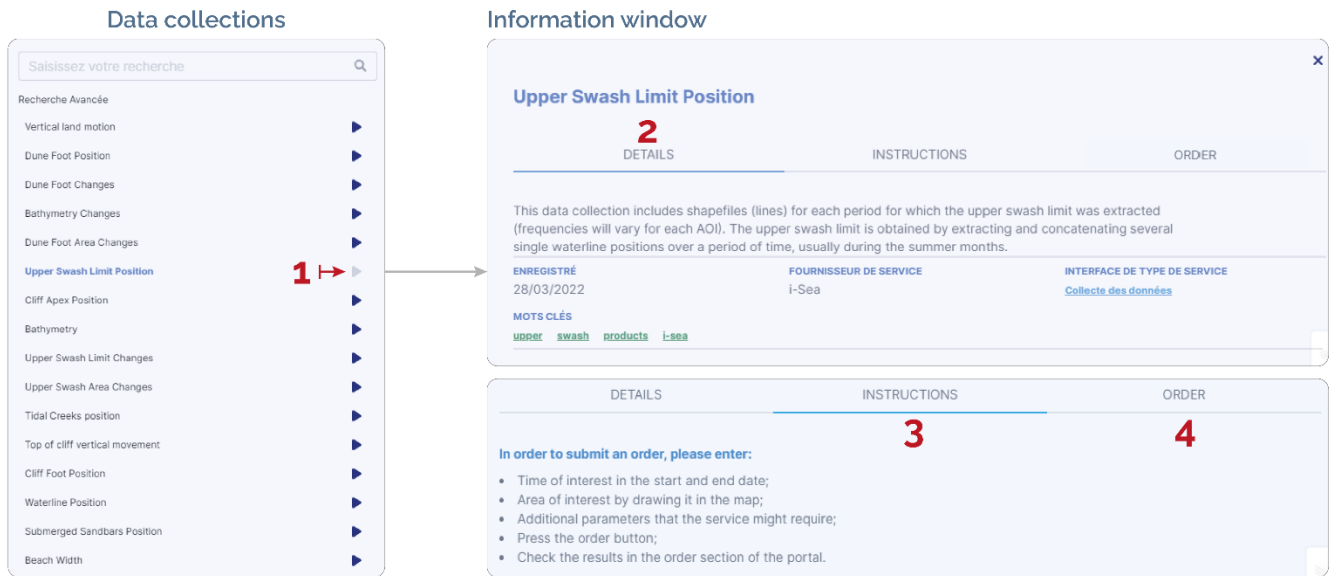


Figure 4 – List of data collections and information box

5.1.2 Ordering

To display the data, it is necessary to make a request - **an order** - which will be available immediately. The data available in the portal and produced in the framework of the Space for Shore project are **accessible for free**.

5.1.2.1 Draw a polygon

After selecting a data collection to be displayed and clicking on **PLAY** in the left-hand panel (previous step), green polygons appear on the map. They correspond to the areas on which each collection was produced (Figure 5). To view the products, it is necessary to draw a polygon covering the area of interest (NB. *The polygon you draw must be strictly included in the green rectangles*).



Upper Swash Limit Position

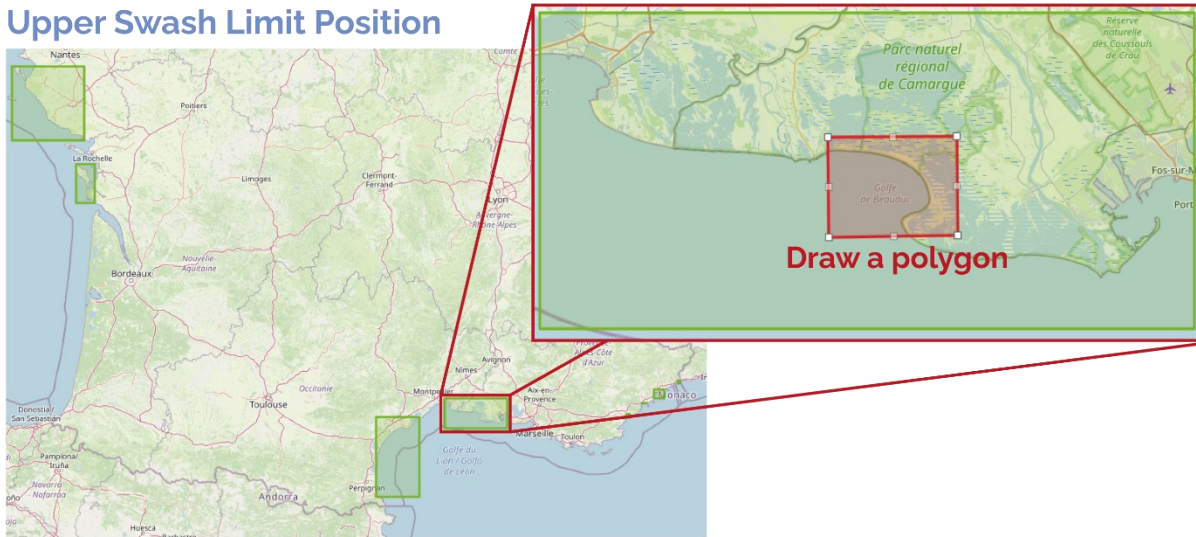


Figure 5 – The data collections are shown in green on the map. Here is an example for the Upper Swash Limit.

To draw a polygon, select the **ORDER** tab in the information window, then click on **DRAW POLYGON** (1, Figure 6).

To complete your order without specifying a time range - in this case all the products available for the chosen indicator will be displayed in the area of your polygon - click on the **DISPLAY** button (3, Figure 6)

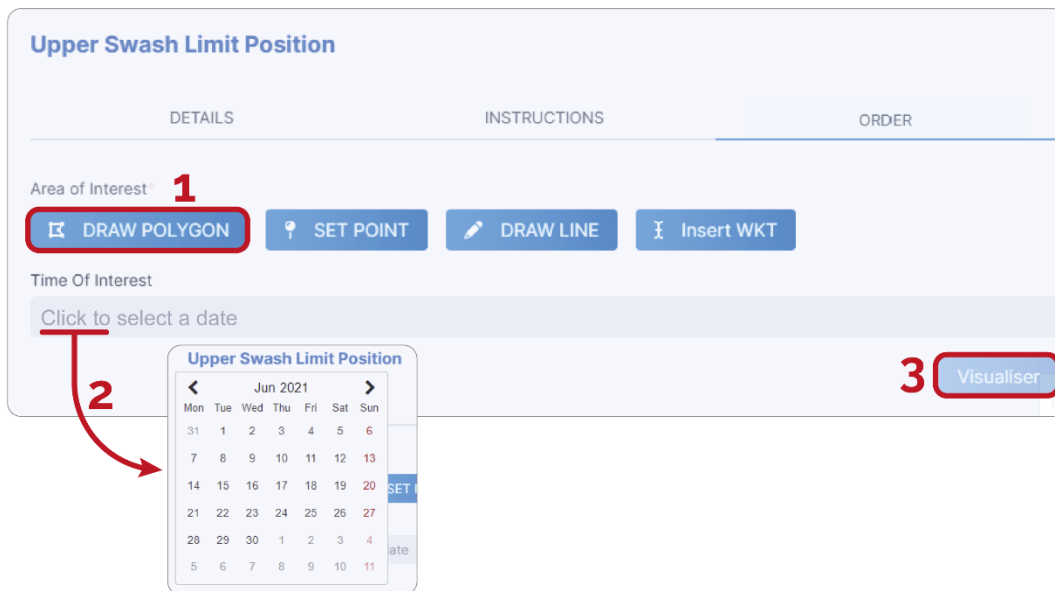


Figure 6 — Order Tab of the information window.

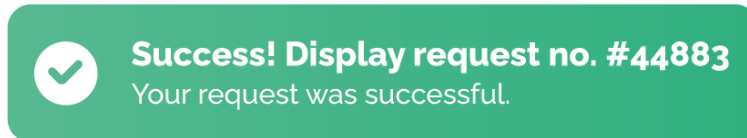


5.1.2.2 Defining a period of interest

You can define a period of interest by clicking on the **SELECT DATE** field (2, Figure 6). A window appears to define the time range of the data to be displayed.

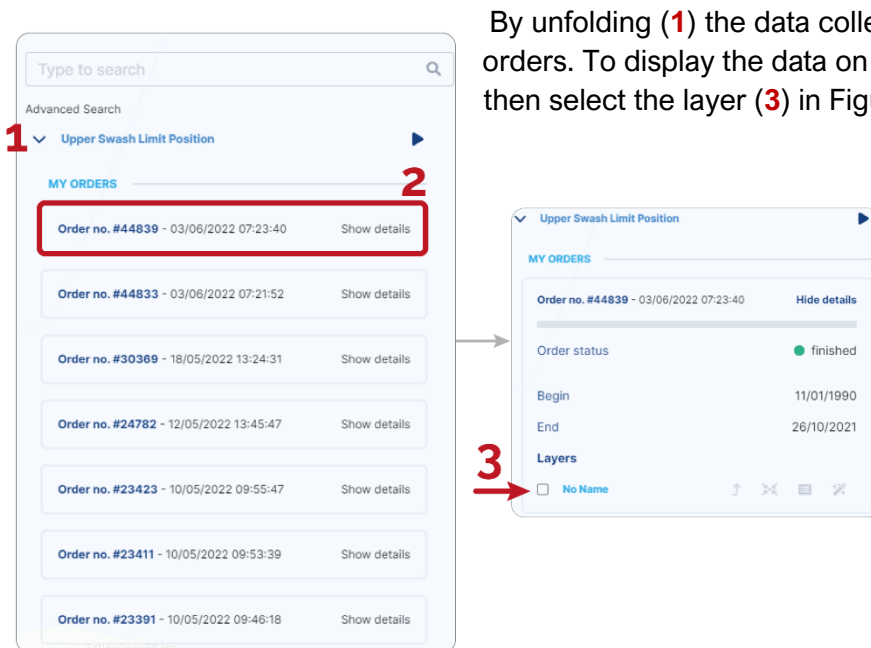
To complete your order by specifying a period, click on the **DISPLAY** button (3, Figure 6)

Once the request has been made, the following dialog box will pop up at the bottom of the screen:



5.1.3 Order access

Once validated, the orders are accessible in the left panel on the home page (2, Figure 2). Each order is located in the corresponding data collection.



By unfolding (1) the data collections, you will have access to all your orders. To display the data on the map, click on **SHOW DETAILS** (2), then select the layer (3) in Figure 7.

In this window (Figure 7), you will have access to the details of your order, as well as a set of visualisation tools whose functions are presented below (Figure 8).



Figure 7 – Access to orders and details of requests

Figure 8 – Details of the visualisation tools



5.2 Browsing data collections

For all data, several visualisation tools are available. They are presented in the following sections. Figure 9 describes the main features of the timeline, which allows the viewing and downloading of available products.

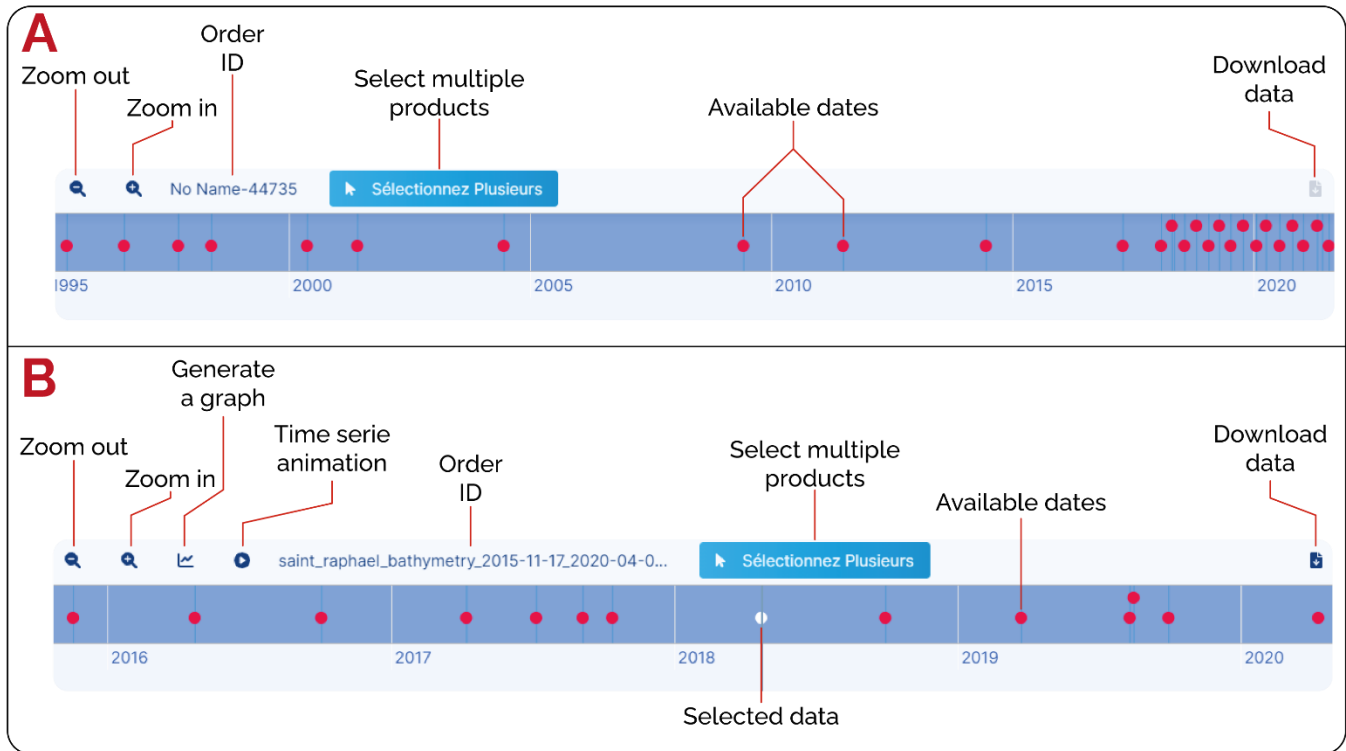


Figure 9 — Timeline and functions. Specific functionalities for (A) coastline indicators and (B) bathymetric products.

5.2.1 Timeline and data display

The timeline appears when you display your order (section 5.1.3, p.12). It allows users to navigate through the data collections and to display one or more products simultaneously. Depending on the nature of the products displayed - coastline or bathymetry - the timeline offers different functionalities which are presented in Figure 9 A et B.

Depending on the product, you can:

- Zoom out or zoom in the timeline
- Find your order ID
- Generate Evolution Charts (bathymetry)
- Generate a time series animation (bathymetry)
- Display one or multiple products
- Download selected data



5.2.2 Graphs and time series (bathymetric products)

For bathymetric products, you can generate evolution graphs, which allow visualising the changes in depth for a given point over the whole time period covered by the products.

You can also generate time animations, which allow displaying successively and automatically a set of selected products in order to visualise the depth variations of the foreshore.

The tools for generating the graphs and animations can be found in the timeline (Figure 9, **B**).

5.2.3 Get product information

At any time and for all the products available on the portal, you have the possibility to obtain accurate information on the values and specifications of each data point.

To do this, click on the point on the map for which you need this information, as shown in Figure 10.

Below are two examples of the information that can be obtained for the bathymetry and shoreline change products (Figure 10).

Bathymetry

Selected Point

Latitude: 43° 24.767' N
Longitude: 6° 44.703' E

Layer: saint_raphael_bathymetry_2015-11-17_2020-04-09/saint_raphael_bathymetry_2015-11-17_2020-04-09
Date/Time: 04-09-2017 02:00

Value: 8.393432

Shoreline change

Selected Point

Latitude: 45° 32.681' N
Longitude: 1° 5.918' W

GroupID: 0
TransOrder: 1679
Azimuth: 110.24
ShrCount: 2
TCD: 83900.0
SCE: 17.33
NSM: -17.33
EPR: -9.6

Figure 10 – Select a point to get information about the displayed layer.



5.3 Download the data

All products available on the portal can be downloaded for import into GIS software or for mapping purposes.

To do this, display the order of the product you are interested in, then select one or more dates. Finally, click on the **DOWNLOAD** icon in the timeline (Figure 9).

An archive file is downloaded on your computer.

Terms of use of data downloaded from the Space for Shore portal

All data produced by the Space for Shores project can be downloaded free of charge. However, re-use of the data is subject to the following statement, which must appear on all products derived from the project data.

Consortium Space for Shore, Coastal Erosion Project, European Space Agency, 2022.

5.4 Tools

Tools for measurement and import of external files are available on the portal. They are accessible on the left side of the homepage, as shown in **box 3** of Figure 2.

5.4.1 Measuring an area

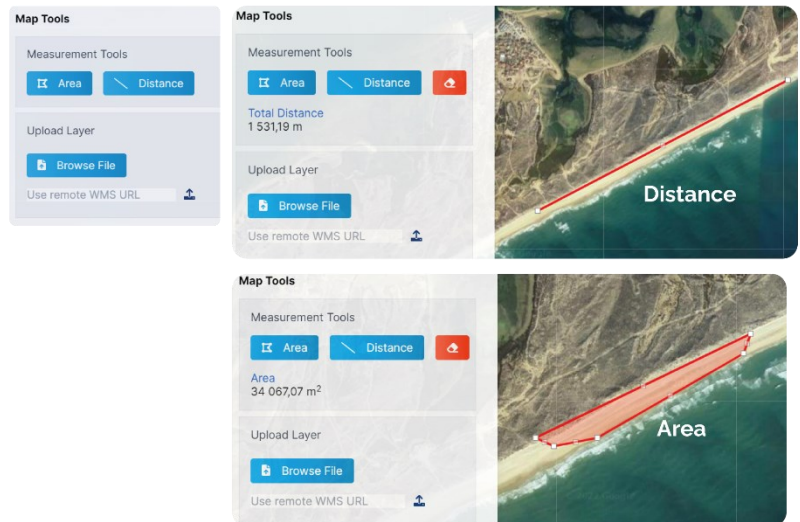
With the **AREA** tool, you can draw a polygon to find out the surface of a given area. It is expressed in square metres. click **ERASE** to make a new measurement.

5.4.2 Measuring a distance

With the **DISTANCE** tool, you can measure a distance between two points in metres.

5.4.3 Importing an external file

You have the possibility to import an external file for display. To do this, you can either (1) import a file stored locally on your computer with the **BROWSE** tool, or (2) import data via a WMS flux by entering its address in the **USE REMOTE WMS URL** field.



6 DESCRIPTION OF DATA COLLECTIONS

6.1 Shoreline position indicators

6.1.1 Unconsolidated coasts

Indicators – Unconsolidated coasts	
Name	Description
Waterline position	This data collection includes shapefiles (lines) for each date for which the waterline position was extracted (frequencies are variable from one site to another). The waterline corresponds to the interface between the submerged and emerged part of the coastal system.
Upper Swash Limit Position	This data collection includes shapefiles (lines) for each period for which the upper swash limit was extracted (frequencies will vary for each AOI). The upper swash limit is obtained by extracting and concatenating several single waterline positions over a period of time, usually during the summer months.
Dune foot position	This data collection includes shapefiles (lines) for each date for which the dune foot was extracted (frequencies will vary for each AOI).
Beach Width	This data collection includes shapefiles (transects) for each period for which the beach width was computed (frequencies will vary for each study site). The beach width is defined as the distance between a reference line indicating the dune foot position, cliff or defence structure, and the waterline delimited at low tide (total beach width), at high tide (upper beach width) or using a time-averaged waterline (average beach width in a microtidal environment).



6.1.2 Cliff coasts

Indicators – Cliff coasts	
Name	Description
Cliff Apex Position	This data collection includes shapefiles (lines) for each date for which cliff apex position was detected (frequencies are variable from one site to another). The line represents the position of the top of the cliff.
Cliff Foot Position	This data collection includes shapefiles (lines) for each date for which cliff foot position was detected (frequencies are variable from one site to another). The line represents the position of the top of the cliff.

6.2 Foreshore indicators

Indicators – Foreshore	
Name	Description
Bathymetry	This data collection includes raster (GeoTIFF) for each date on which satellite-derived bathymetry was retrieved. Each pixel corresponds to a bathymetry value, which is expressed in positive (For example, a pixel value of 8 denotes a depth of eight metres). Conversely, a negative value indicates that the seabed has a higher elevation than the hydrographic elevation reference.
Submerged Sandbar Position	This data collection includes shapefiles (lines) for each date for which submerged sandbars were retrieved (frequencies are variable from one site to another). The line is considered as the position of the sandbar apex.
Tidal Creeks Position	This data collection includes shapefiles (polygons) and corresponds to annual maps of the tidal creeks edge extracted at low tide. Large values correspond to a high probability of the presence of creek edges, corresponding to strong signals in SAR imagery.



6.3 Coastal Dynamics Indicator

6.3.1 Shoreline change

Indicators – Shoreline dynamics	
Name	Description
Upper Swash Limit Changes	This data collection includes shapefiles (lines) for each period over which UPSWA position changes have been assessed. This period could vary in length, depending on image availability and target period. Shoreline change values are compiled in cross shore transects, which are generated every 10m (along shore). Several statistics have been computed and included in Attribute Tables such as NSM (Net Shoreline Movement: distance between the oldest and the youngest shorelines for each transect) and EPR (End Point Rate: calculated by dividing the distance of shoreline movement by the time elapsed between the oldest and the most recent shoreline). Shoreline change values (NSM) and rates (EPR) are expressed in metres.
Upper Swash Area Changes	This data collection includes shapefiles (polygons) for each period over which UPSWA area changes have been assessed. This period could vary in length, depending on image availability and target period. Changes in area are expressed in metres, with negative values indicating area loss and positive values indicating area gain.
Dune Foot Changes	This data collection includes shapefiles (lines) for each period over which dune foot position changes have been assessed. This period could vary in duration, depending on image availability and target period. Shoreline change values are compiled in cross shore transects, which are generated every 50m (along shore). Several statistics have been computed and included in Attribute Tables such as NSM (Net Shoreline Movement: distance between the oldest and the youngest shorelines for each transect) and EPR (End Point Rate: calculated by dividing the distance of shoreline movement by the time elapsed between the oldest and the most recent shoreline). Shoreline change values (NSM) and rates (EPR) are expressed in metres.
Dune Foot Area Changes	This data collection includes shapefiles (polygons) for each period over which dune foot area changes have been assessed. This period could vary in duration, depending on image availability and target period. The area changes are expressed in square metres. Changes in area are expressed in metres, with negative values indicating area loss and positive values indicating area gain.



6.3.2 Foreshore Dynamics

Indicators – Foreshore dynamics	
Name	Description
Bathymetry changes	This data collection includes raster (GeoTIFF) images for each period over which bathymetry changes have been assessed. This period may vary in length, depending on the availability of the images and the period of interest. The values of the changes are contained in the pixels of the raster files. A positive value indicates an increase in depth between the most recent and the oldest date of the study period, reflecting sediment losses (e.g., a pixel value of 3 indicates a depth increase of three metres). Conversely, a negative value indicates a reduction in depth between the most recent and the oldest date of the study period, which reflects sediment gains (e.g., a pixel value of -0.50 indicates a depth reduction of 50 centimetres).

6.3.3 Vertical movements of cliffs and microdeformations

Indicators – Vertical movements of cliffs and microdeformations	
Name	Description
Top of cliff vertical movement	This data collection includes shapefiles (points) for each period for which vertical cliff top movements were derived from ERS and ENVISAT SAR images. The vertical movement values are given for each point in millimetres.
Vertical Land Motion	This data collection includes raster files (GeoTIFF) for each period for which vertical ground movements were derived from SAR images. The vertical movement values are given by pixel in millimetres.

-- END --

