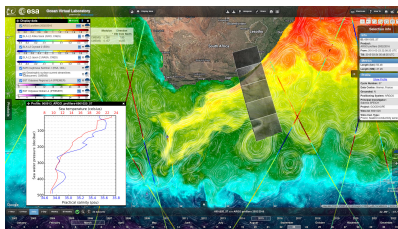Ocean Virtual Lab

Developed by

Funded by

Sponsored by

Earth Observation missions generate a large amount and variety of satellite data, treasure troves waiting to be fully exploited but currently underused because their data format, volume and complex geometry constitute a barrier for many users.

To help remove this barrier and foster data synergy exploitation, open tools such as the Ocean Virtual Laboratory (https://ovl.oceandatalab.com) were developed with ESA support, making data discovery, access and analysis a rather easy task for science users.

Ocean Virtual Laboratory https://odl.bzh/fn-IFecI

The main objectives of the OVL-NG project are:

- to prolong the ESA/Copernicus data visualisation and promotion activities started in OVL and S3VIEW
- to improve tools and services based on user feedback
- to explore ways for improving the sustainability of these services in the long term
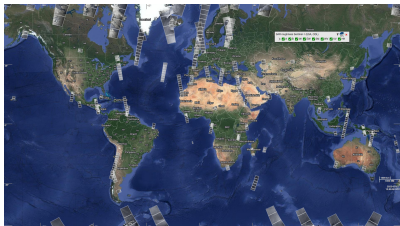
The sponsored resources were used to extend the temporal coverage of Sentinel-1, Sentinel-3 and Sentinel-6 data available in the OVL portal for three months, from February to April 2023.

OVL only needs the original L1 and L2 files for generating images and extracting some metadata, so downloading all these files to discard them shortly after would be a waste of network bandwidth. Another aspect to consider is the evolution of storage requirements for keeping the generated images available in OVL: with several years worth of Sentinel-1, Sentinel-3 and Sentinel-6 acquisitions, OVL generated about 300 TiB of images and this amount keeps growing with the unending stream of incoming observations.
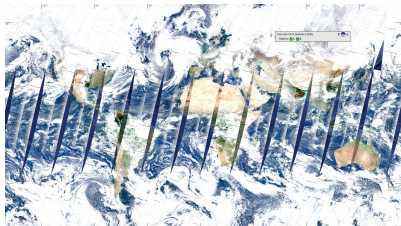
For these reasons, implementing OVL on a platform offering Infrastructure as a Service (IaaS) as well as direct access to the Sentinel data solves both the network bandwidth and storage scalability issues, which is why part of OVL is running on a DIAS.

The processing chains and infrastructure required for OVL were set up on Creodias earlier in the project, and storage already had the capacity required to save new results, so the temporal coverage extension has been achieved simply by operating the system for three more months.
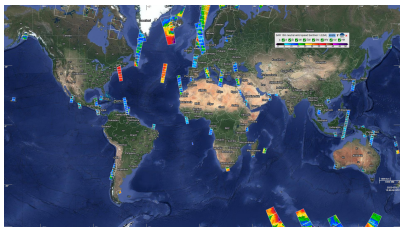
Sentinel-1A SAR roughness
https://odl.bzh/DzaHOPc8

Sentinel-3A/B OLCI true RGB
https://odl.bzh/HWDhOPRc

Sentinel-1A SAR wind
https://odl.bzh/G2KGY-ie
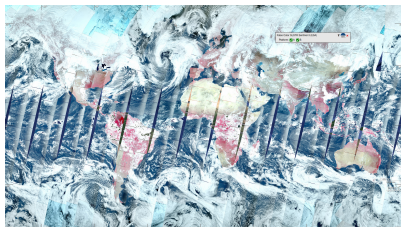
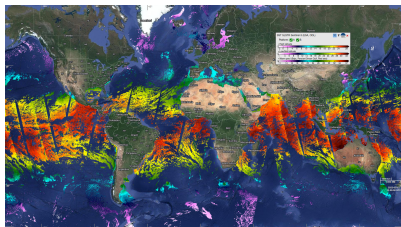

Sentinel-3A/B SLSTR false RGB
https://odl.bzh/4PPtXwT5

Sentinel-3A/B OLCI NIR brightness contrast
https://odl.bzh/F1yE4_5G
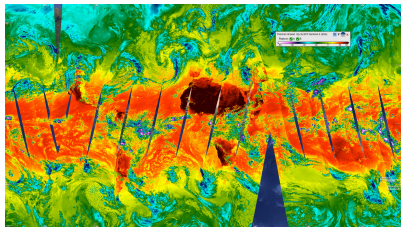
Sentinel-3A/B SLSTR 12µm brightness temperature
https://odl.bzh/BRSva5tr
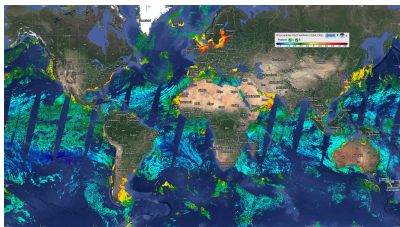
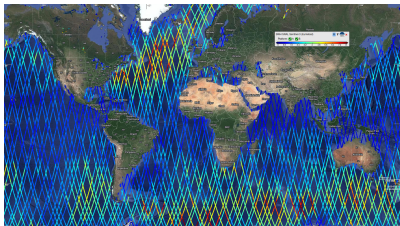Sentinel-3A/B OLCI chlorophyll-a
https://odl.bzh/CkodqCeC

Sentinel-3A/B SLSTR sea surface temperature
https://odl.bzh/8iGukUIU

Sentinel-3A/B SRAL 1Hz significant wave height
`https://odl.bzh/mbDY1hwI`
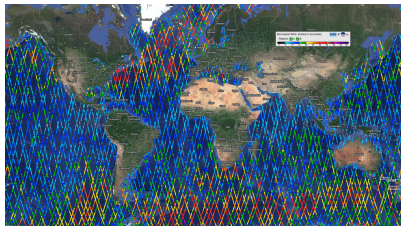
Sentinel-3A/B SRAL 1Hz wind speed
`https://odl.bzh/1TbbppZ9`
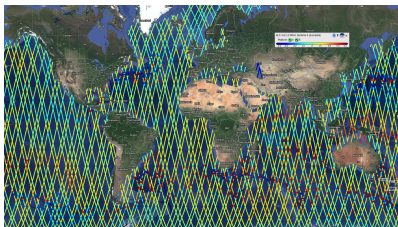
Sentinel-3A/B SRAL 1Hz sea level anomaly
`https://odl.bzh/NRGVn7Vb`

Sentinel-3A/B SRAL 1Hz brightness temperature
23.8GHz beam
`https://odl.bzh/QKCMop04`
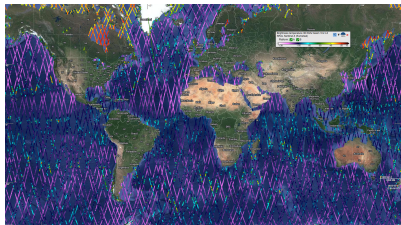
Sentinel-3A/B SRAL 1Hz brightness temperature
36.5GHz beam
`https://odl.bzh/4rB78w_M`
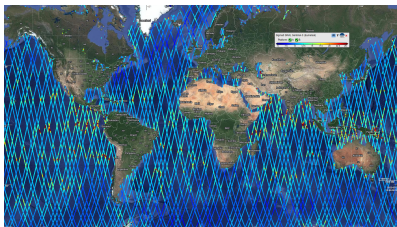
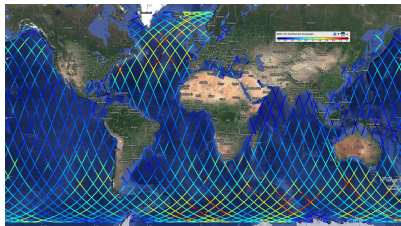Sentinel-3A/B SRAL 1Hz sigma0
`https://odl.bzh/HHYS_21M`

Achievements - temporal coverage extension
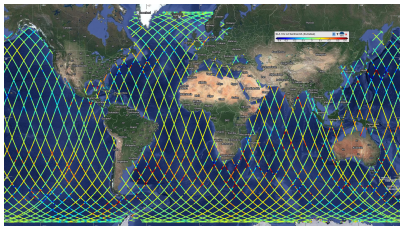
Sentinel-6A 1Hz sea level anomaly
https://odl.bzh/KE3sMUMO

Sentinel-6A 1Hz significant wave height
https://odl.bzh/y0ziYaMc
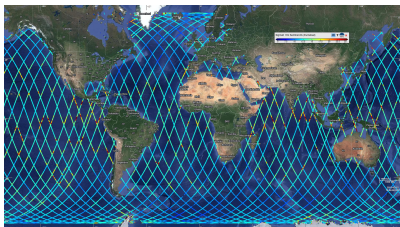
Sentinel-6A 1Hz sigma0
https://odl.bzh/7WRKKcOH
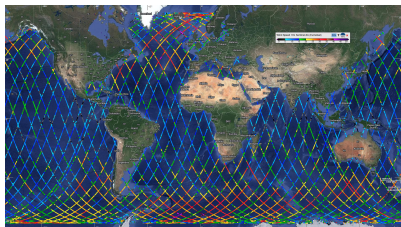
Sentinel-6A 1Hz wind speed
https://odl.bzh/no1EtKdD

OVL processing chains previously relied on Creodias API to filter out Sentinel-1 acquisitions on land but switched to a custom implementation based on the GSHHG data set (`https://www.soest.hawaii.edu/pwessel/gshhg/`) to process data only for oceans, coastal areas and inland large water bodies.
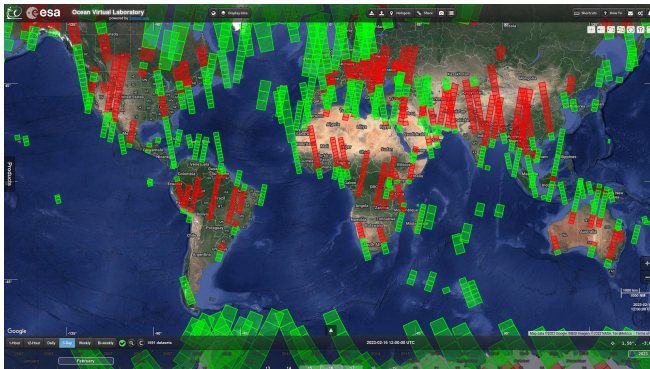
Results of the new filter: acquisitions on land are discarded (red) whereas acquisitions on water are processed (green).

Achievements - Improved land mask

This new implementation is more accurate and revealed many acquisitions in the southern ocean and on the coasts of Antarctica that the previous filter had erroneously discarded (Creodias has migrated to a new API and removed the faulty filter since then).
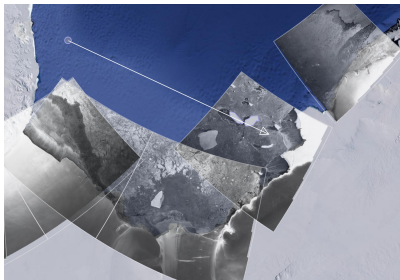
Sentinel-1 data are published in OVL using Creodias since 2021-11-01 so there were many acquisitions missing due to this issue but OVL has now recovered them.

This work has notably been helpful to users trying to locate under-ice ARGO floats in the Weddell Sea.

Sentinel-1 acquisitions in Weddell Sea with old filter
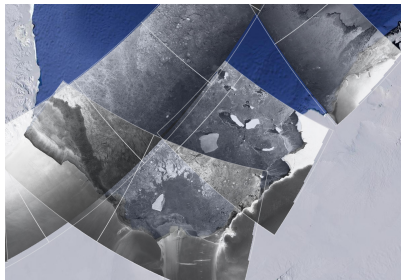
Sentinel-1 acquisitions in Weddell Sea with new filter

Offering an easy way to see the content of near real time Sentinel data allowed users to quickly browse satellite acquisitions to detect interesting physical phenomena, and then to visually compare measurements from different satellites and other data sources as a starting point for discussions and further studies.

OVL does not track its users (and does not intend to), so measuring the impact of the resources sponsored by the NoR can only rely on anonymous web statistics, as well as links and screenshots published publicly on websites or social media. It is also not rare to see Sentinel data displayed in OVL during workshops and conferences.

Several publications using Sentinel data from OVL have been found on the SEAShot website (https://seashot.odl.bzh) which allows users to share their findings on topics such as ocean currents or wind farms.

On SEAShot, user AlexEddy shared an animation based on several scenes of chlorophyll-a concentration measured by Sentinel-3 showing how spring bloom can reveal sub-mesoscale structures.

`https://seashot.odl.bzh/s/zr4VyKvBUIk`
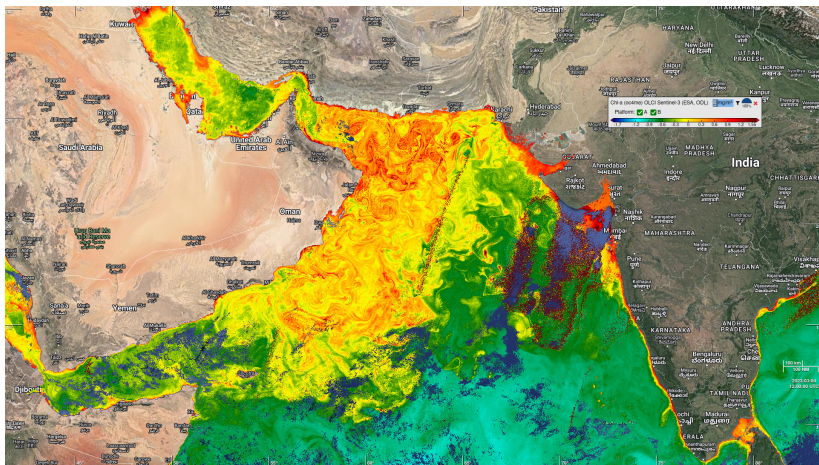
On SEAShot, user daniel shared a scene in the North Sea where the wake of offshore wind farms is clearly observed on Sentinel-1 SAR roughness.

https://seashot.odl.bzh/s/a4TNGlKMXFI
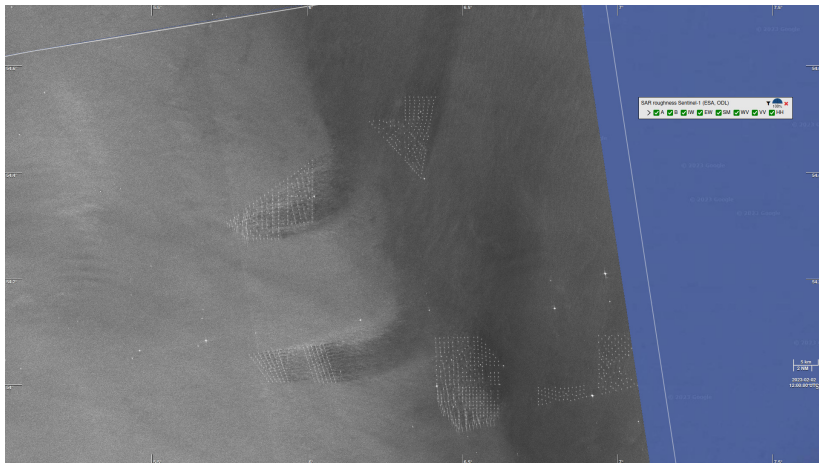
The anonymous monthly statistics collected when users visit the OVL online portal (`https://ovl.oceandatalab.com`) show that despite some variations from month to month, the overall number of visitors has kept increasing during the February-April 2023 period.

As a consequence, offering visualisation for Sentinel NRT data during that time frame allowed more users to discover and exploit these satellite acquisitions.