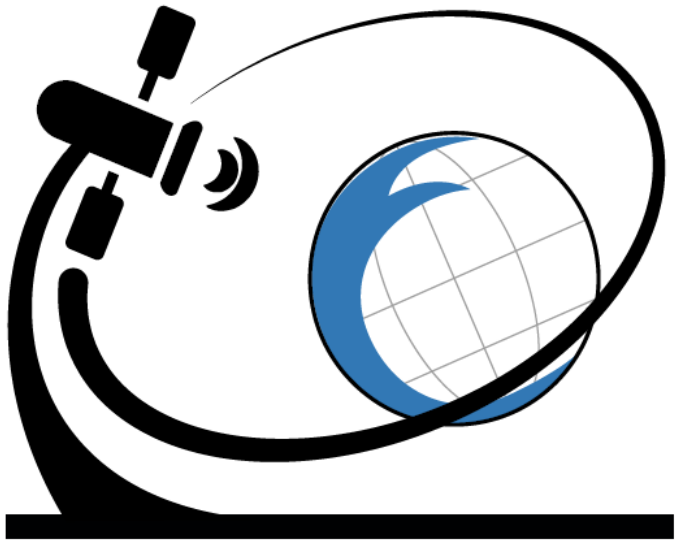


Ocean Virtual Lab

Developed by

OceanDataLab

Funded by

esa

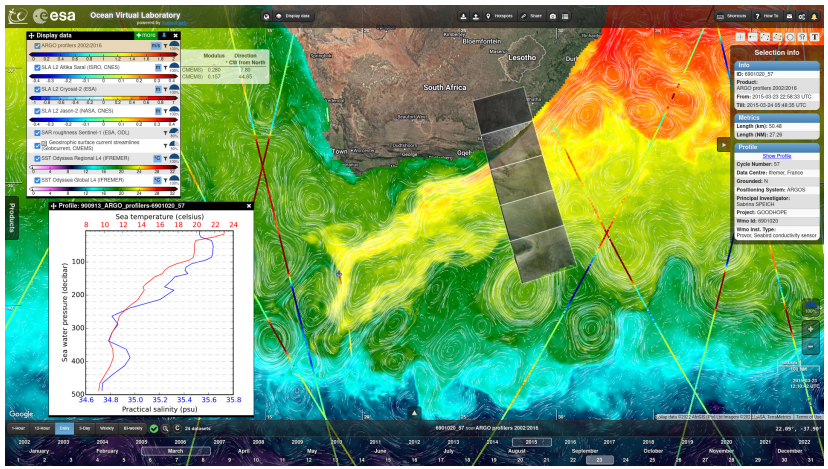
Sponsored by

NoR

Objectives

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 until the end of 2022, and to keep the results online in January 2023.

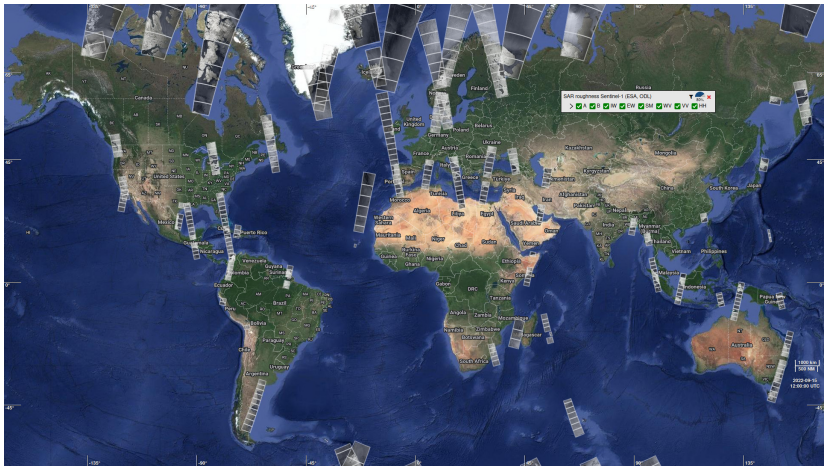
OVL only needs the original L1 and L2 files for generating images and extracting some metadata, so downloading all these files to discard them shortly after would be a waste of network bandwidth. Another aspect to consider is the evolution of storage requirements for keeping the generated images available 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.

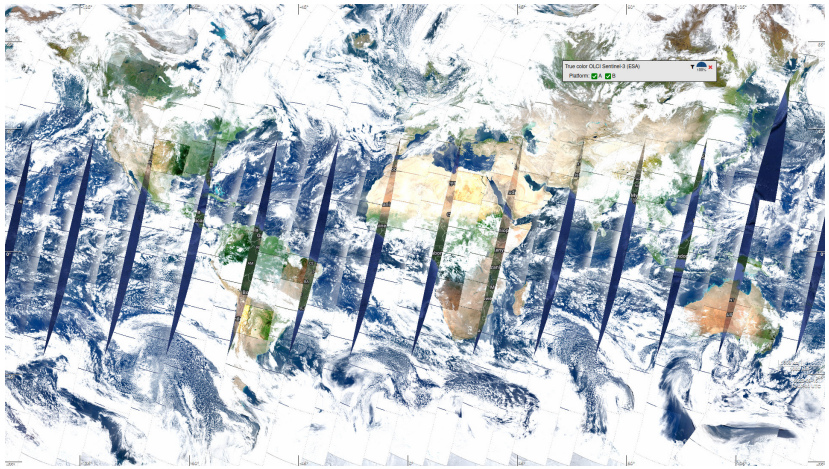
The processing chains and infrastructure required for OVL were set up on Creodias earlier in the project, so the temporal coverage extension has been achieved very easily by allocating new storage resources to save new results, and by using these new data stores as targets for the processing chains.

The OpenStack dashboard offered by Creodias allows users to perform these operations (allocating and assigning storage resources) in a few clicks.

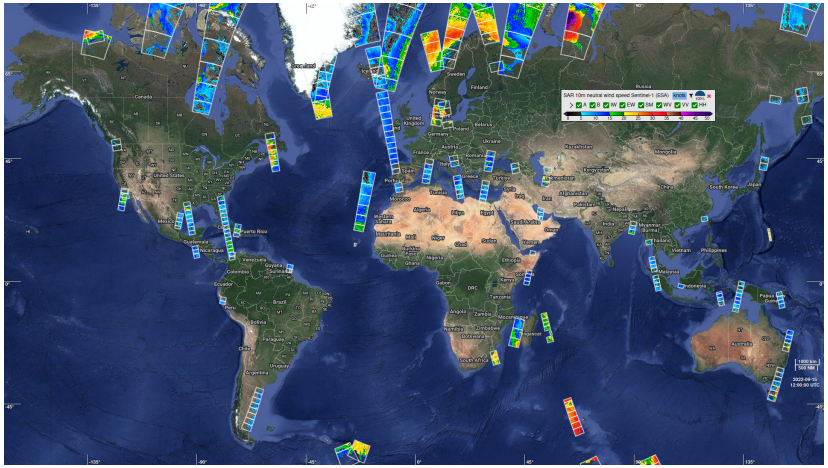
Achievements - temporal coverage extension



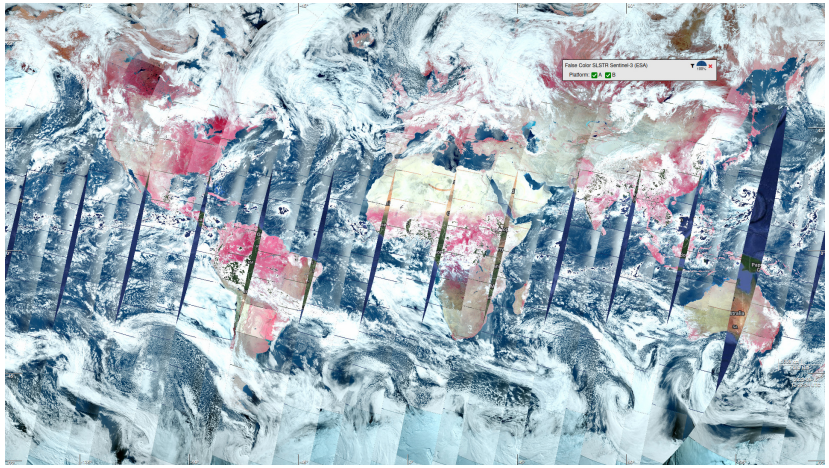
Sentinel-1A SAR roughness
`https://odl.bzh/Mr92i_aN`



Sentinel-3A/B OLCI true RGB
`https://odl.bzh/L9uzcwCJ`

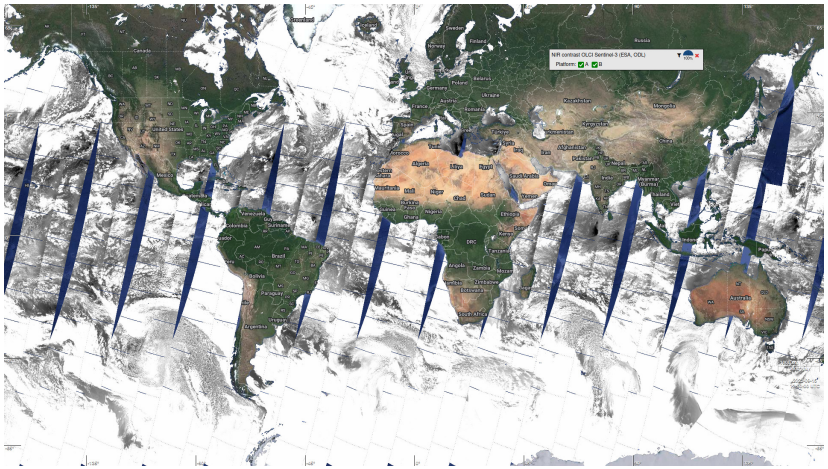


Sentinel-1A SAR wind
`https://odl.bzh/xnpEoXwC`

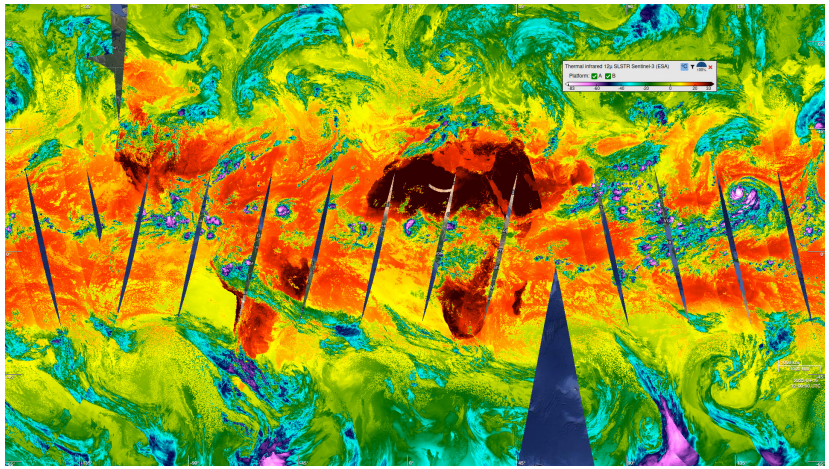


Sentinel-3A/B SLSTR false RGB
`https://odl.bzh/AwXYm8R7`

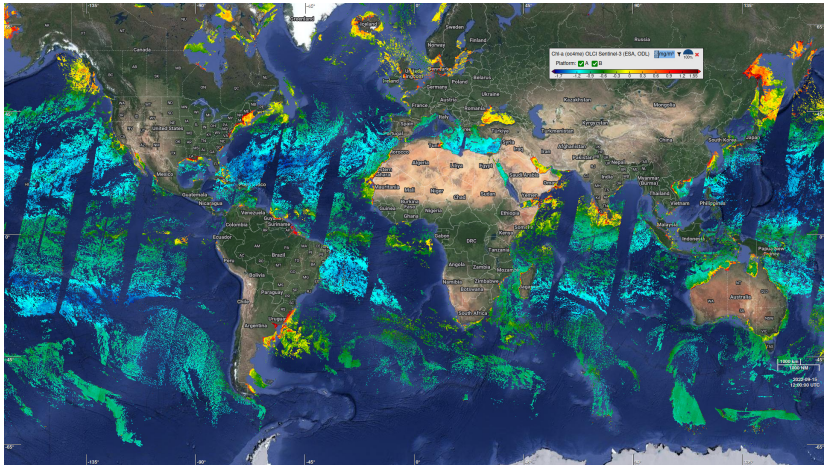
Achievements - temporal coverage extension



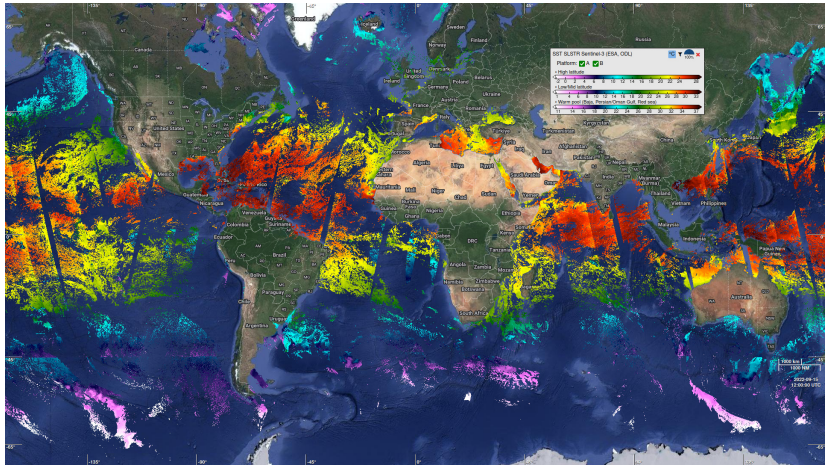
Sentinel-3A/B OLCI NIR brightness contrast
`https://odl.bzh/dVUUV8sd`



Sentinel-3A/B SLSTR 12µm brightness temperature
`https://odl.bzh/YmdrK2-2`

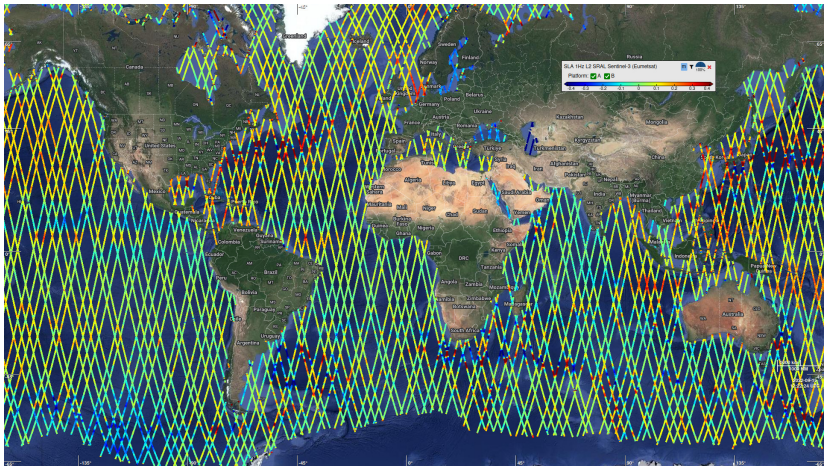


Sentinel-3A/B OLCI chlorophyll-a
`https://odl.bzh/Dqcu-M5V`

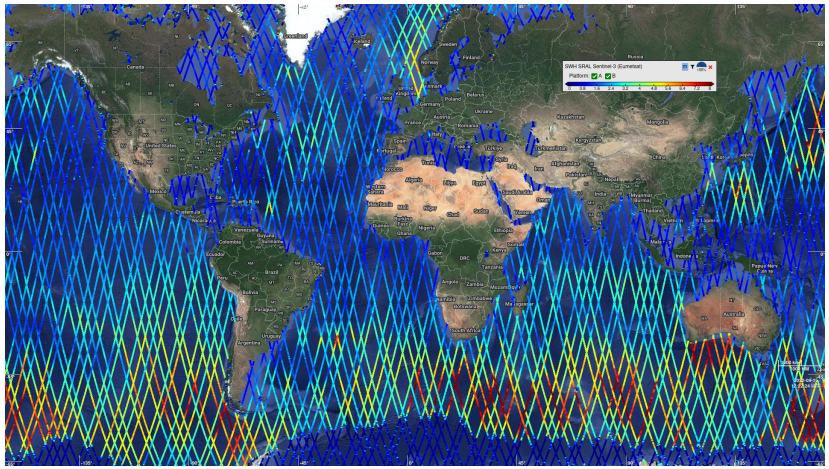


Sentinel-3A/B SLSTR sea surface temperature
`https://odl.bzh/JN2e0Kiz`

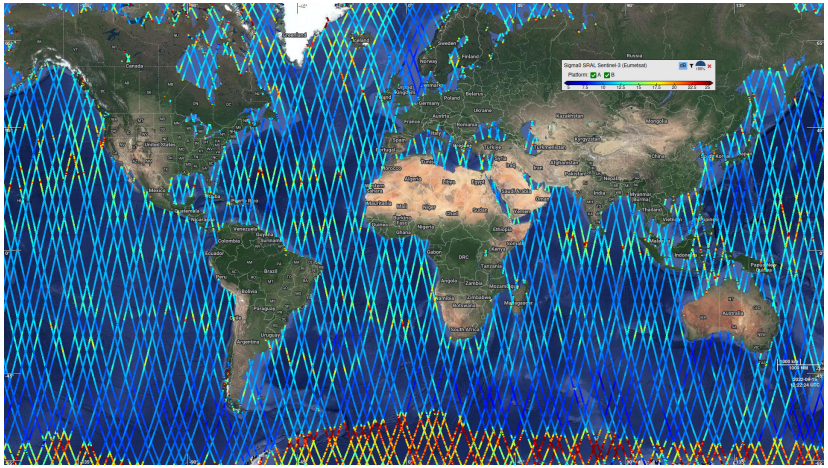
Achievements - temporal coverage extension



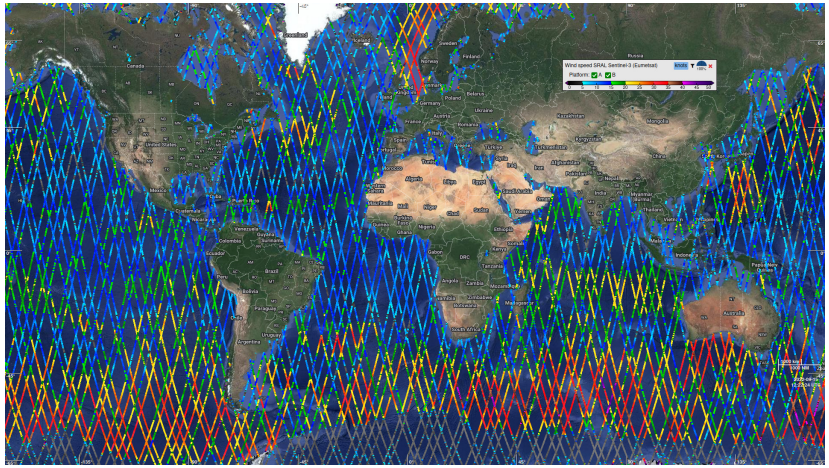
Sentinel-3A/B SRAL 1Hz sea level anomaly
`https://odl.bzh/UMwOpnon`



Sentinel-3A/B SRAL 1Hz significant wave height
`https://odl.bzh/GdAA342k`

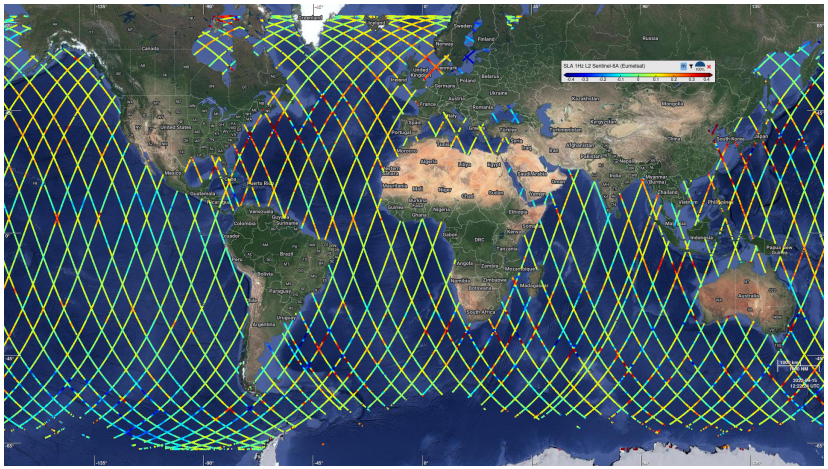


Sentinel-3A/B SRAL 1Hz sigma0
`https://odl.bzh/GohUk8MY`

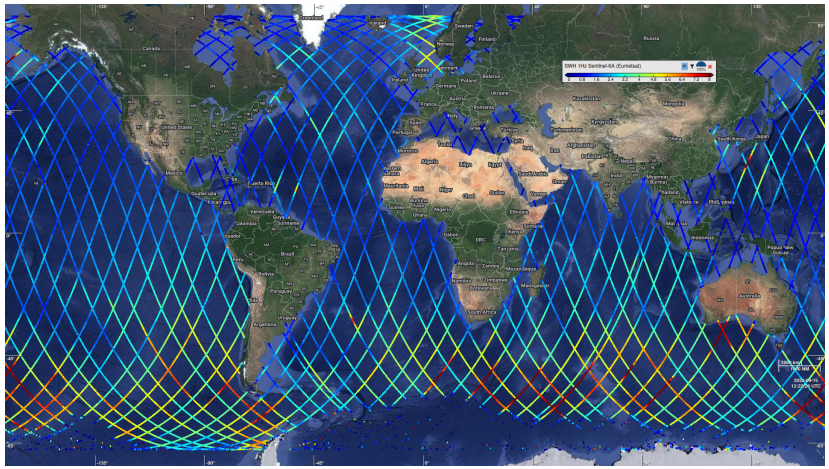


Sentinel-3A/B SRAL 1Hz wind speed
`https://odl.bzh/80p6Dkxn`

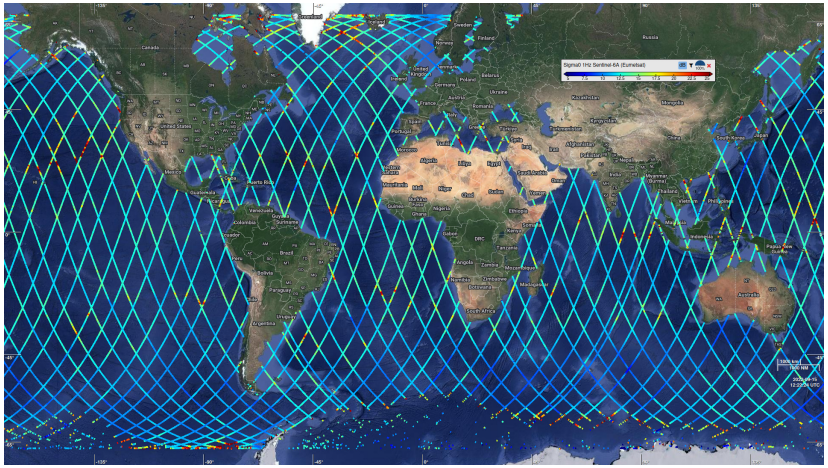
Achievements - temporal coverage extension



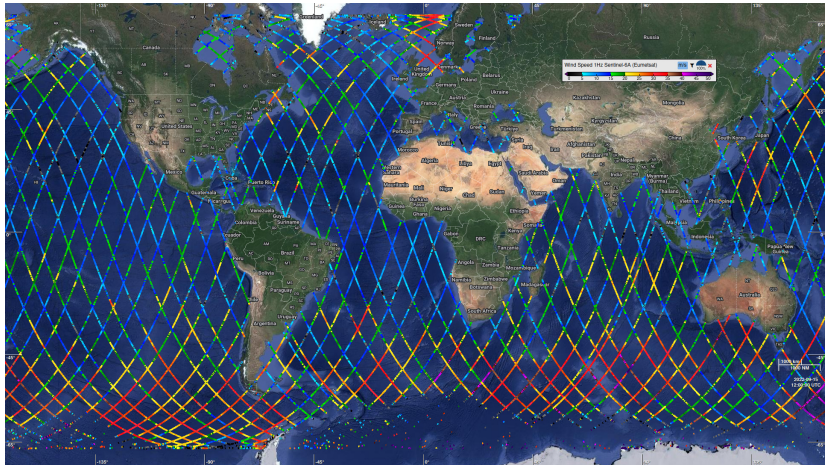
Sentinel-6A 1Hz sea level anomaly
`https://odl.bzh/Rx1MrzdC`



Sentinel-6A 1Hz significant wave height
`https://odl.bzh/4V7cC3zw`



Sentinel-6A 1Hz sigma0
`https://odl.bzh/zoM2E63k`



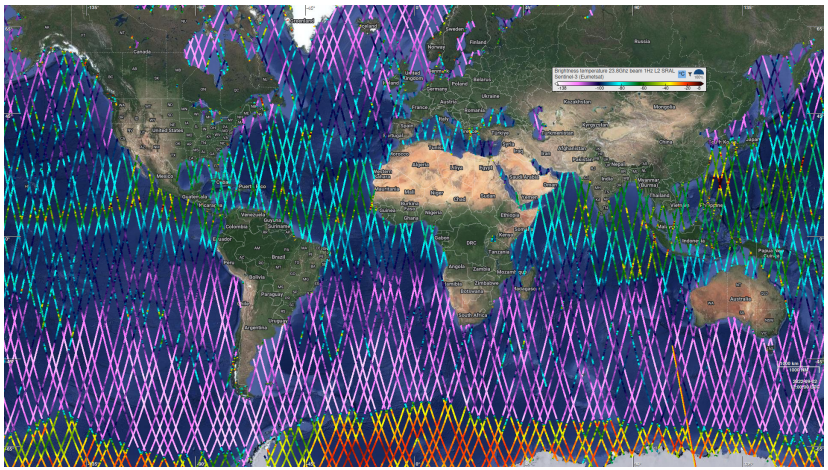
Sentinel-6A 1Hz wind speed
`https://odl.bzh/aQitGJRq`

Achievements - Sentinel-3 microwave radiometer products

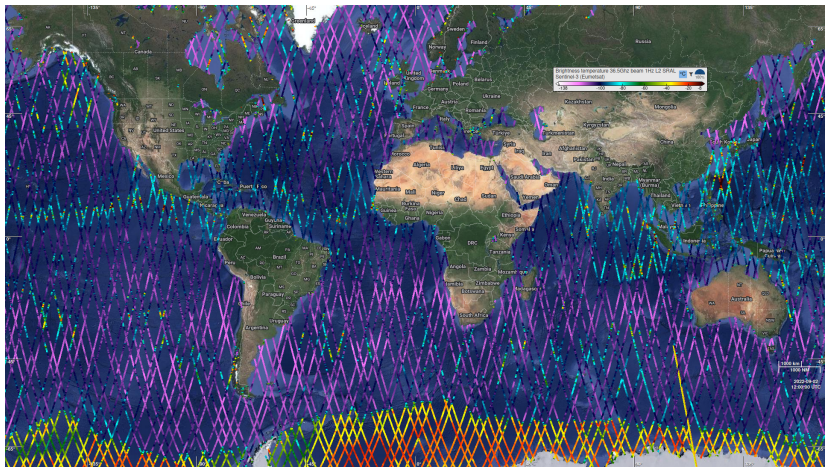
Measurements from the microwave radiometer (MWR) onboard Sentinel-3 are available in SRAL files and users wanted a way to visualize them, so we modified our processing chains and adapted our storage capacity to include them in OVL.

This change required very little effort due to previous work on the harmonization of OVL processing systems and to the ability to extend storage capacity with a few simple steps on Creodias.

All the NRT data still available on Creodias have been ingested in the system, i.e. from 30th April 2017 for Sentinel-3A and from 9th December 2018 for Sentinel-3B.



Sentinel-3 A/B SRAL 1Hz brightness temperature
23.8Ghz beam
`https://odl.bzh/hQP1FKEU`

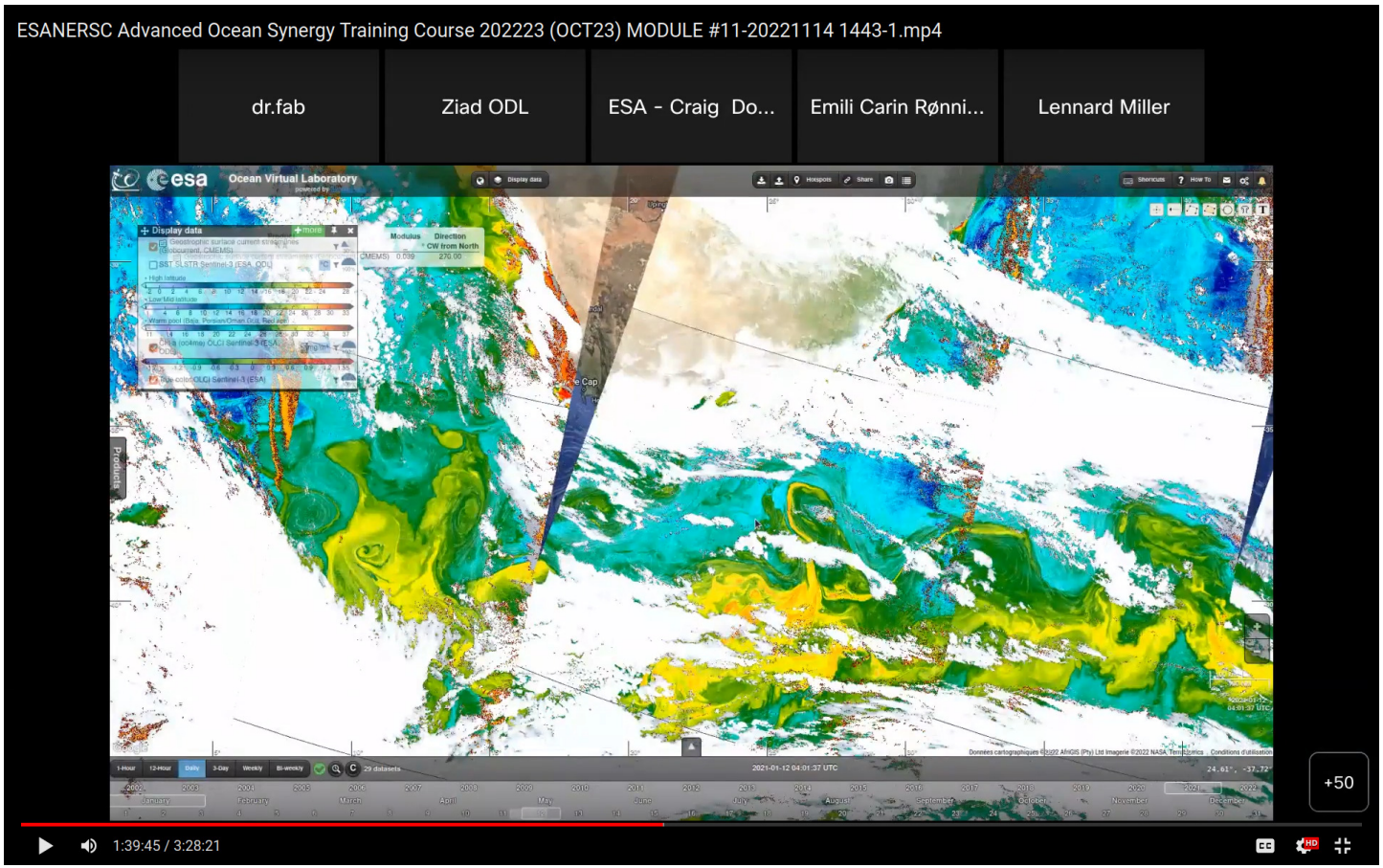


Sentinel-3 A/B SRAL 1Hz brightness temperature
36.5Ghz beam
`https://odl.bzh/kUq_8qSR`

Achievements - OTC23 online lectures

Between September and December 2022, dozens of students in various fields of oceanography have been able to attend formal and interactive lectures online in the scope of the ESA Ocean Training Course 2023:
`https://otc23.nersc.no/online_course`.

Interactive lectures relied heavily on the visualisation of Sentinel data to illustrate physical phenomena and synergies between data sources:



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.

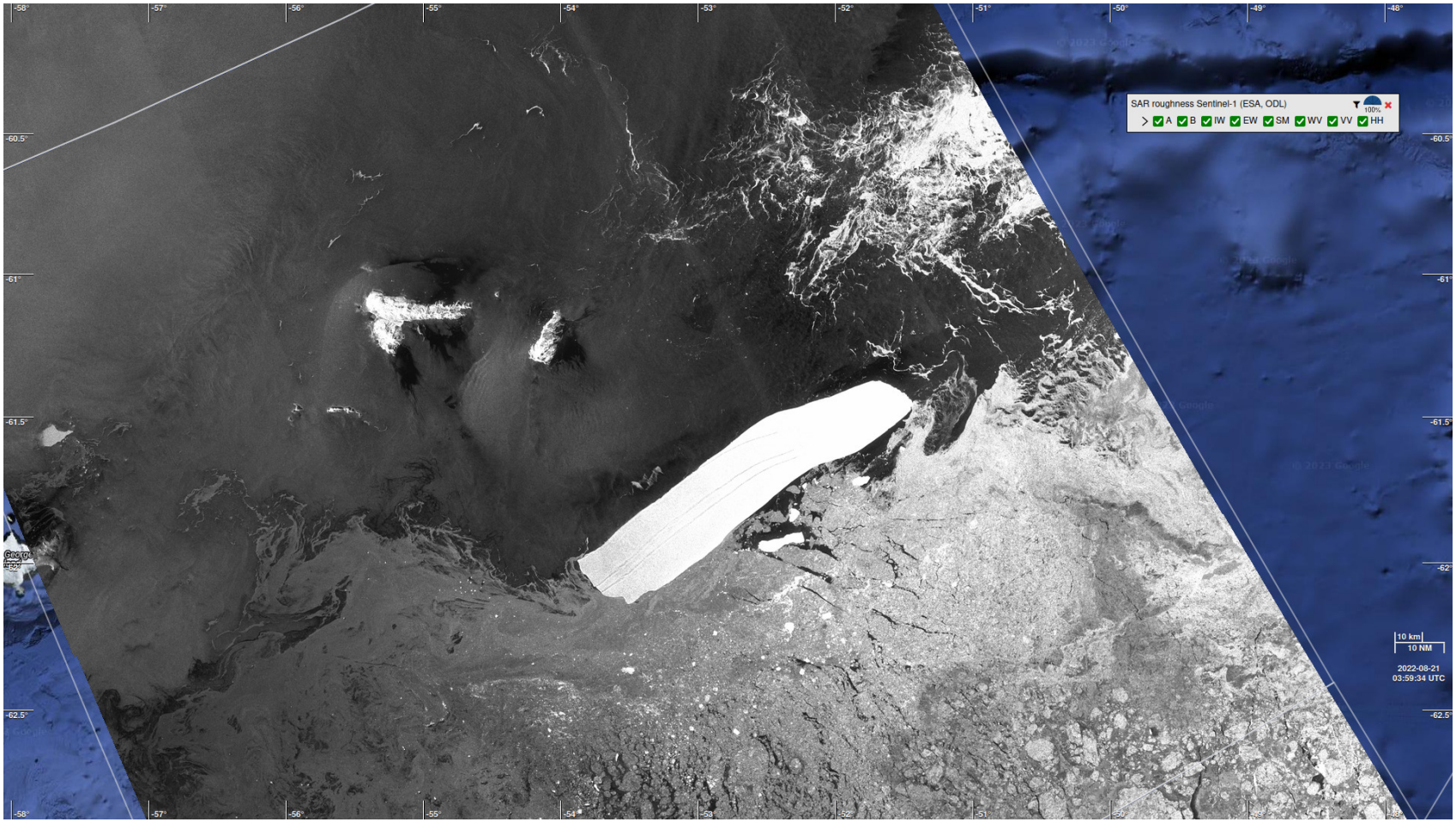
OVL does not track its users (and does not intend to), so measuring the impact of the resources sponsored by the NoR can only rely on anonymous web statistics, as well as links and screenshots published publicly on websites or social media. It is also not rare to see Sentinel data displayed in OVL during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

Several publications using Sentinel data from OVL have been found on X (formerly Twitter) and on the SEAShot website which allows users to share their findings on topics such as:

- Iceberg tracking
- Hurricanes
- Oil & gas leaks
- Ocean currents
- Wind/wave patterns

Iceberg tracking

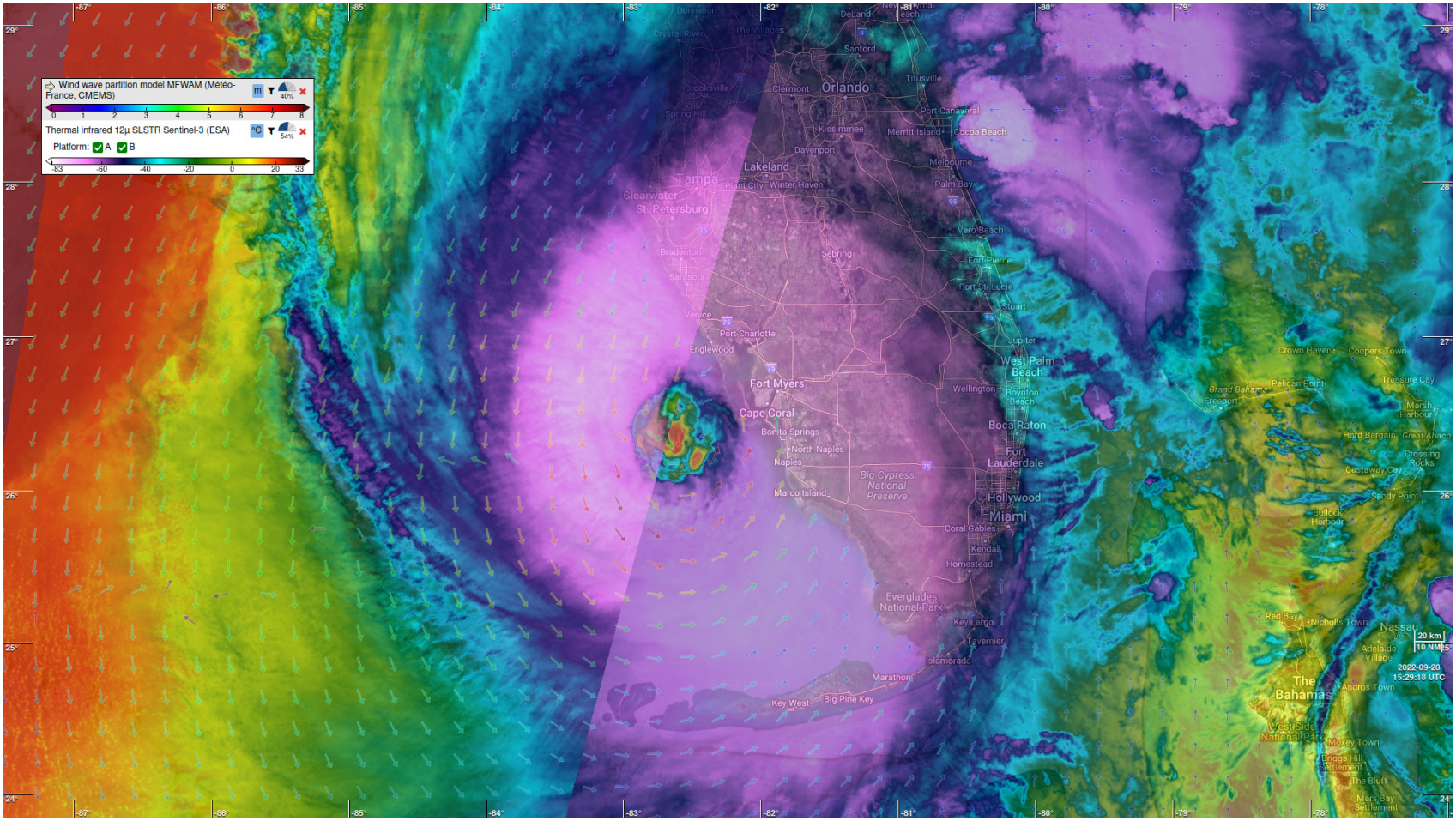
On SEAShot, user dr.fab used Sentinel-1 SAR roughess data along with sea ice concentration from the AMSR sensor on GCOM-W1 to track a drifting iceberg.



https://seashot.odl.bzh/s/ja3vk5-vG4A

Hurricanes

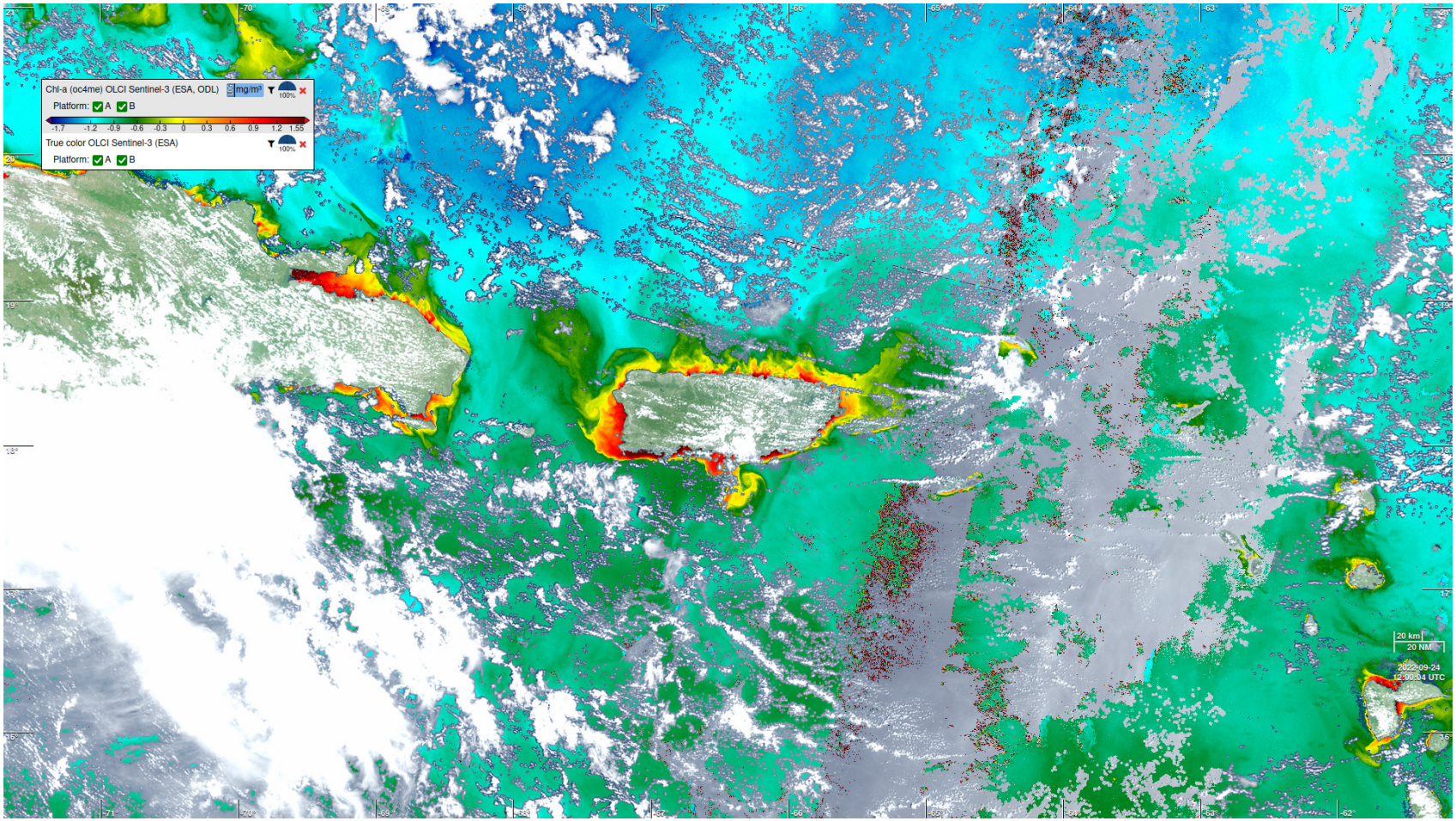
On SEAShot, user dr.fab shared a scene where the eye of cat 4 hurricane Ian has been captured by Sentinel-3 OLCI as it makes landfall in Florida.



https://seashot.odl.bzh/s/3zSyKWReykA

Hurricanes

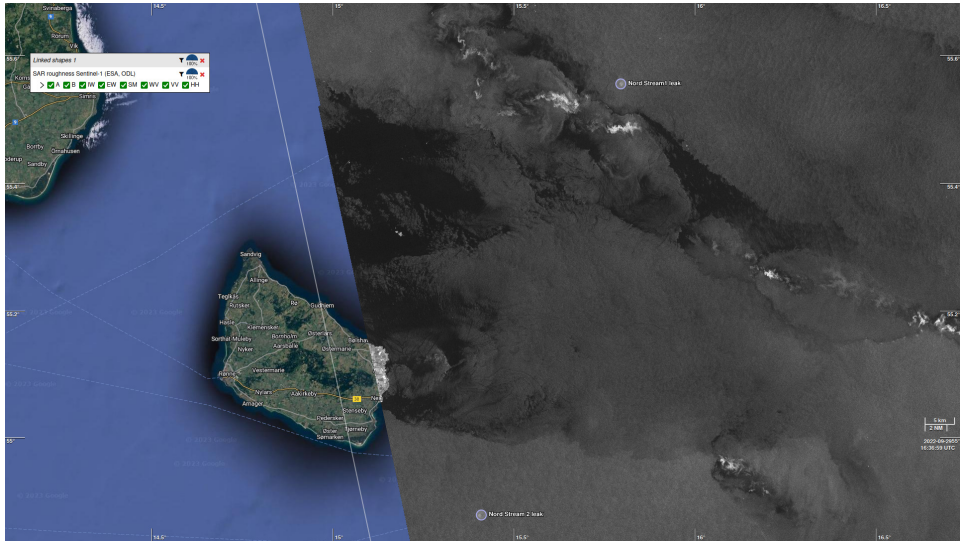
On SEAShot, user william.hernandez shared a scene showing how the chlorophyll-a concentration measured by Sentinel-3 OLCI around Puerto Rico evolved several days after intense rainfall from hurricane Fiona.

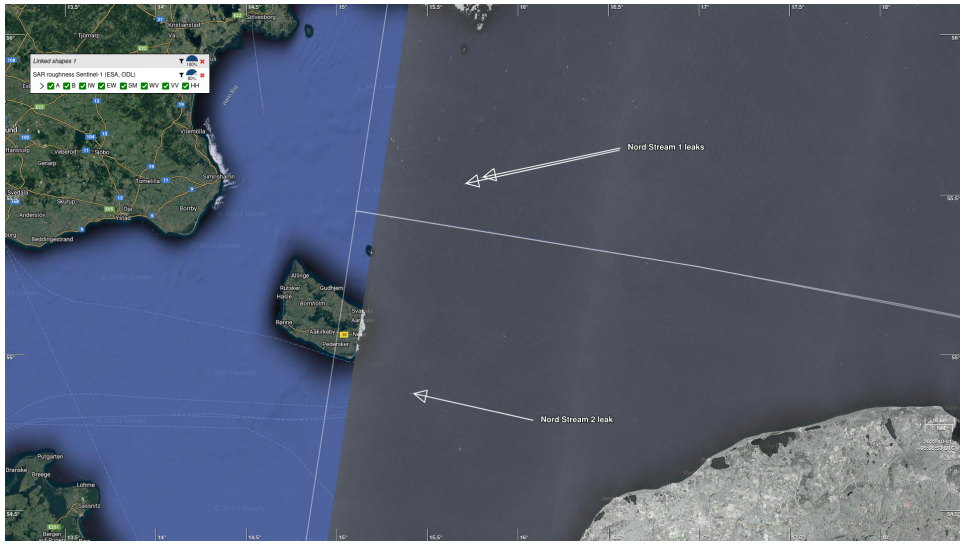


https://seashot.odl.bzh/s/KnujXLqnwnE

Oil & gas leaks

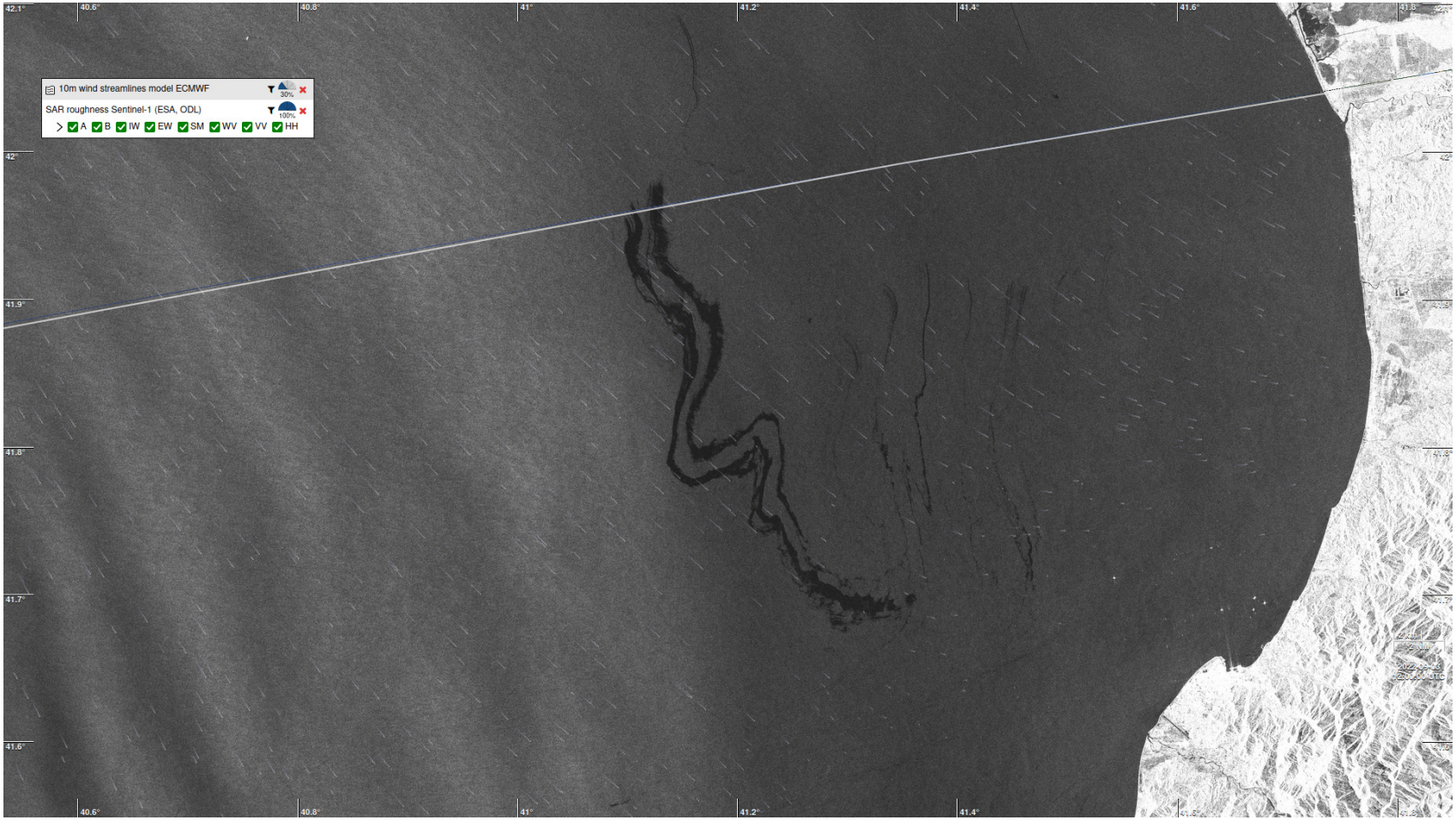
On SEAShot user dr.fab shared annotated scenes separated by two days where the gas leaks from Nordstream are visible on Sentinel-1 SAR roughness acquisitions (see `https://seashot.odl.bzh/s/vr4rsp4l7B0` and `https://seashot.odl.bzh/s/RzUGOPwa5Yo`).





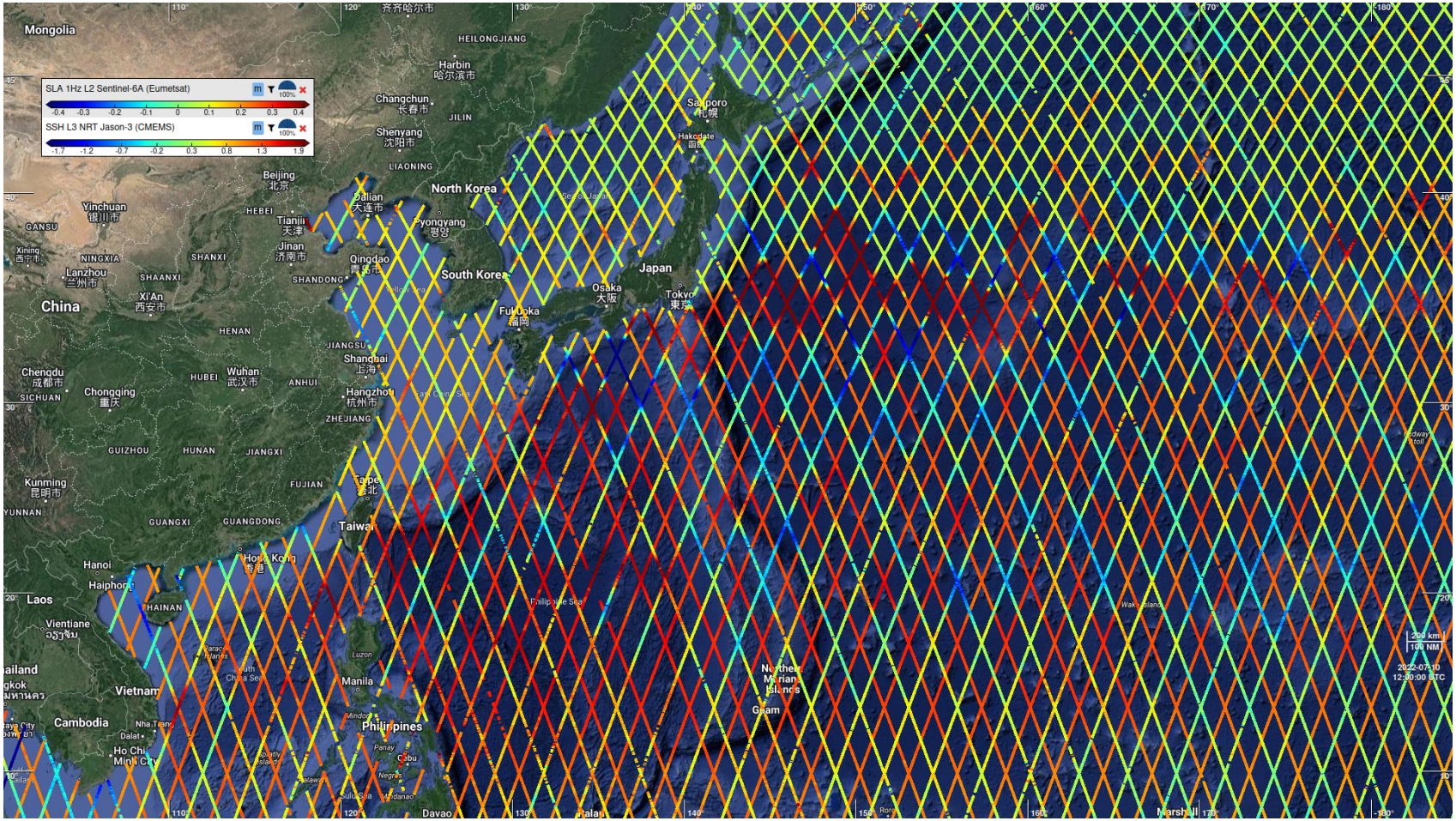
Oil & gas leaks

On SEAShot, users christinnea and dr.fab shared scenes showing natural oil seepage in eastern Black Sea captured in Sentinel-1 SAR roughness acquisitions (see `https://seashot.odl.bzh/s/sEeObKDbez4` and `https://seashot.odl.bzh/s/y1XVOQyDZcw`)



Ocean currents

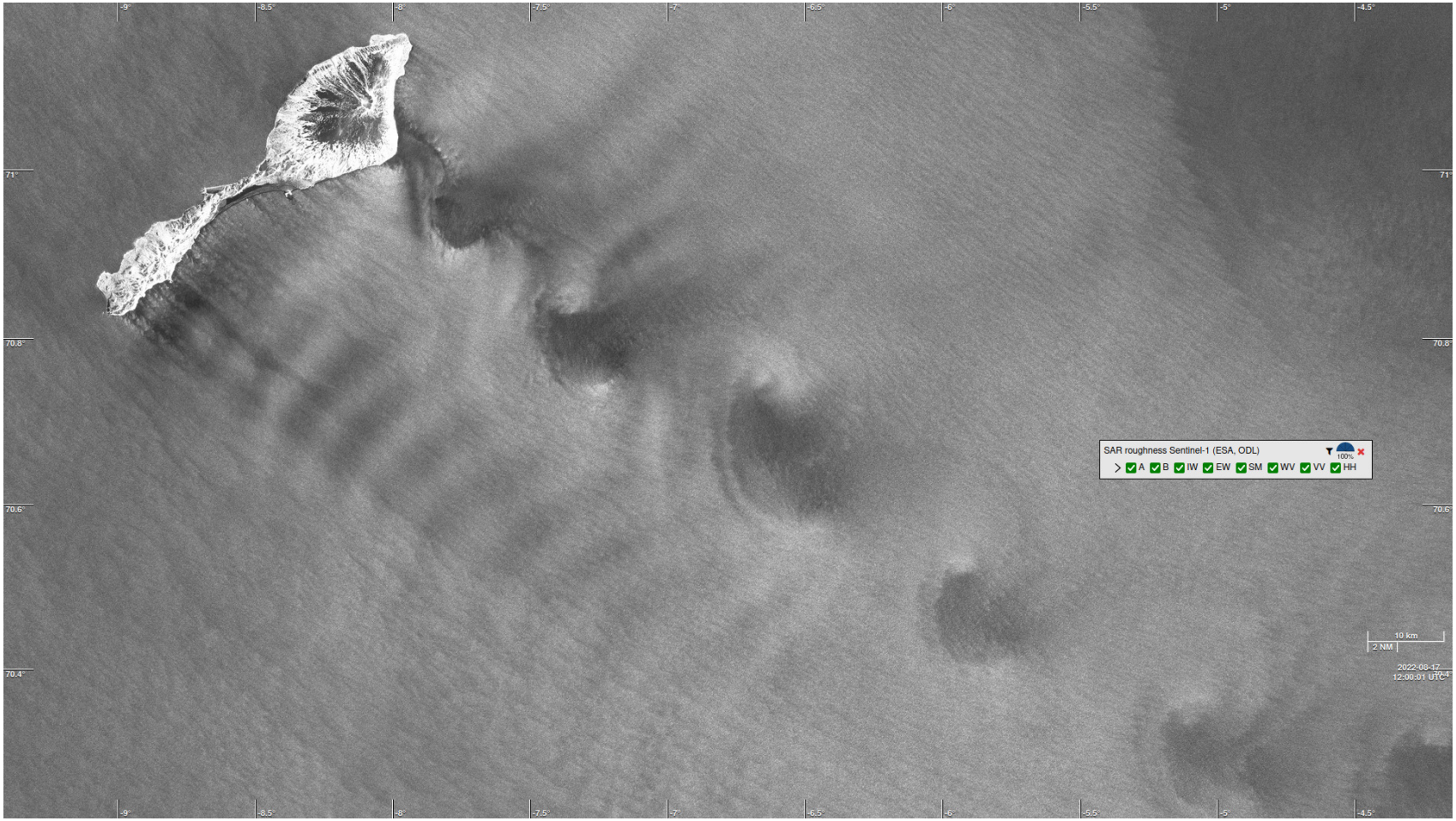
On SEAShot user Lucile Gaultier shared a scene showing how the tracks of Jason-3 and Sentinel-6 are interleaved with each other to provide a better combined spatial and temporal coverage, here emphasizing the signature of the Kuroshio current seen as sea surface height by Jason-3 and sea level anomaly by Sentinel-6.



https://seashot.odl.bzh/s/PpbidOkKfmA

Wind/wave patterns

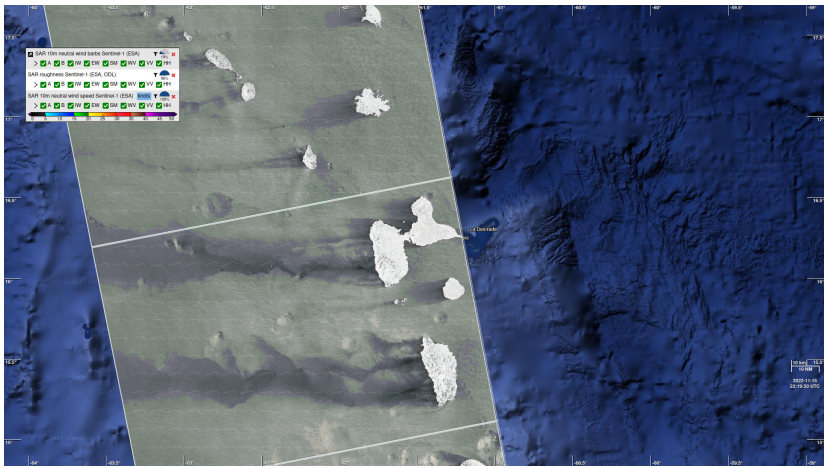
On X/Twitter, user @remi_wind shared a post to show how he used OVL to visualize gravity waves revealed by Sentinel-1 SAR roughness data near Jan Mayen (see `https://twitter.com/remi_wnd/status/1559871009146241025`).



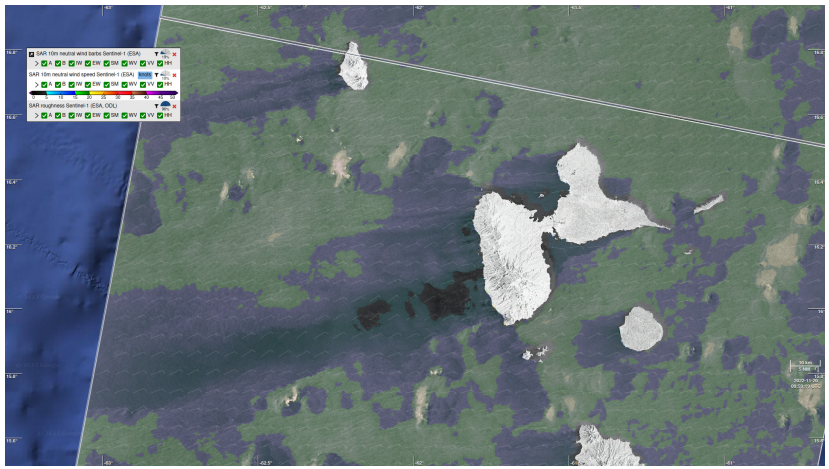
`https://odl.bzh/eXnd_e0Y`

Wind/wave patterns

On X/Twitter, we notified participants of the Route du Rhum race about unfavorable wind conditions using SAR wind and roughness data from Sentinel-1 (see `https://twitter.com/oceandatalab/status/1592794653153456129` and `https://twitter.com/oceandatalab/status/1594293716298395649`).



`https://odl.bzh/NSUxMdKM`



`https://odl.bzh/fonswgus`

Web statistics

The anonymous monthly statistics collected when users visit the OVL online portal (`https://ovl.oceandatalab.com`) show that the project has attracted a large number of users in the second half of 2022.

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