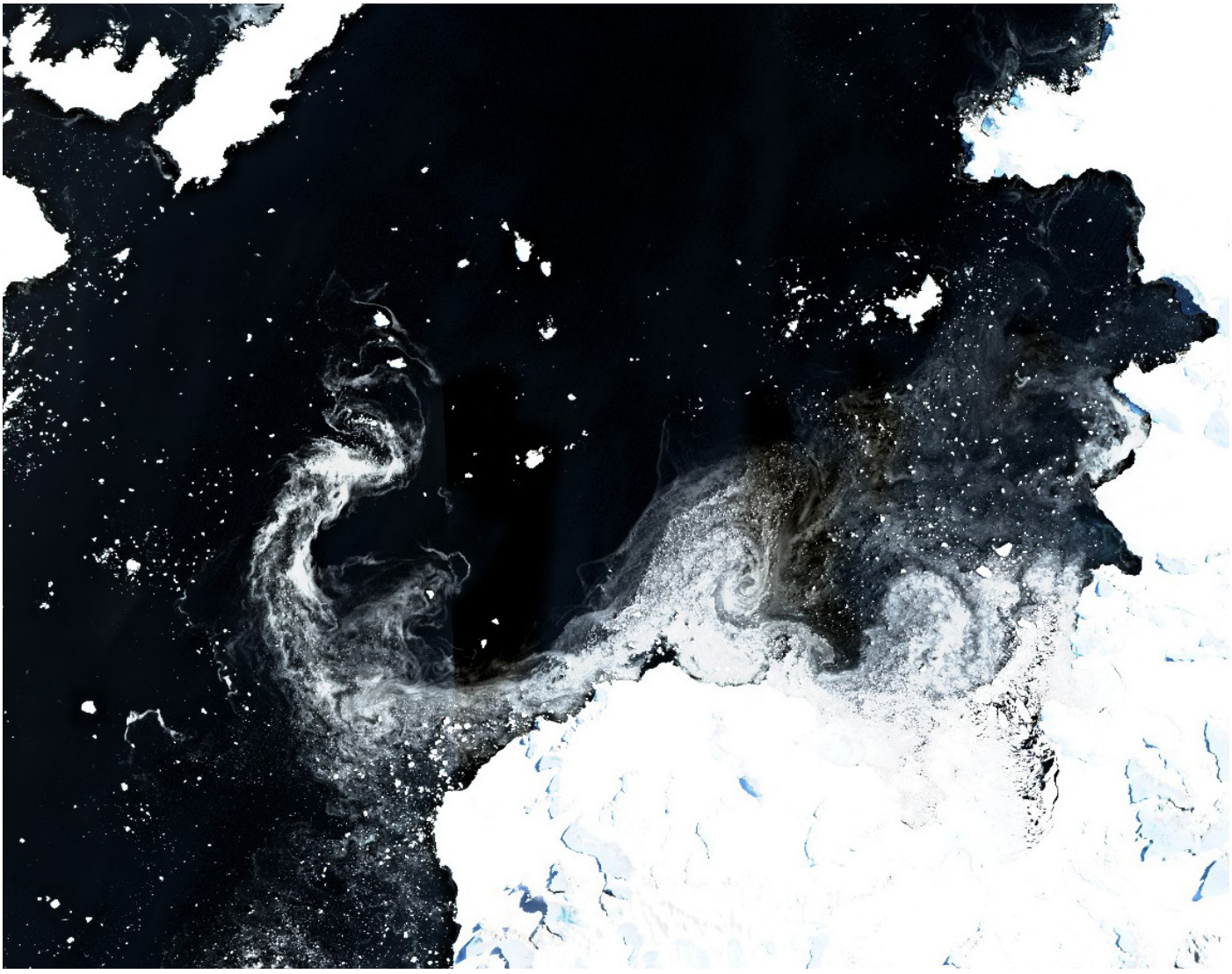
esa

teach with space

USER GUIDE

→ EO BROWSER: QUICKSTART GUIDE FOR EDUCATION

Do-It-Yourself Earth Observation in the classroom



→ EO BROWSER: QUICKSTART GUIDE FOR EDUCATION

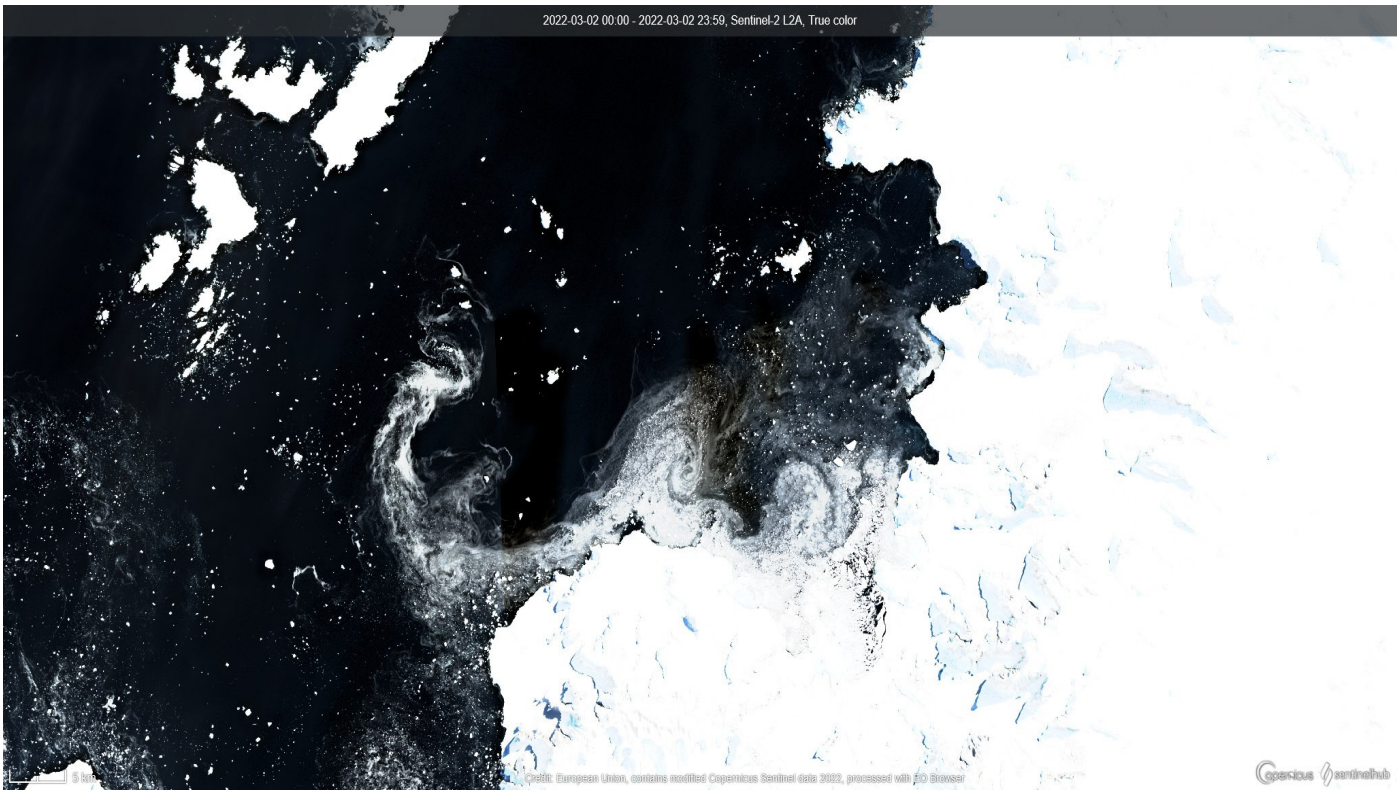
Do-It-Yourself Earth Observation in the classroom

What is EO Browser?

EO Browser (powered by Sentinel Hub with contributions from the European Space Agency) is an online application that provides easy and free access to satellite imagery from different Earth Observation (EO) missions. EO Browser provides ready-to-use satellite images and pre-configured visualisations. It can be accessed from a desktop browser or a mobile device. Have a look and try it for yourself!

How to use EO Browser in Education?

With the EO Browser, you can research satellite images of any area you are interested in (e.g., your city, a glacier, the Amazon rainforest, or an active volcano). It is also possible to download the images in different formats. Changes on Earth that have taken place in the last 30 years can be analysed with the compare function or by creating a time-lapse. You can explore the changes in the landscape through the seasons, measure the size of a deforested area or investigate the consequences of a volcanic eruption. The images can be viewed in 'true color', that is how we see the world with our eyes. However, Earth can also be explored from different perspectives! To do this, there are different visualisation options that enable you to see the world through the eyes of a satellite! For example, you can investigate the health of vegetation or the chlorophyll content of water bodies by selecting one of the many available indices used by scientists. It's also possible to study the atmosphere and investigate air pollution. EO Browser allows interdisciplinary activities and can be used to support STEM lessons and projects that can be developed in the classroom, such as the Climate Detectives school project.



↑ Pine Island Glacier.

A. Start Exploring

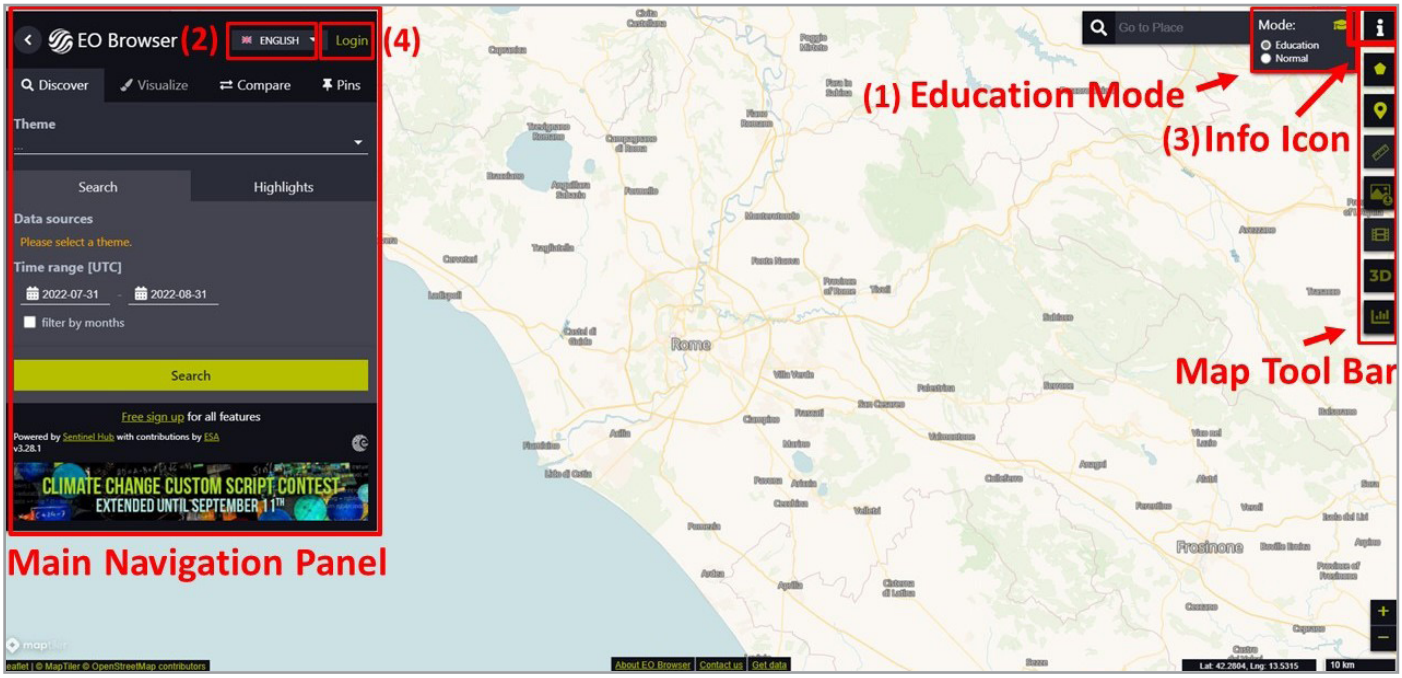
Getting to know the EO Browser: Education layout

EO Browser has two different modes available: Normal and Education. We will use EO Browser (https://apps.sentinel-hub.com/eo-browser/) in the **Education mode** which gives the option to access specific satellite data tailored to a selected theme. Themes cover different topics, from agriculture to atmosphere and air pollution, to volcanoes and wildfires.

1. In the top right corner of your EO Browser screen, click on the academic hat icon (1) and choose **Education**. This mode can also be accessed directly via the corresponding URL: https://apps.sentinel-hub.com/eo-browser-education/

2. EO Browser is available in different languages. You can select the language (2) in the main Navigation Panel.

3. By clicking on the info icon (3) in the top right corner, you can watch a tutorial to learn more information about the different options in the map toolbar and the main navigation panel.



Creating an EO Browser account (Optional)

1. On the top right of the Main navigation Panel, click on the **Login** button (4).

2. Click on **Sign Up** and create your own free EO Browser user account.

NOTE: You can still use EO Browser without a user account and download satellite images. However, to use some of the map toolbar features like the time-lapse function and to save your pins, you need to be logged in!

B. Find your satellite image

Search for images

1. Search for the location of your interest either by scrolling over the map with the mouse or by entering the location in the search bar on the right side of your screen (1).

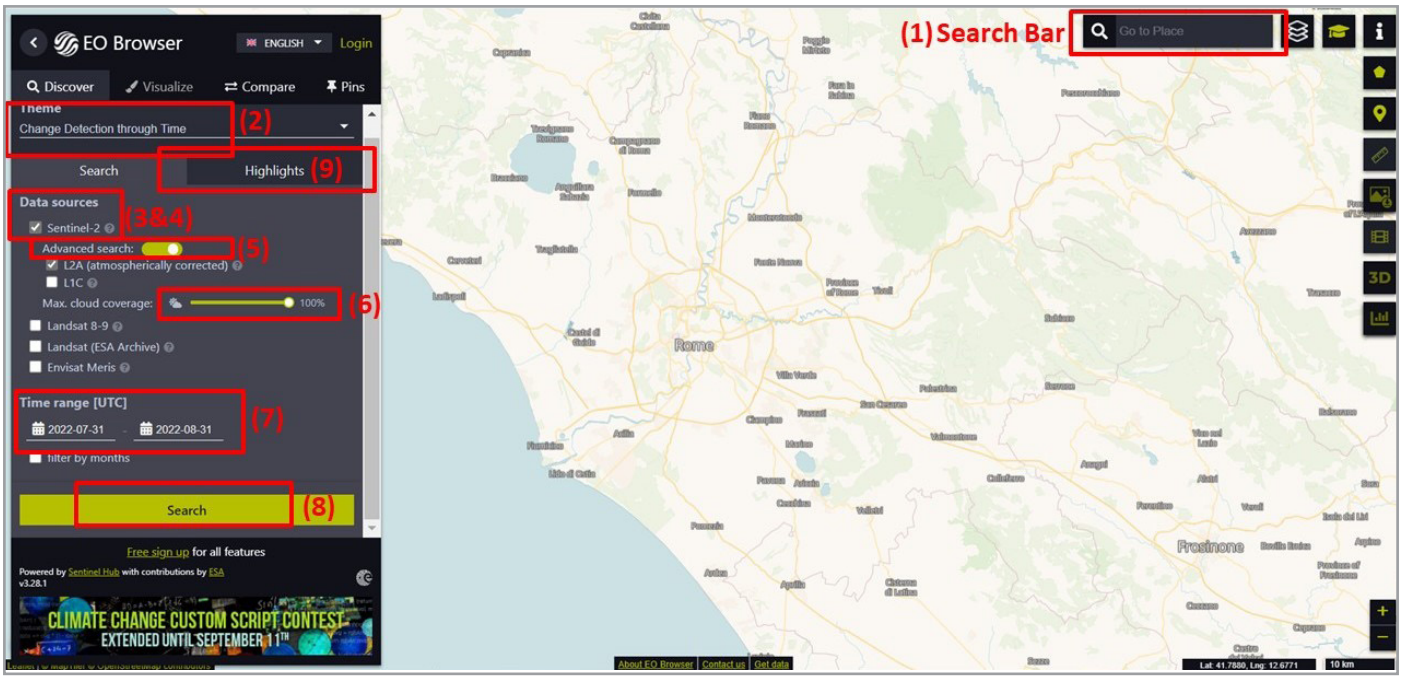
2. Select a predefined **Theme** (2) and choose from which satellites you want to receive the data (checkboxes on the left side of your screen (3)). You can find a brief description of each satellite and its main characteristics by clicking on the question mark icon (4).

> **TIP**
>
> To find a good satellite image that shows a cloudless and clear image, select **Advanced search** (5), and, if applicable, select **Max. cloud coverage** (6).

3. The final step to find an image is to select the **Time range** (7). You can select the date by either typing the date or selecting it from the calendar.

> **TIP**
>
> To get better and faster search results, you can check the data availability for the selected satellite. To do this, click on the question mark icon that appears next to each satellite.

4. To see the results of your search click on **Search** (8).



> **TIP**
>
> Under **Highlights** (9), you will find a pre-selection of interesting locations connected to the selected theme that can inspire you to explore further.

Results

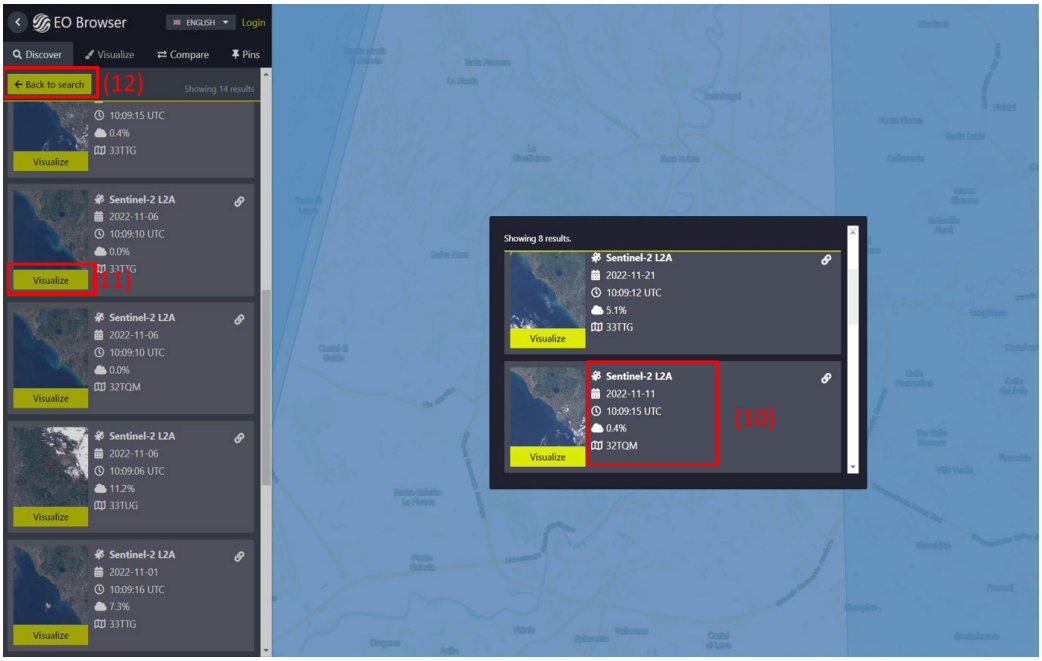
1. You should now see the list of results on the left side of your EO Browser screen.

2. Select one of the tiles shown on the map or in the results list with the least cloud coverage. The image information **(10)** is displayed next to the thumbnail:

   - Sensing date – date when it was taken
   - Sensing time – time when it was taken
   - Cloud Coverage – not all satellites are equipped to take images through clouds, so this icon explains how much of the image is covered by clouds in %
   - MGRS Location (Millitary Grid Reference System Location) – standardised system for geo-coordinates around Earth

3. Clicking on the **Visualize** **(11)** button or thumbnail image will open the **Visualisation tab**.

4. If you don't find the image you are looking for, click **Back to search** **(12)** to change the search settings



NOTE: It's not always easy to find the perfect image. Even scientists sometimes have trouble finding the data they need. You need to be persistent and not give up!

C. Visualise and download your satellite image

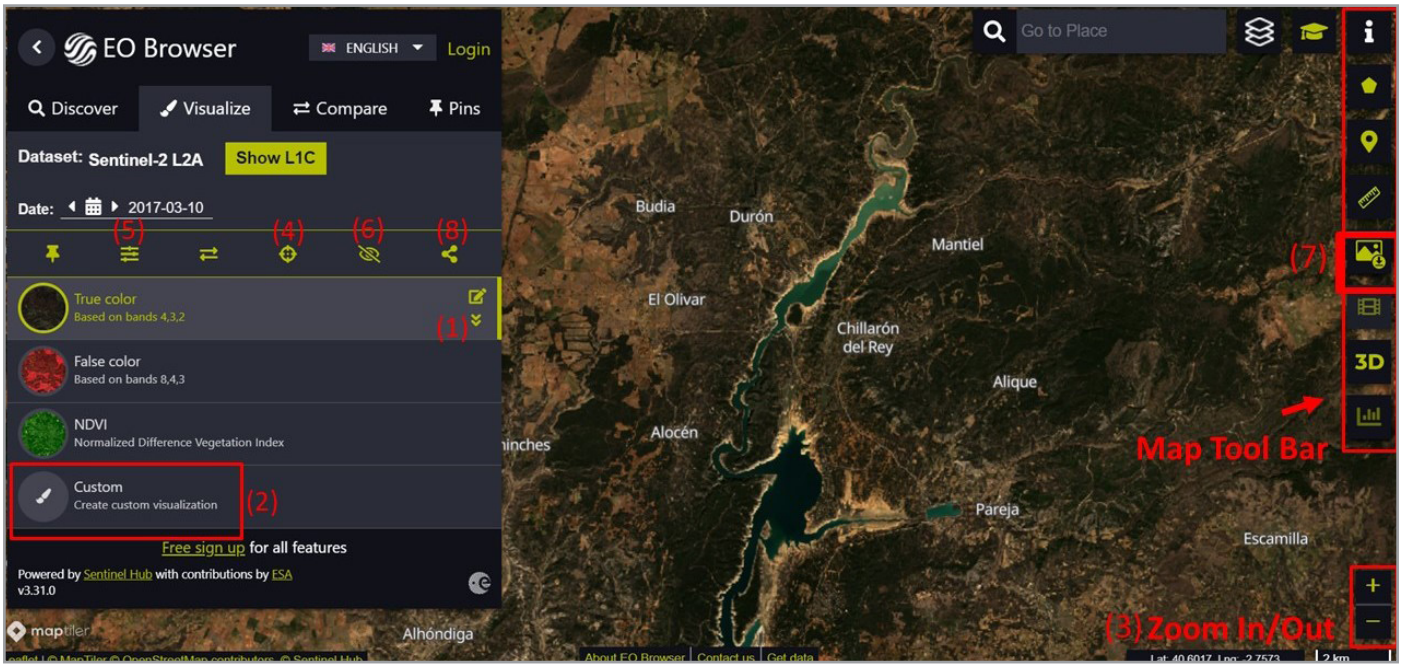
1. After you have selected an image, you can choose among different visualisation* options (True color, False color, NDVI, etc.). Most visualisations are accompanied by an explanation and a legend, which you can view by clicking on the expand icon. **(1)**

TIP

You can also make your own visualisations! Select **Custom** **(2)** and have fun exploring the different band combinations. For more information, see the Links section.

*What is a visualisation?

Satellites carry sensors that image the Earth in different ranges of the electromagnetic spectrum. No single sensor is sensitive to all wavelengths of the electromagnetic spectrum. The recorded wavelengths are referred to as (spectral) bands. To display satellite images in the browser often different bands are mapped to the red, the blue and the green channel.
The True color visualization uses visible light bands: red, green, and blue, which resembles what our eyes naturally see. However, satellites also record the wavelengths that our eyes cannot see! Therefore, other visualizations (other combinations of bands) can give us additional information. A false color visualization uses at least one non-visible wavelength. One of the most common false-color band combinations uses near infrared, red and green bands. It is very useful to assess vegetation health, as plants reflect near infrared and green light, while absorbing red.



2. Additional features that allow you to explore the image in more detail:

   - Zoom in and out the image by using the plus and minus in the right lower corner (3) or zoom to the centre of the tile by clicking on the crosshair (4).
   - Select advanced options like the sampling method or apply different effects such as contrast (gain) and luminance (gamma) by clicking on the effect sliders icon (5).
   - Hide or show the layer for the satellite image (6).

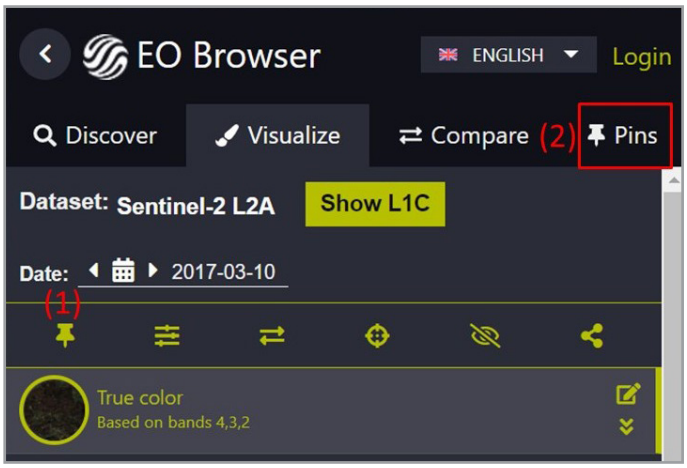
3. To download the image you are working with, go to the Map toolbar (on the right side of your screen) and select Download Image (7). The images can be downloaded in various file formats. If you don't have an account, you can only download the images in JPG or PNG format.

TIP

After a satellite image has been loaded, you can share the link to the satellite image with the same view and zoom by clicking on the Share button (8) in the Main Navigation Panel. This is the direct link (https://sentinelshare.page.link/HgGf) to the image above.

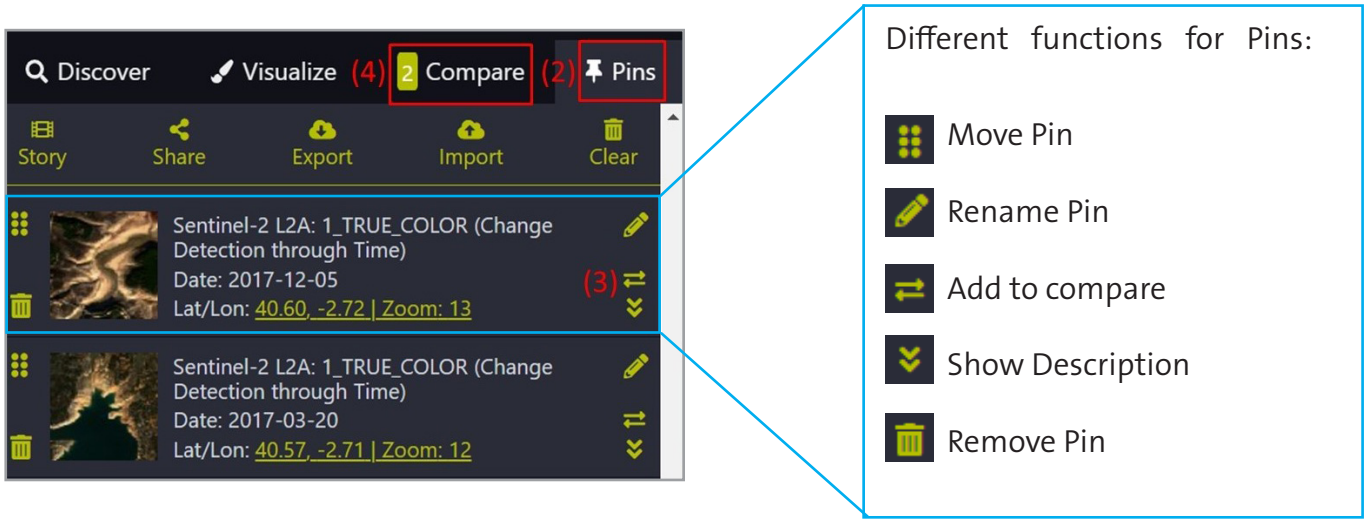
D. Work with your satellite images

Pins and Image Comparison



1. If you want to save an image for later use, you have to pin it. By clicking on the pin icon (1), you ensure that your image is saved in the **Pins** tab (2) and that you can use it again at any time. Make sure you are logged in, otherwise your pins will not be saved.

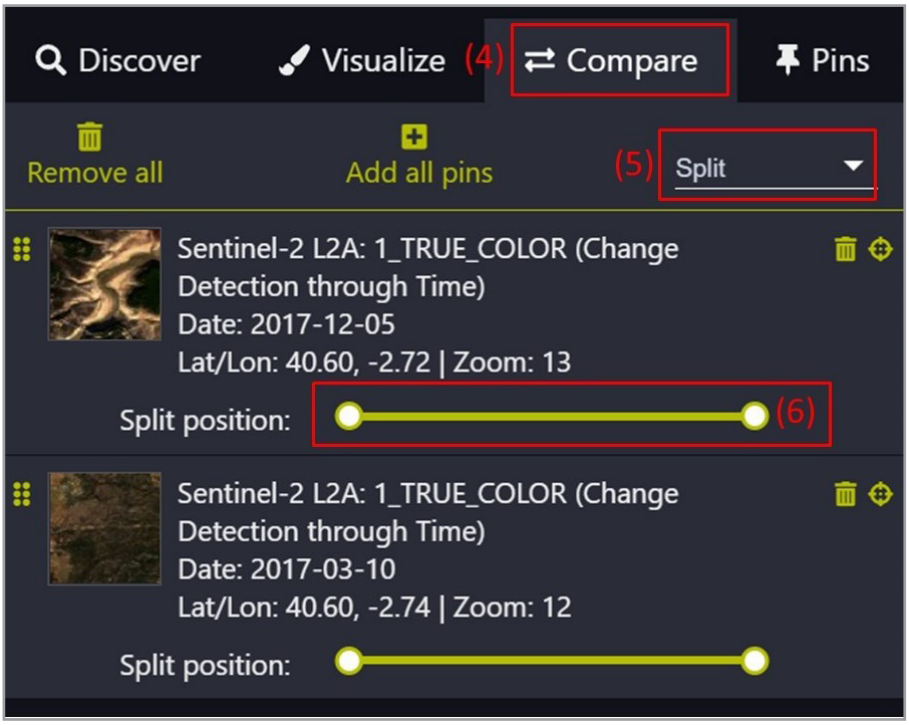
2. You have to pin images to use the **Compare** function. With this function you can compare two or more pinned satellite images. These images can be found in the **Pins** tab (2).

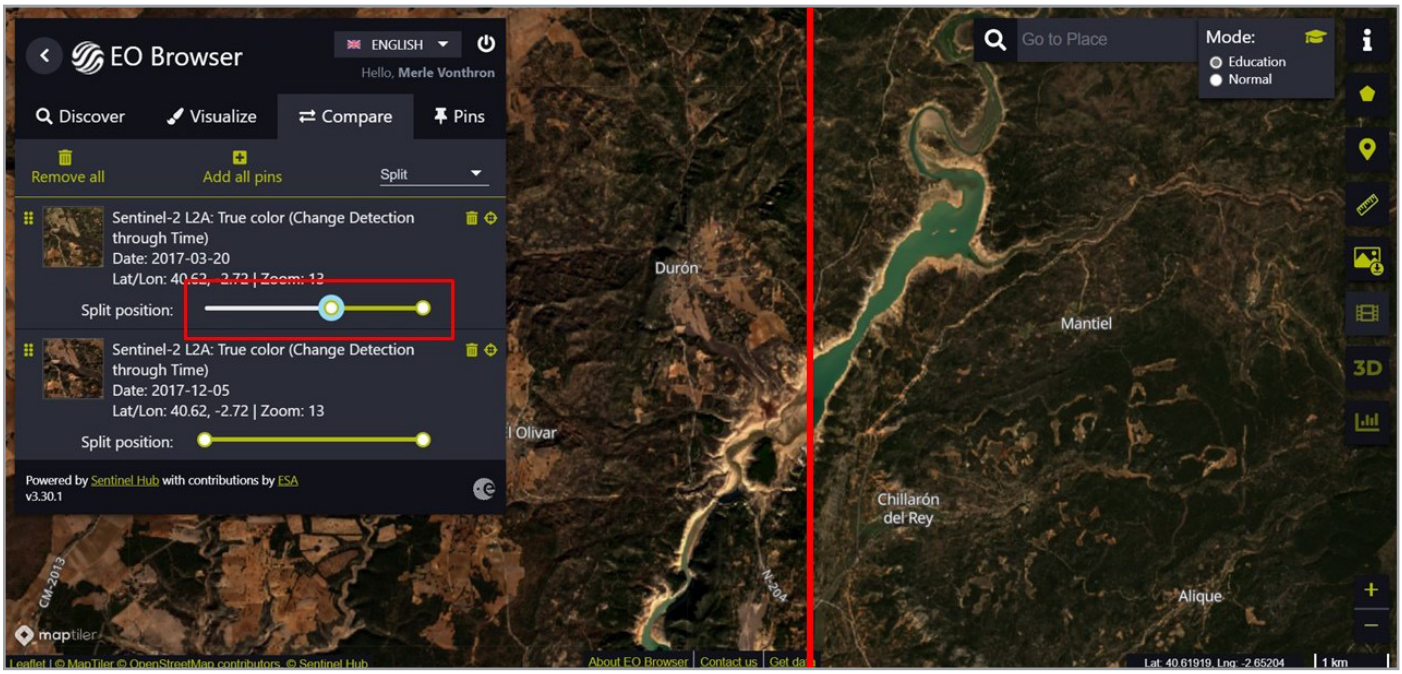


3. To start the **Compare** function, choose at least two different satellite images from the **Pins tab**. They can be from different time periods, but they must have the same location in order to investigate a change over time. Once you've decided which images you want to compare, click the Add to Compare icon (3) for each image. This will add them to the **Compare** tab (4). The number next to the **Compare** tab shows you how many images you've added for comparison. In our case there are two.

4. Open the compare tab (4) by clicking on **Compare**.

5. Select Opacity or Split mode (5) and move the sliders (6) to see the comparison of your images. If you choose the Split option, you will see a side-by-side comparison of your two images, as in the example below.



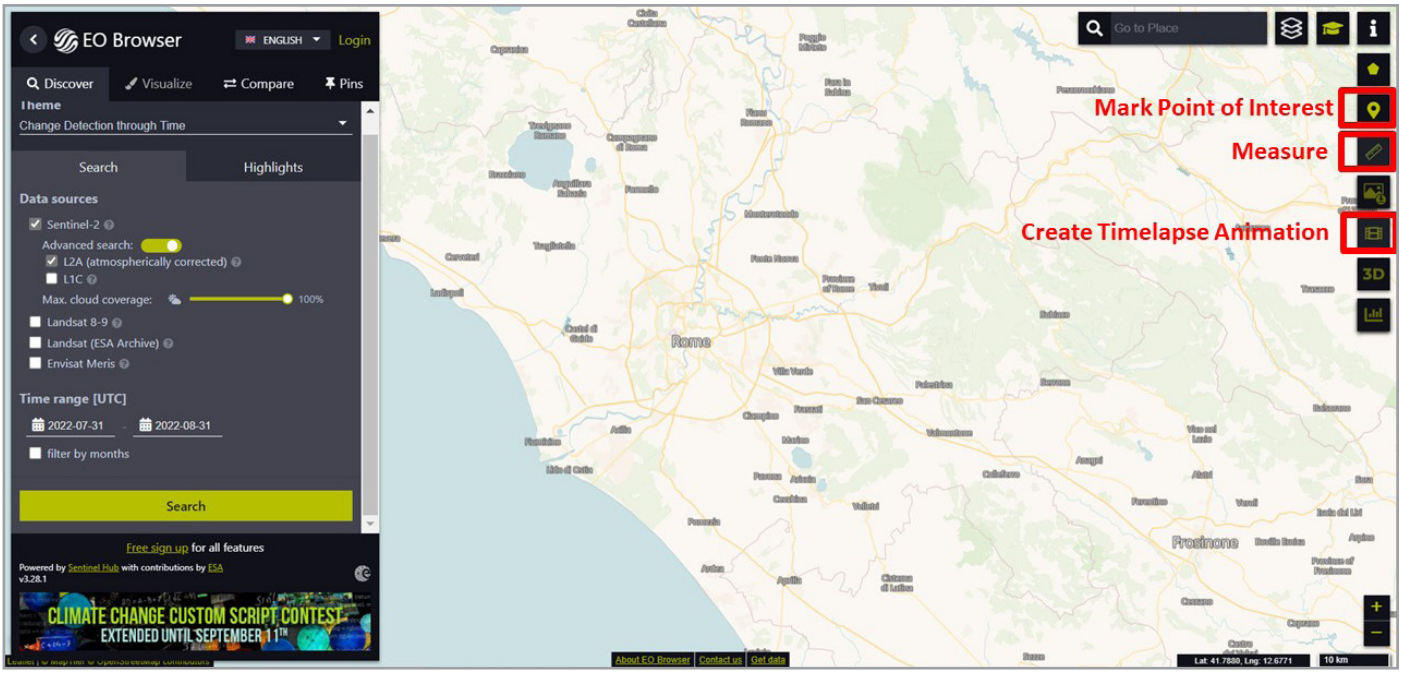


Example: Comparison of the Entrepeñas Reservoir, Spain, In March and December 2017.

E. Explore more in EO Browser

This guide gives you an overview of the basic functionality of EO Browser. With EO Browser you can travel back in time and even access images taken by satellites that are no longer in operation, but their data is stored in a huge database! To do this in the Education mode, all you need to do is select the **Change Detection through Time** theme and choose the satellite according to the time period in which you are searching for images. Click on the question mark next to each satellite to get more information about the different satellites.

Have a look at the map toolbar on the right and discover how to mark a point of interest, measure distances and areas, or create a time-lapse. You can even perform statistical analysis. For more information, see the EO Browser User Guide and explore EO data on the EO Browser home page.



→ Links

ESA Projects

ESA's Earth Observation missions
esa.int/Our_Activities/Observing_the_Earth/ESA_for_Earth

Climate Detectives school project
https://climatedetectives.esa.int/

EO Browser

EO Browser platform
https://apps.sentinel-hub.com/eo-browser/

EO Browser – educational mode
https://apps.sentinel-hub.com/eo-browser-education/

EO Browser Videos

How to download a satellite image on EO Browser
https://youtu.be/kfTKo_2ESqo

How to create a timelapse using EO Browser
https://youtu.be/bPuKE2Vplag

Sentinel Hub Webinar: Introduction to EO Browser
https://www.youtube.com/watch?v=eKoOMn5H-kY

Sentinel Hub Webinar: Create Beautiful Satellite Images with EO Browser
https://www.youtube.com/watch?v=02Xbbu1PHdg

EO Browser Tutorials/ User guides

EO Browser user guide
https://www.sentinel-hub.com/explore/eobrowser/user-guide/

Custom Scripts Tutorial – Create your own visualisations with EO Browser
https://www.sentinel-hub.com/explore/education/custom-scripts-tutorial/