

First release of the CMEMS Global coastal OLCI 300 m Chlorophyll-a Product

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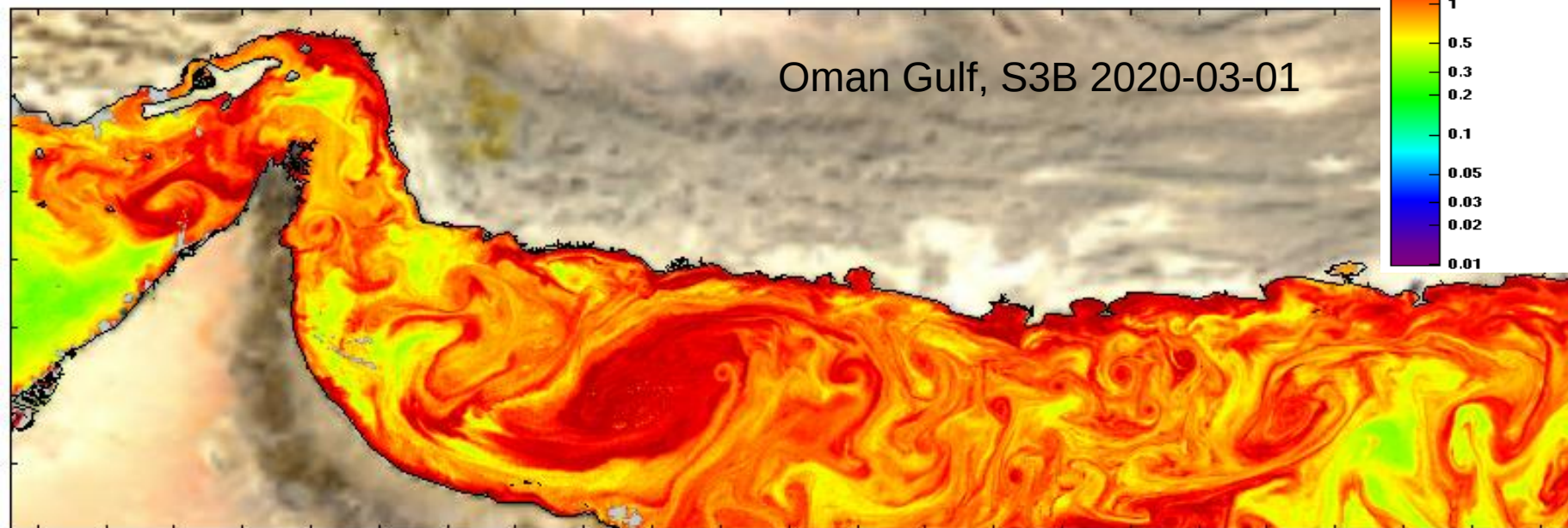
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A new CMEMS OLCI 300 meters Global Product (GlobColour processor)

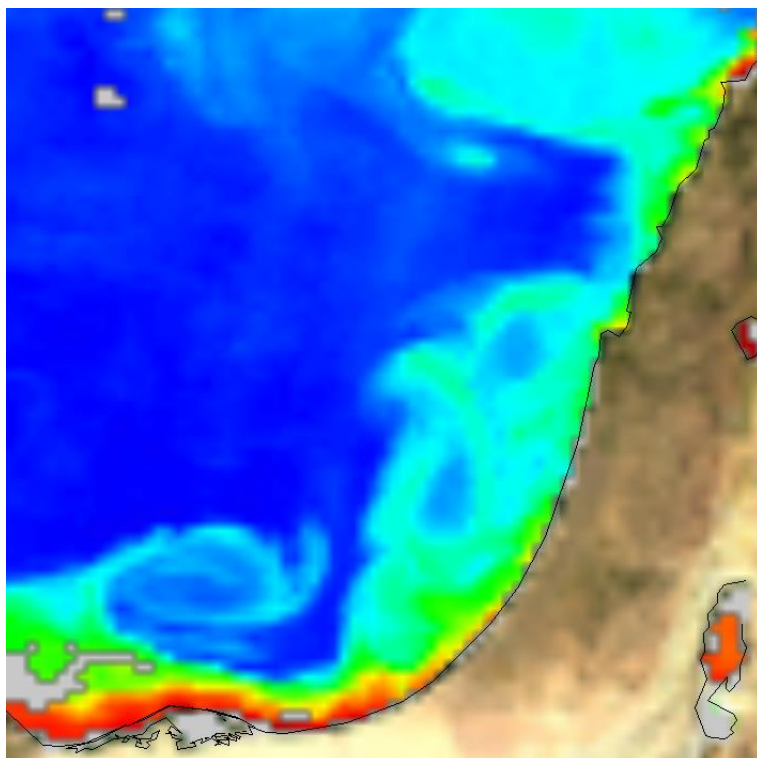
This study highlights the first release of a 300 meters chlorophyll-a product based on the merging of OLCI S3A and S3B and available at Global level.

- ✓ This 300 meters product is freely available through the Copernicus Marine Service (CMEMS) with an operational dissemination starting in May 2021.
- ✓ This new product is based on the GlobColour processor (already used by CMEMS for the Global 4km chlorophyll-a product and the regional Atlantic daily interpolated product).

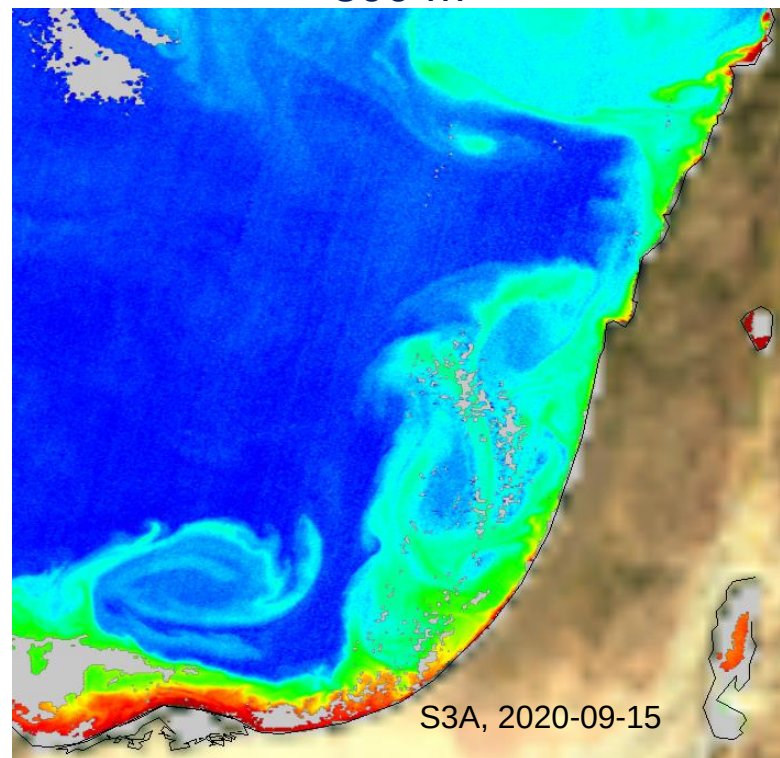


- ✓ Before this new product, the resolution of the CMEMS Chlorophyll global products was 4km.
- ✓ The chlorophyll-a product derived from OLCI's 300 m measurement allows many more applications in marine and coastal ecology, from ecosystem modeling, to fisheries management, and monitoring of water quality.

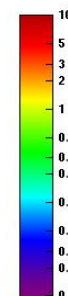
4 km



300 m

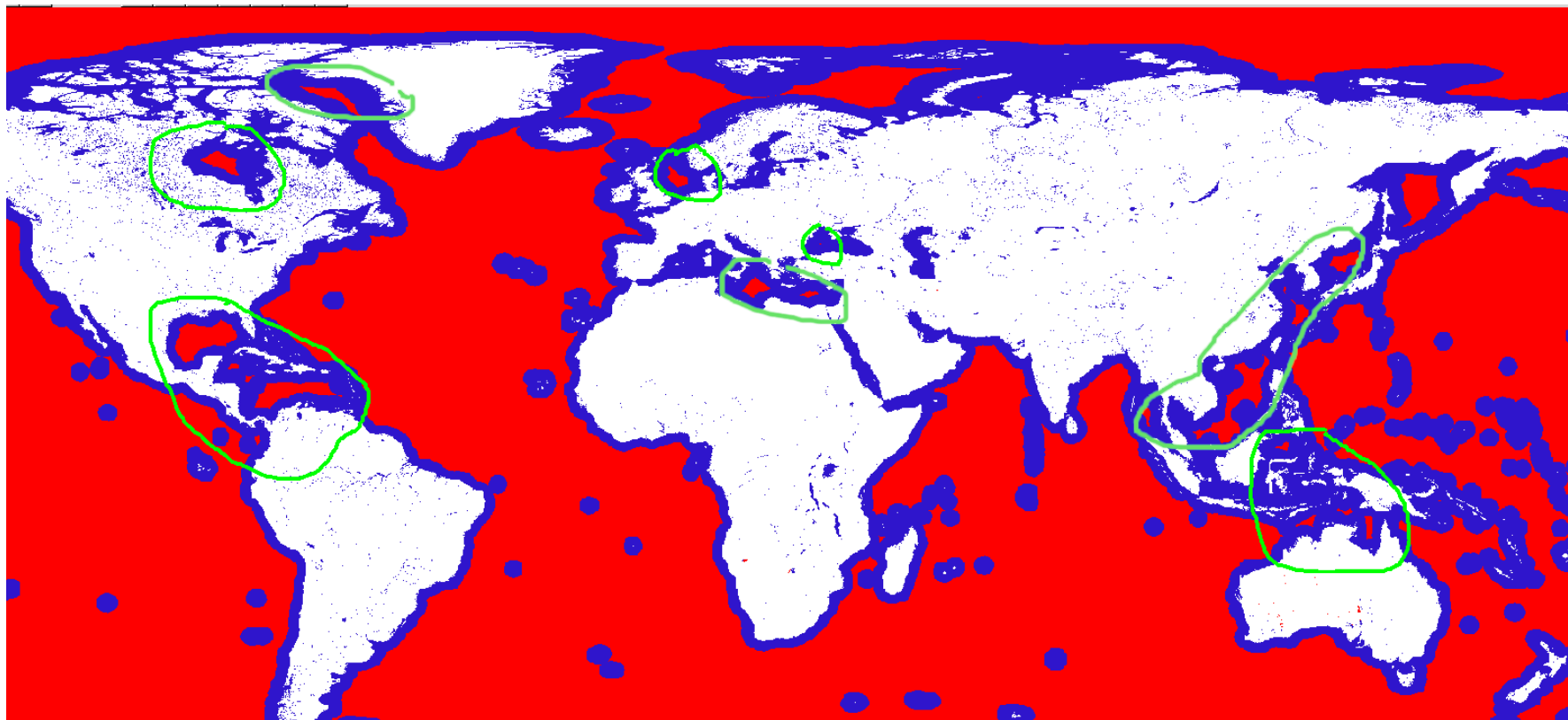


Chl (mg/m³)



Characteristics of the GlobColour 300 m product

- ✓ Global coverage with data available along the coasts (in blue)
(up to 200 km from the coastline + some areas filled (in green))
- ✓ 300-500 meters of spatial resolution (depending latitude)
- ✓ Available one day after satellite acquisition

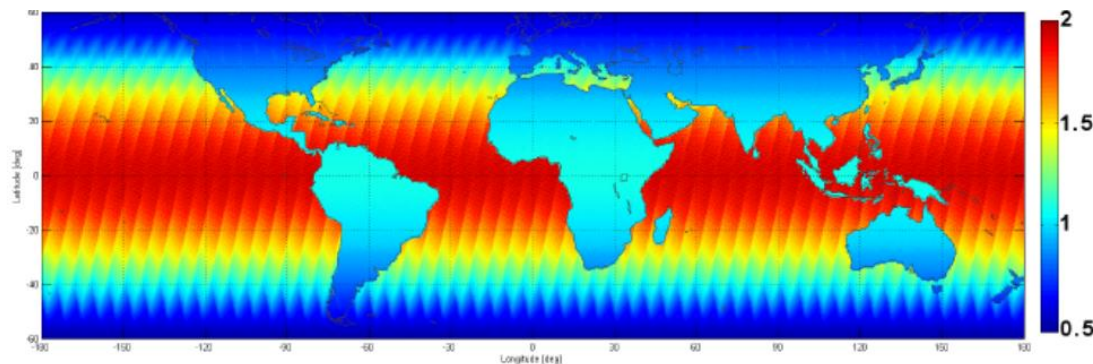


Use the synergy of 2 satellites S3A + S3B



Credit J.Huart

+



Credit S3 ESA user guide

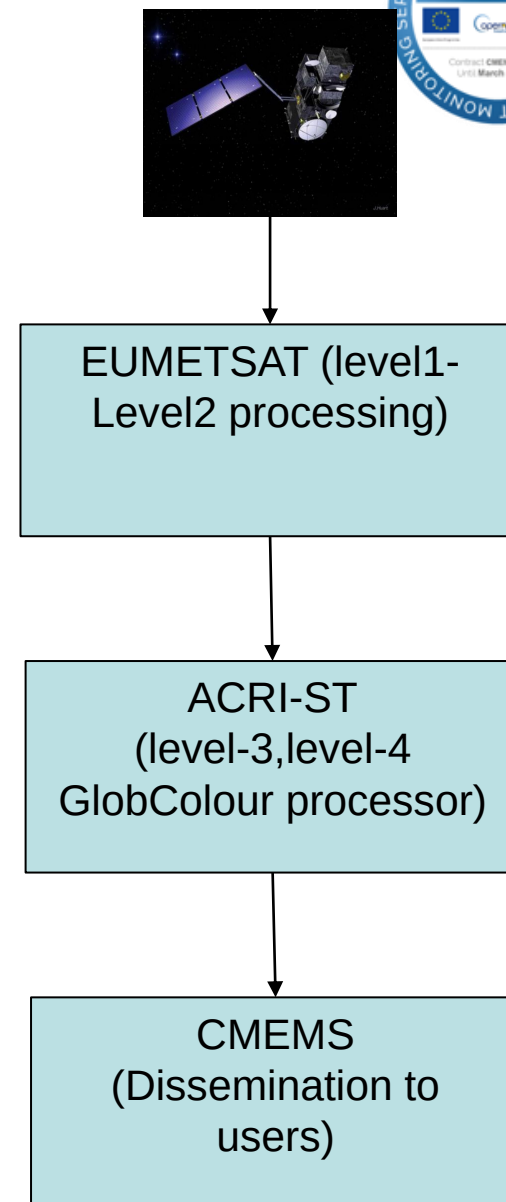
**Mean revisit time (in days)
with the 2 satellites after
one full repetitive cycle)**

- The 300 m product is available for the period 2021-01-01 to present
- The time-series will be extended to starting in 2016 when EUMETSAT will have provided the re-processed time series

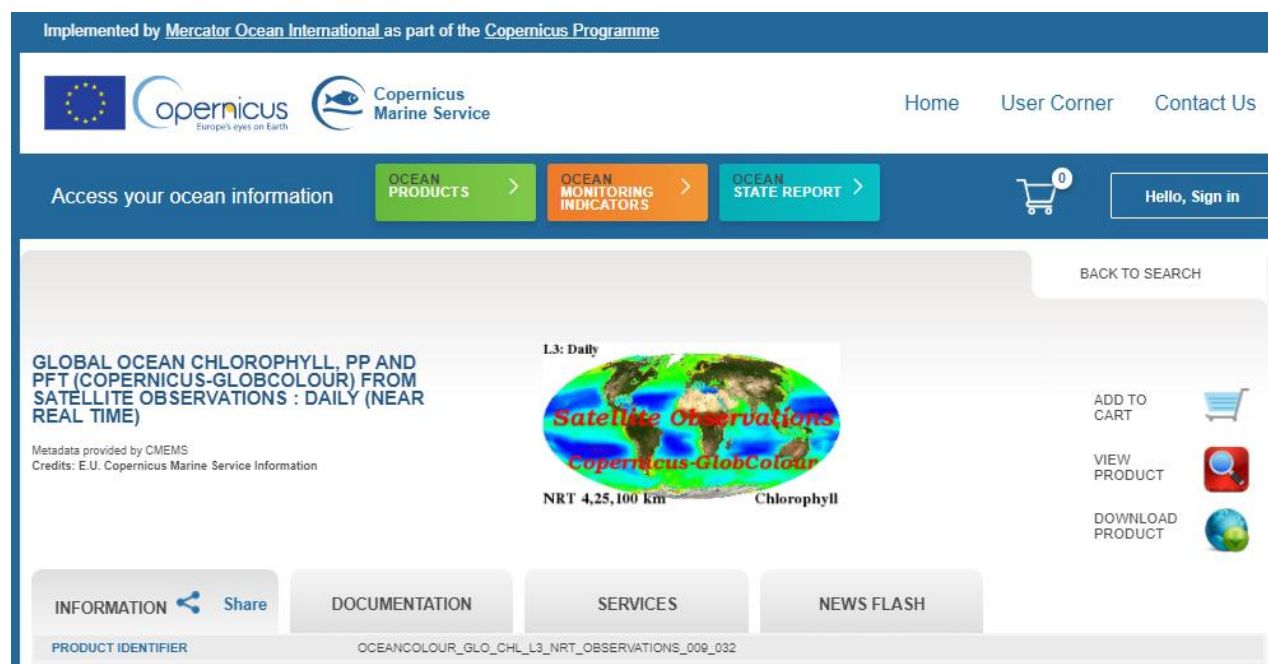
A new CMEMS 300 meters Global Product Overview



- ✓ The Ocean Colour Instrument (OLCI) on-board the Sentinel-3A and 3B satellites with a 300 m spatial resolution has a major advantage compared to other satellite missions with a typical 1 km spatial resolution
- ✓ The OLCI 300 m chlorophyll-a swath data are processed (level-1 and level-2) and disseminated by the EUMETSAT agency.
- ✓ ACRI-ST company (part of the CMEMS production units) eases the usage of these Level-2 (swath data) by providing Level-3 (daily mapped gridded files) at global and regional level (using the GlobColour processor).
- ✓ The Copernicus Marine Environment Monitoring Service (CMEMS) disseminate products to user (one day after satellite acquisition)



- ✓ The daily image products are stored as NetCDF compressed files using a regular lat/lon projection (grid 32400x64800 pixels)
- ✓ The time series is daily extended in the framework of the operational CMEMS initiative (Copernicus Marine environment Service)
- ✓ CMEMS provides to the end-user facilities to extract data on a selected area and period of interest (also available using ftp when the full product is required).
- ✓ Data are freely available at <https://marine.copernicus.eu/>



Implemented by [Mercator Ocean International](#) as part of the [Copernicus Programme](#)

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GLOBAL OCEAN CHLOROPHYLL, PP AND PFT (COPERNICUS-GLOBCOLOUR) FROM SATELLITE OBSERVATIONS : DAILY (NEAR REAL TIME)

Metadata provided by CMEMS
Credits: E.U. Copernicus Marine Service Information

L3: Daily

Satellite Observations
Copernicus-GlobColour

NRT 4,25,100 km Chlorophyll

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PRODUCT IDENTIFIER

OCEANCOLOUR_GLO_CHL_L3_NRT_OBSERVATIONS_009_032

Upstream (level 2 NRT from EUMETSAT) (baseline product 003, 15-Feb-2021)



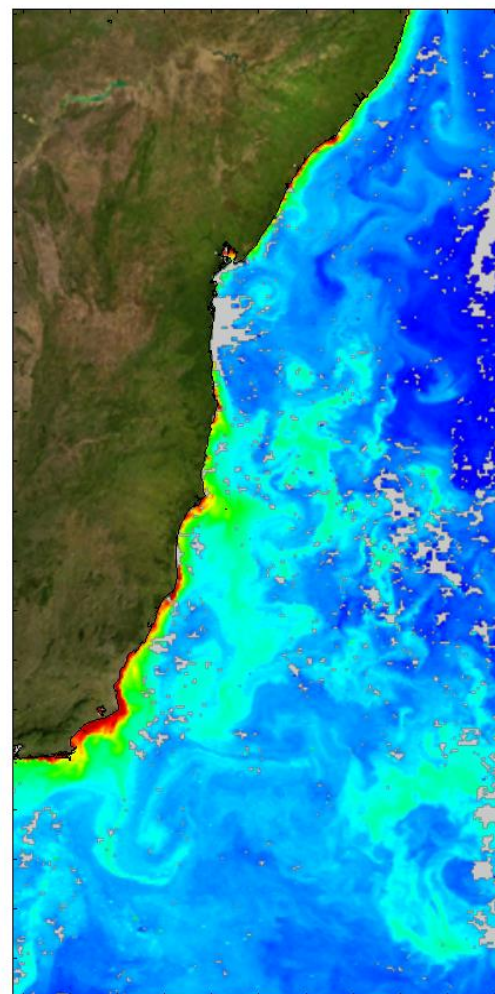
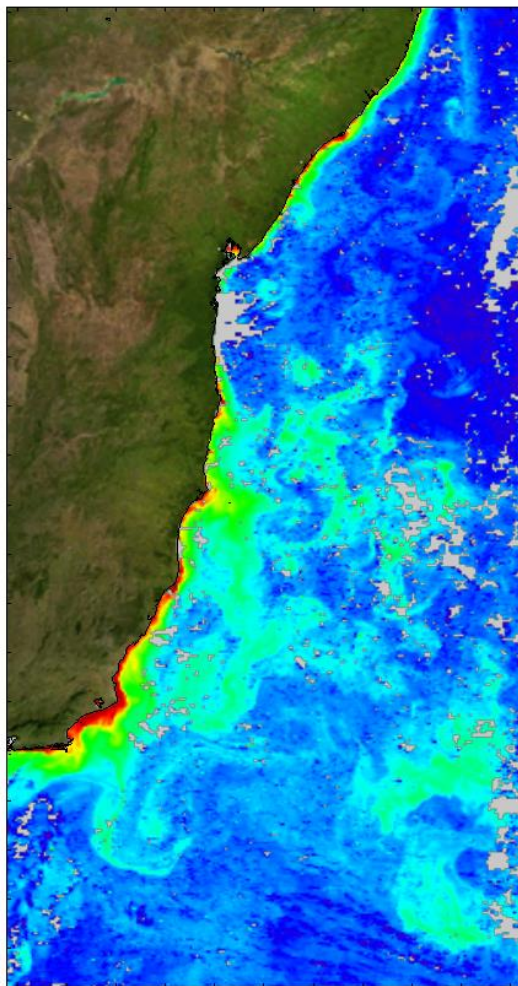
- ✓ The new CMEMS 300 m product takes benefit of the new EUMETSAT's Level-2 product baseline which has been switched operationally in NRT mode since 15-February-2021. This new baseline improves mainly the System Vicarious Calibration (SVC) gains of both S3A and S3B and the associated quality flags.
 - It has facilitated the achievement of the Global 300 m product with a very good correlation of the chlorophyll field obtained from S3A or S3B

- ✓ In this new baseline, the Chlorophyll-a OC4ME algorithm has been embedded with the use of the Colour Index algorithm (CI,Hu) for clear water.
 - It makes this product more consistent with the CMEMS 4km GlobColour Global product which use a similar approach (use of CI since Nov. 2018).
 - The use of the CI algorithm has improved the quality of the product

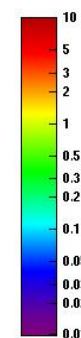
The chlorophyll Algorithm (benefit of the Colour Index algorithm)

OC4Me algorithm (previous release)

With CI algorithm (new release)



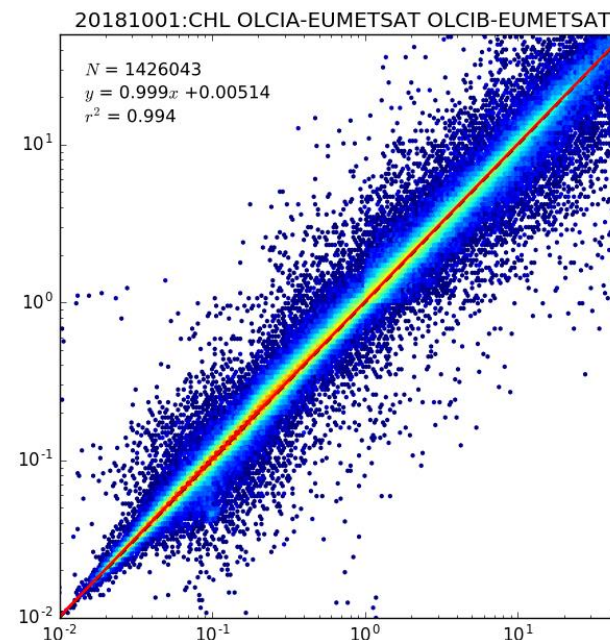
Chl (mg/m3)



S3A, 2021-03-20

Assesment of the new EUMETSAT upstream (baseline 003, 15-Feb-2021)

- ✓ The intercomparison of S3A & S3B (based on tandem data) shows a very good correlation between S3A and S3B.
- ✓ For the chlorophyll OC4ME product the regression between a daily S3A and S3B (global product, not only coastal) provides a R2 of 0.99 with a respective slope and offset of 1.0 and 0.005.
- ✓ For Reflectances, similar results obtained [400,670]



Name	Units	N	r2	Slope	Offset	Bias	RMSE
NRRS400	sr-1	2389268	0.96	0.99	0.00021	-0.00014	0.00138
NRRS412	sr-1	2389268	0.95	0.99	0.00009	-0.00004	0.00137
NRRS490	sr-1	2389268	0.92	0.99	0.00007	0.00001	0.00131
NRRS510	sr-1	2389268	0.92	0.99	0.00001	0.00004	0.00129
NRRS560	sr-1	2389268	0.93	0.99	0.00001	0.00002	0.00125
NRRS670	sr-1	2389268	0.92	0.98	-0.00001	0.00002	0.00119

Regression OLCI-B/OLCI-A reflectances (RR product Global 4km removing 0.1% of outliers) based on tandem data (2018-07-01 + 2018-10-01)

Assesment of the new Eumetsat baseline (Flags recommendation)

- ✓ To go from level 2 upstream to the CMEMS product level 3, flags have to be used to remove cloudy or unreliable pixels.
- ✓ In the baseline 003 (Feb.2021), EUMETSAT has updated/improved flags with new recommendations for users (see table above)

For the GlobColour 300 m products, these recommendations have been adapted to also flag upstream data using ABSO_DUST flag. This flag represents the Dust-like absorbing aerosol selected for atmosphere correction and when raised specific level-2 correction are applied based on aerosol model table.

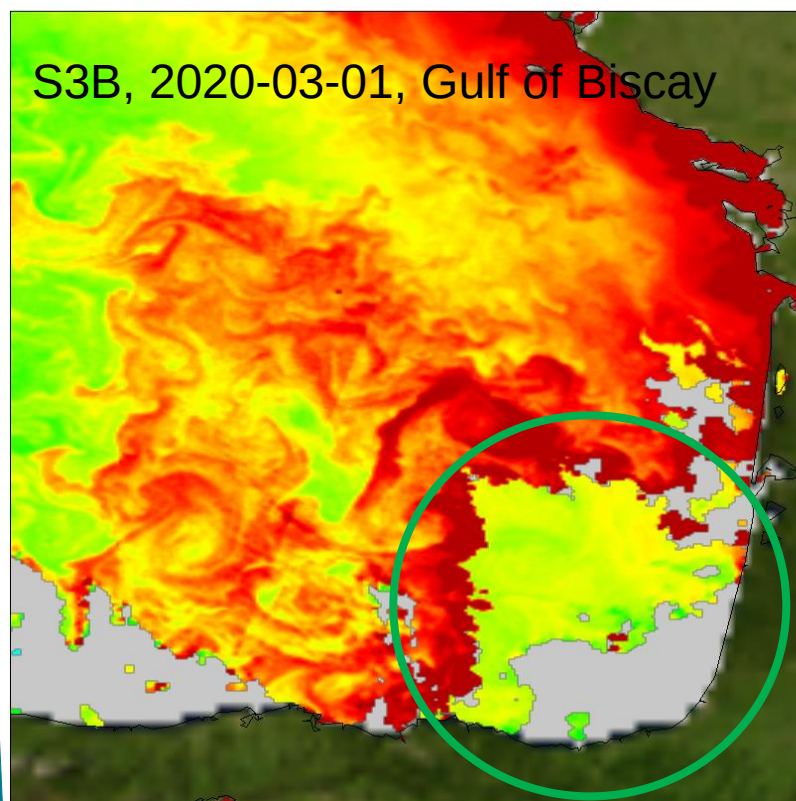
This correction “systematically” introduces an over-estimation of the all the reflectances with drawback on the chlorophyll (under-estimate with a factor x2 in most of the case).

Product names	Products	Common flags	Processing chain flags	Product flags
Water reflectance – BAC Open Waters	Oa**_reflectance → Oa**_reflectance	Ocean Colour Products (WATER or INLAND_WATER) and not (CLOUD CLOUD_AMBIGUOUS CLOUD_MARGIN INVALID COSMETIC SATURATED SUSPECT HISOLZEN HIGHGLINT SNOW_ICE)	Baseline Atmospheric Correction (BAC) Open Water Products <i>not</i> (AC_FAIL WHITECAPS ADJAC RWNEG_O2 RWNEG_O3 RWNEG_O4 RWNEG_O5 RWNEG_O6 RWNEG_O7 RWNEG_O8)	<i>none</i>
Algal pigment concentration – BAC Open Waters	chl_oc4me → CHL_OC4ME			<i>not</i> OC4ME_FAIL
Diffuse attenuation coefficient – BAC Open Waters	trsp → KD490_M07			<i>not</i> KDM_FAIL
Photosynthetically Active Radiation – BAC Open Waters	par → PAR			<i>not</i> PAR_FAIL
Aerosol Optical Thickness and Ångström exponent – BAC Open Waters	w_aer → T865, A865			<i>none</i>
Algal pigment concentration – AAC Complex Waters	chl_nn → CHL_NN		Alternative Atmospheric Correction (AAC) Complex Water Products <i>no specific flags to be applied</i>	<i>not</i> OCNN_FAIL
Total suspended matter concentration – AAC Complex Waters	tsm_nn → TSM_NN	Atmospheric Products		<i>not</i> OCNN_FAIL
Coloured Detrital and Dissolved Material absorption – AAC Complex Waters	iop_nn → ADG443_NN			<i>not</i> OCNN_FAIL
Integrated Water Vapour Column	iwv → IWV		Water Vapour <i>not</i> MEGLINT	<i>not</i> WV_FAIL

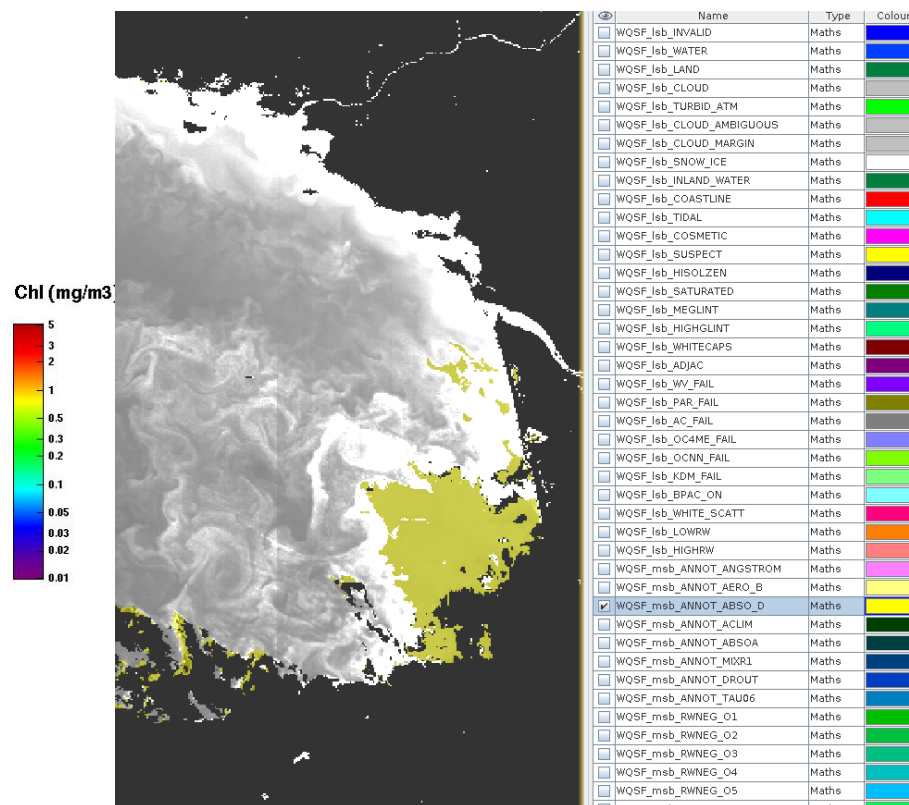
Table 1. Recommended OLCI Level-2 flag combinations for masking of cloudy or unreliable pixels.

Assesment of the new Eumetsat baseline (Flags recommendation)

- ✓ Example of artefact created over chlorophyll when the flag ABSO-D is not used (chlorophyll is under-estimate with a factor of about 3 in this case).



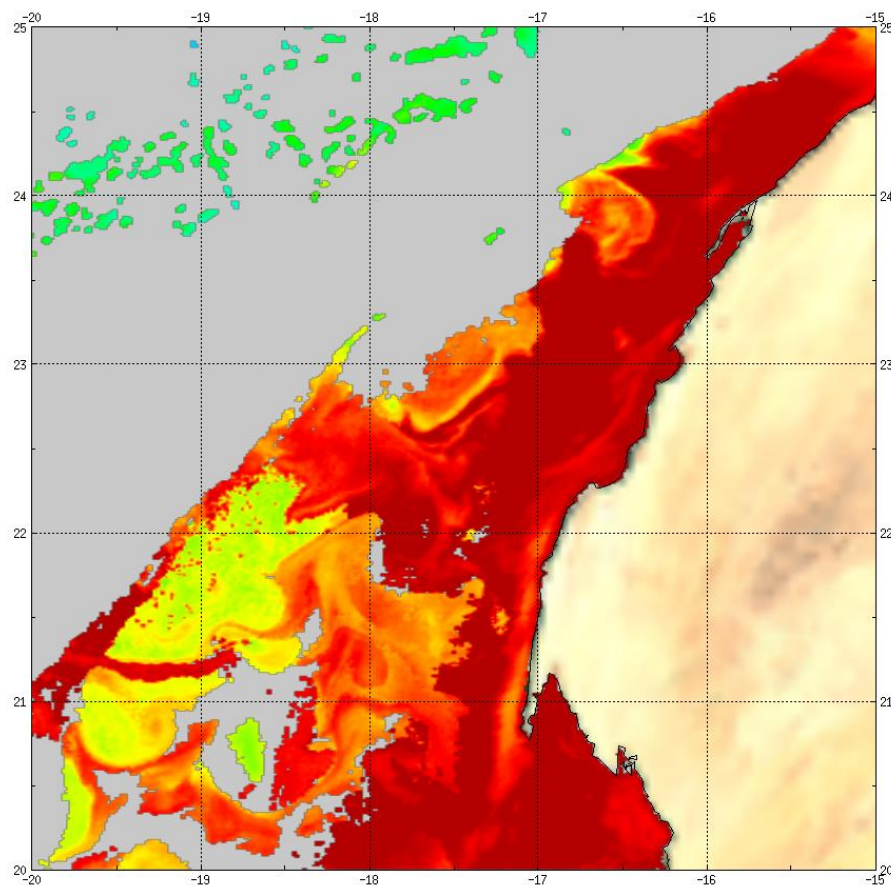
Artefacts when the flag is unused



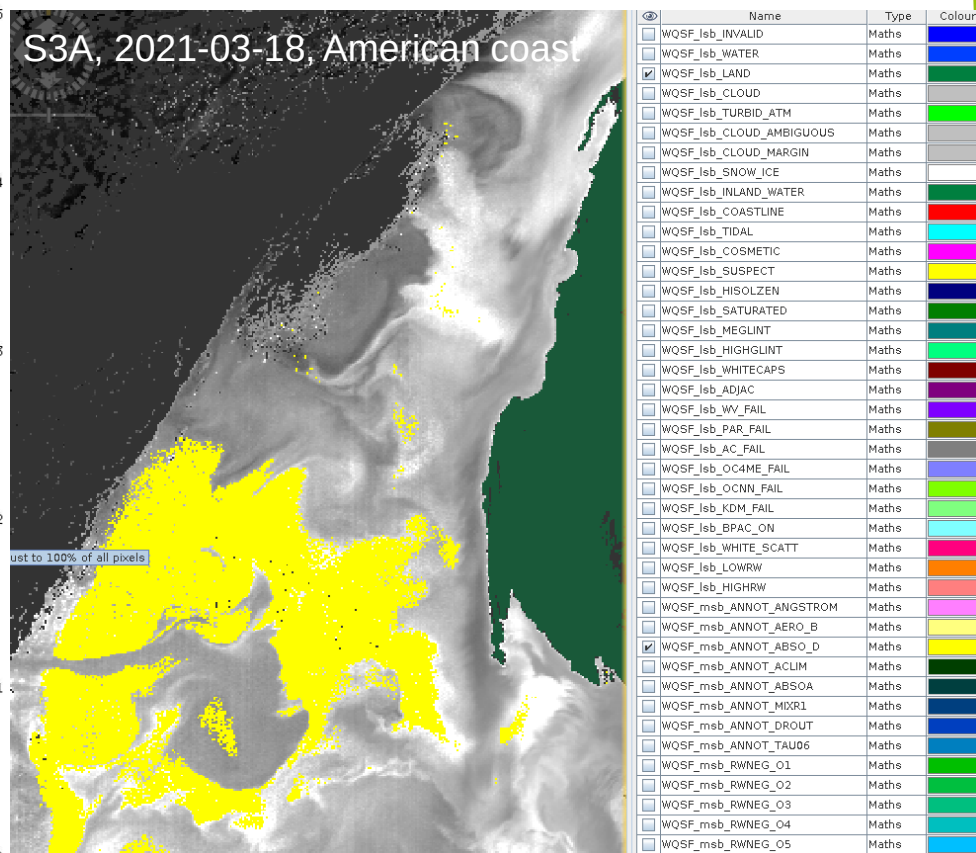
In yellow Abso-Dust flag map

Assesment of the new Eumetsat baseline (Flags recommendation)

- ✓ Example of artefact created over chlorophyll when the flag ABSO-D is not used (chlorophyll is under-estimate)



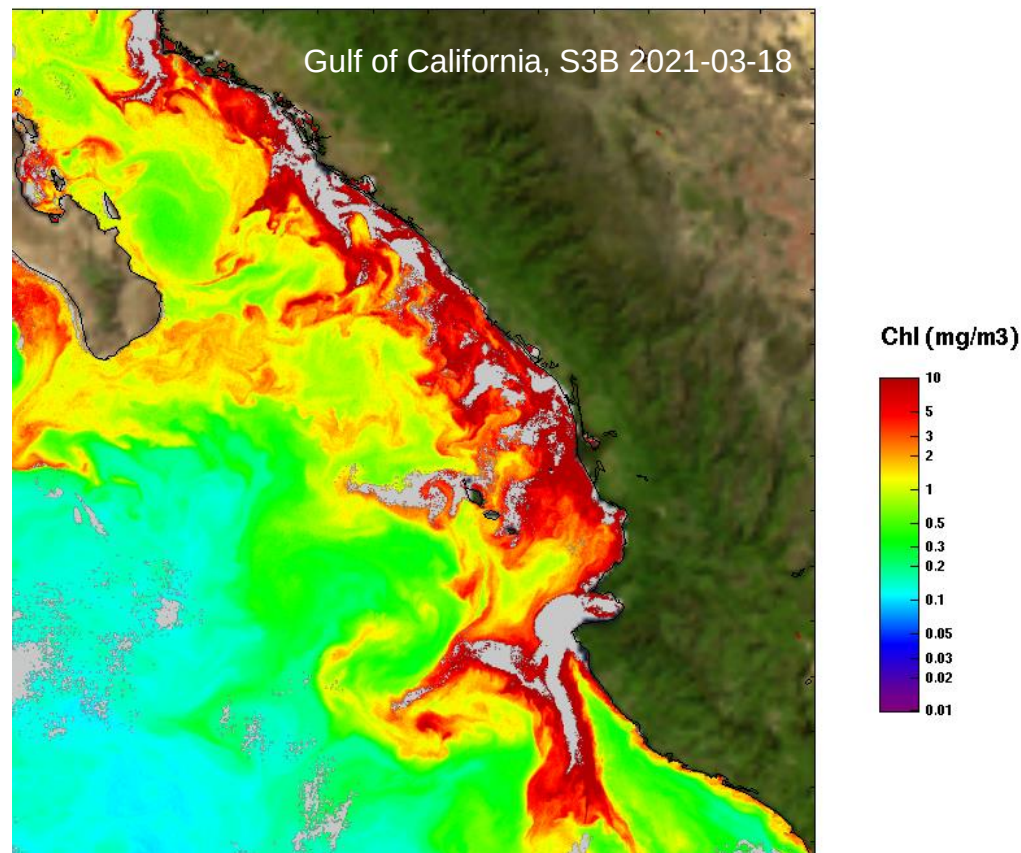
Chlorophyll map



Abso-Dust flag map (yellow)

Assesment of the new Eumetsat baseline (Flags recommendation)

The drawback is in many places, data are not available in the new 300 m. products, especially when high concentration are raised (illustration here: grey zone along the coast), but the only alternative is to provide under-estimate chlorophyll concentration which is not an acceptable solution.

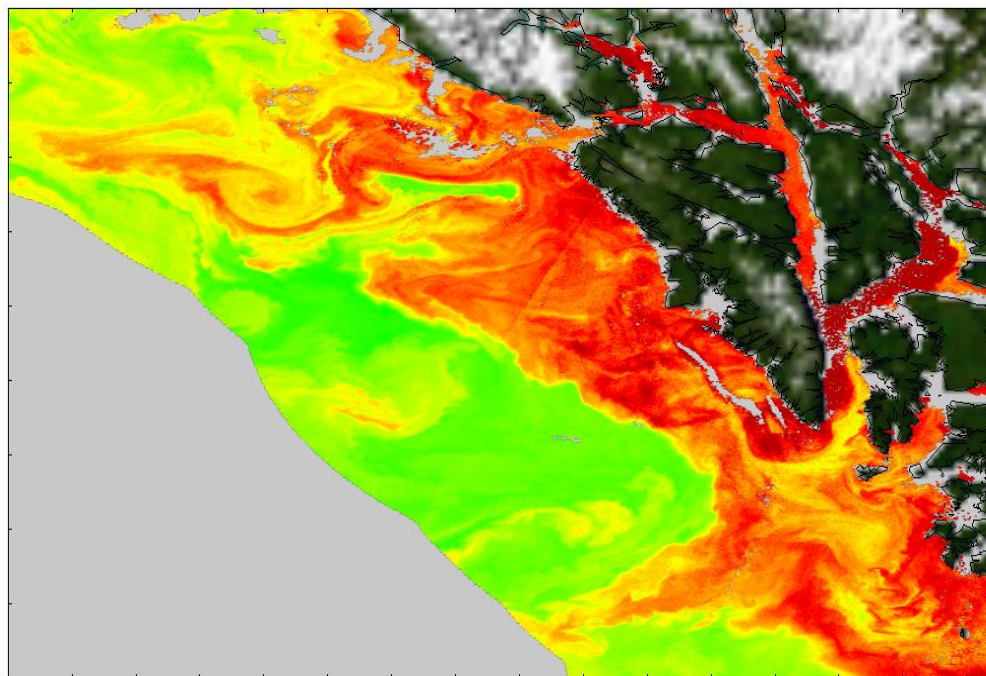


Probably, the threshold used to set this flag should be revisited to improve level-2 EUMETSAT product.

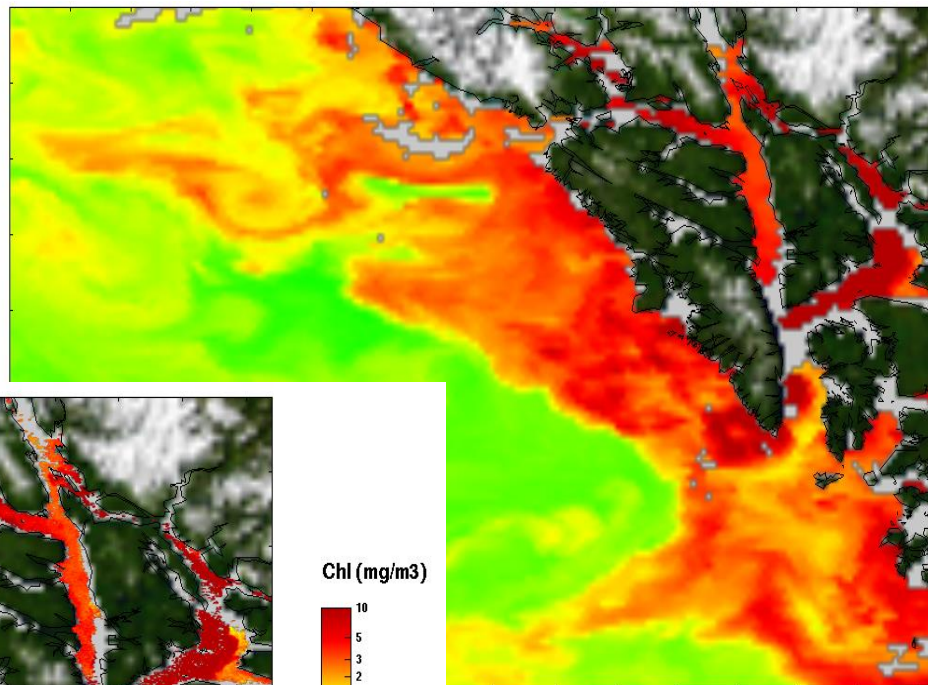
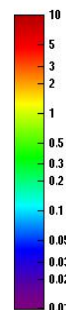
A new CMEMS OLCI 300 meters Global Product Gallery of images (selection of the best scenes)

4 km

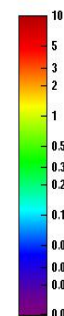
300 meters



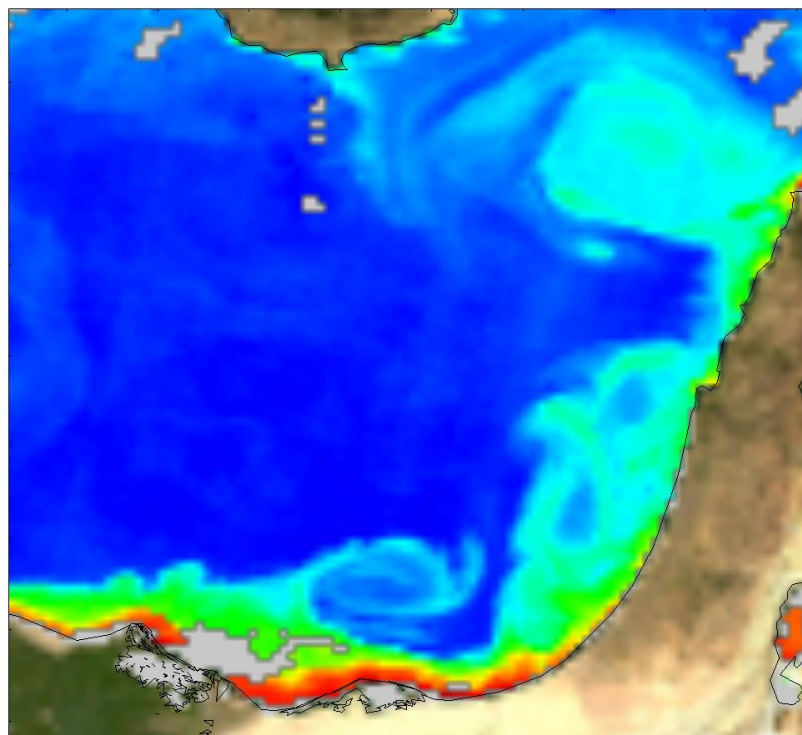
Chl (mg/m3)



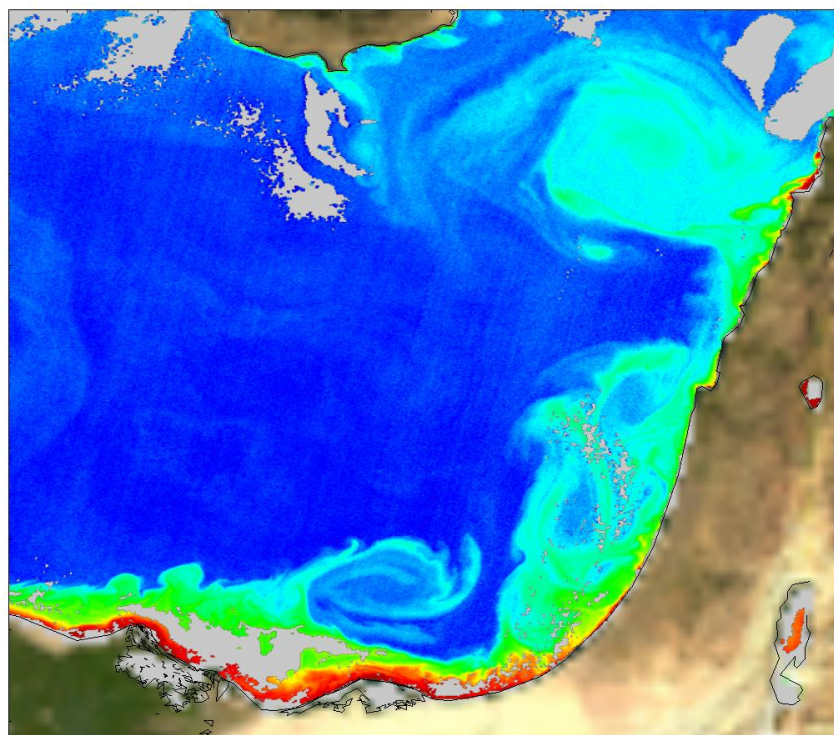
Chl (mg/m3)



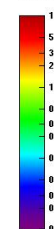
4 km



300 m

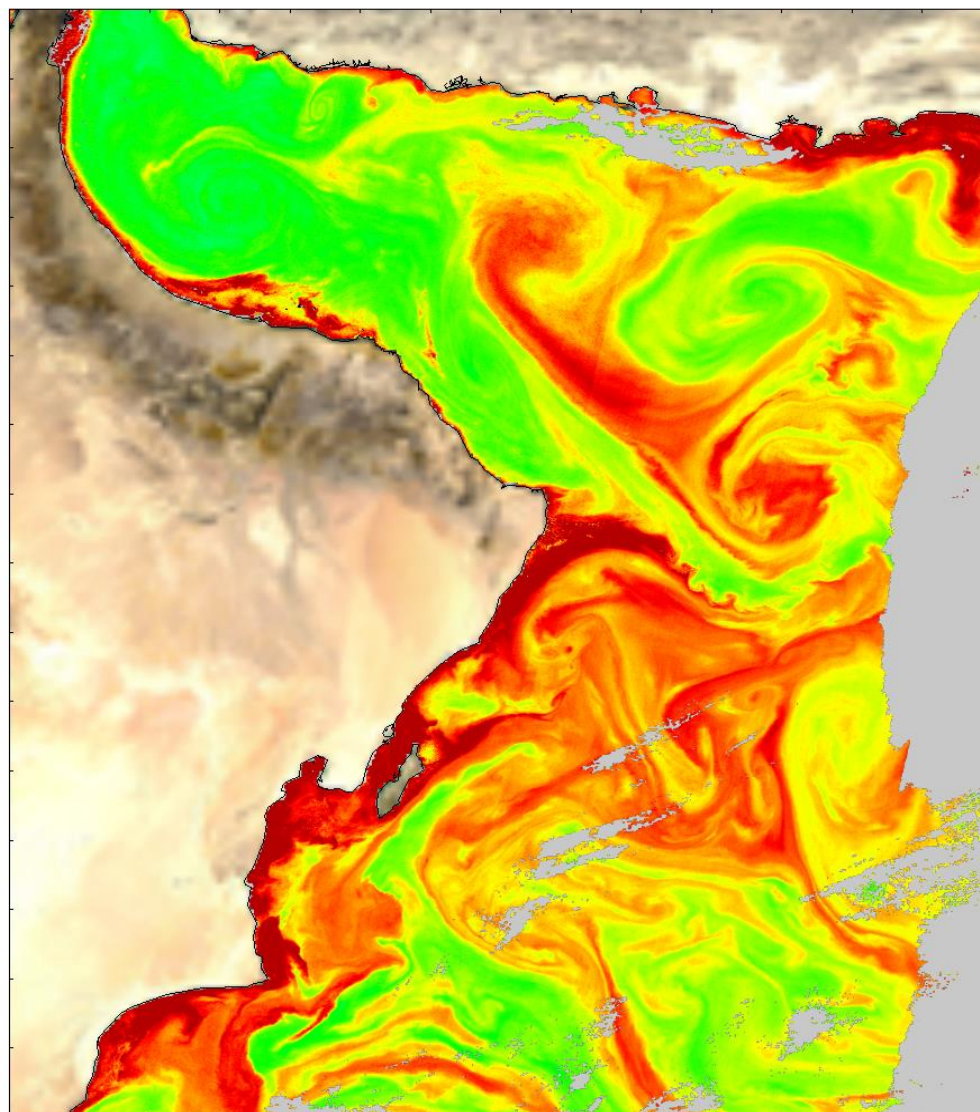


Chl (mg/m3)

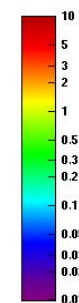


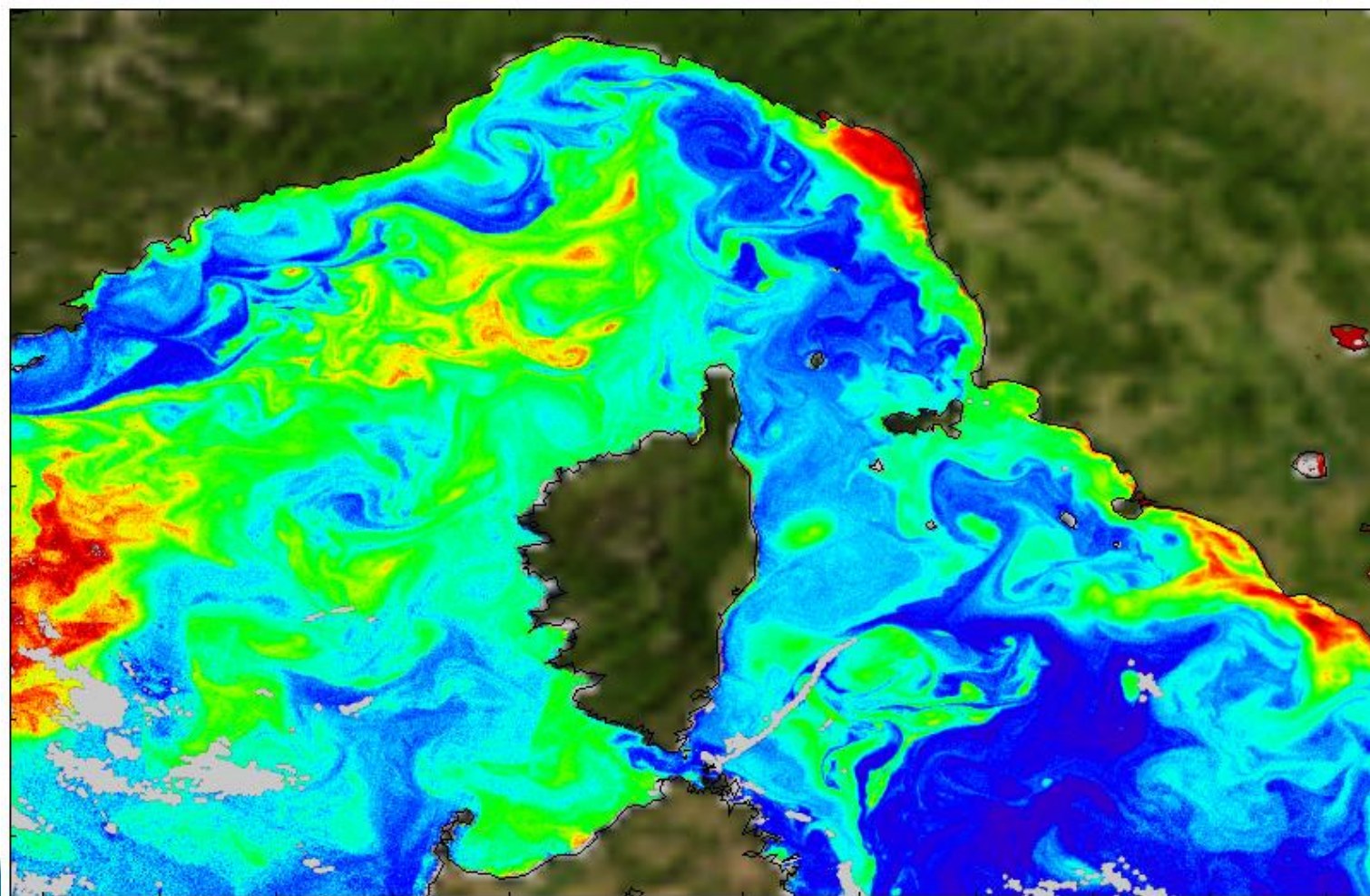
Gulf of Biscay

Oman Gulf

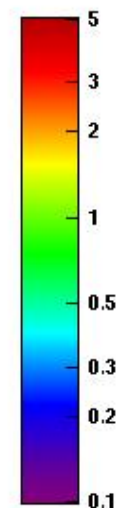


Chl (mg/m3)

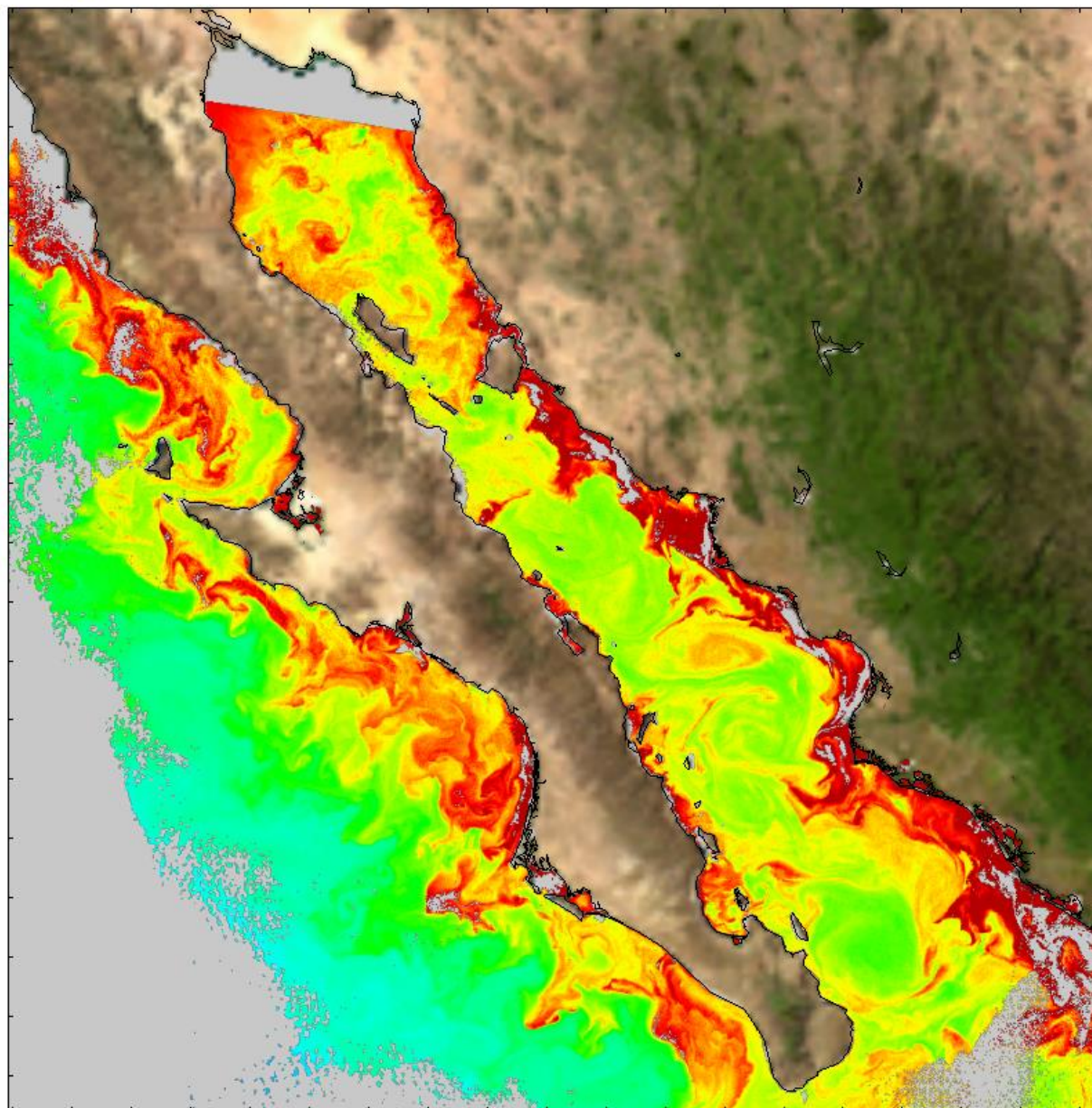




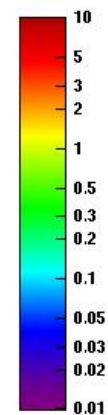
Chl (mg/m3)



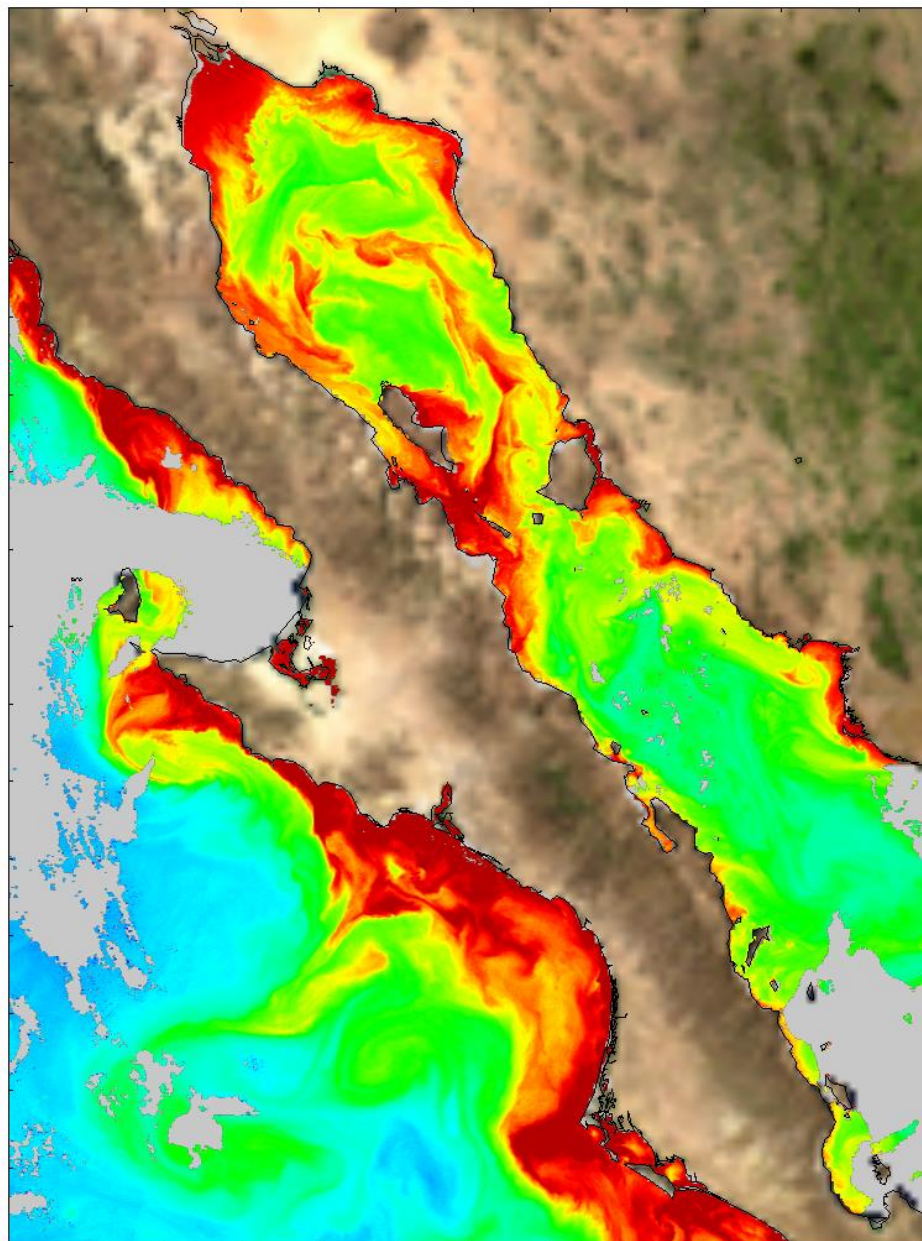
Mediterranean sea



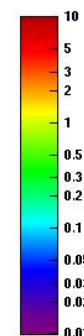
Chl (mg/m3)



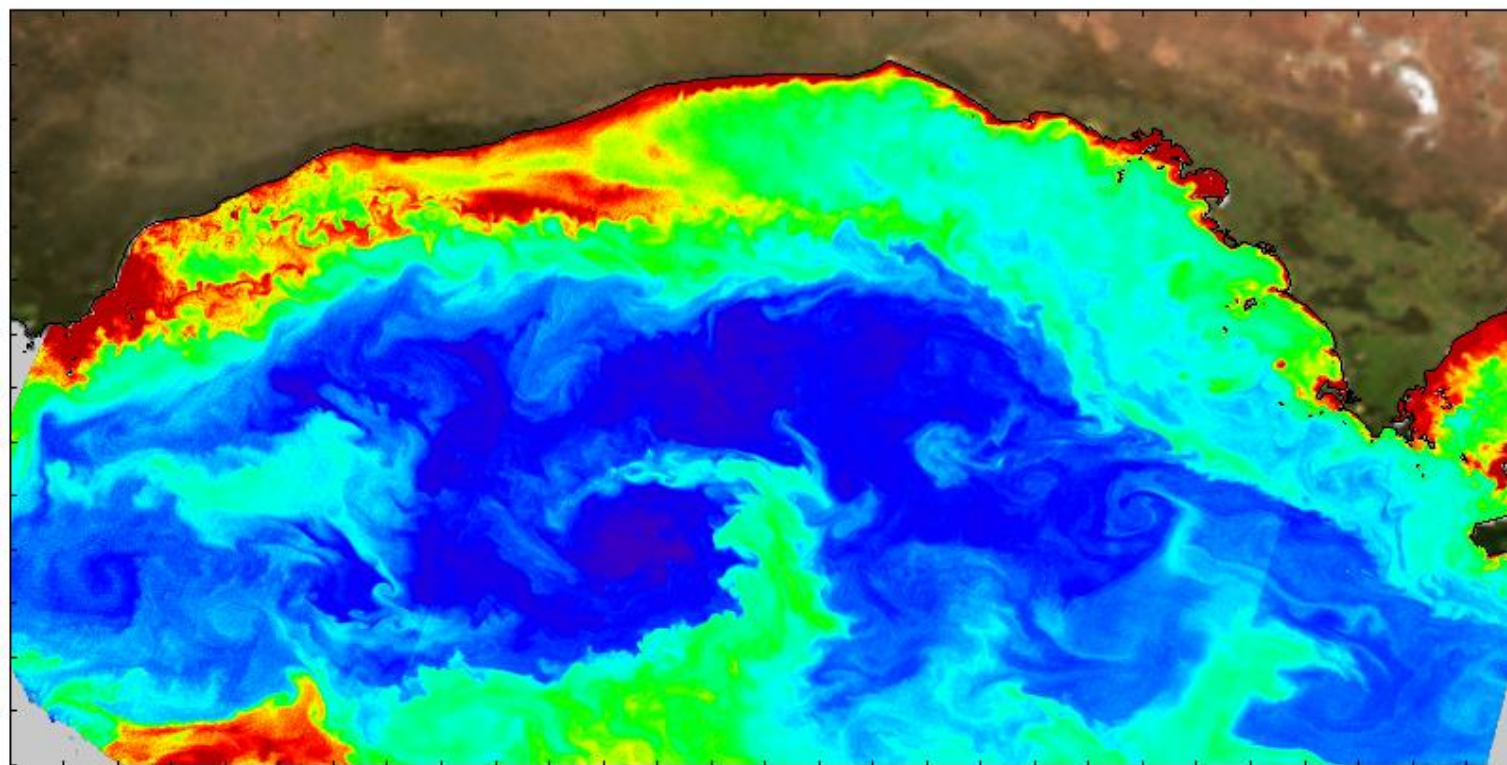
Gulf of California



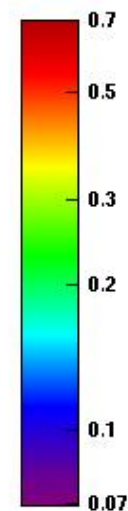
Chl (mg/m3)



Persian Gulf



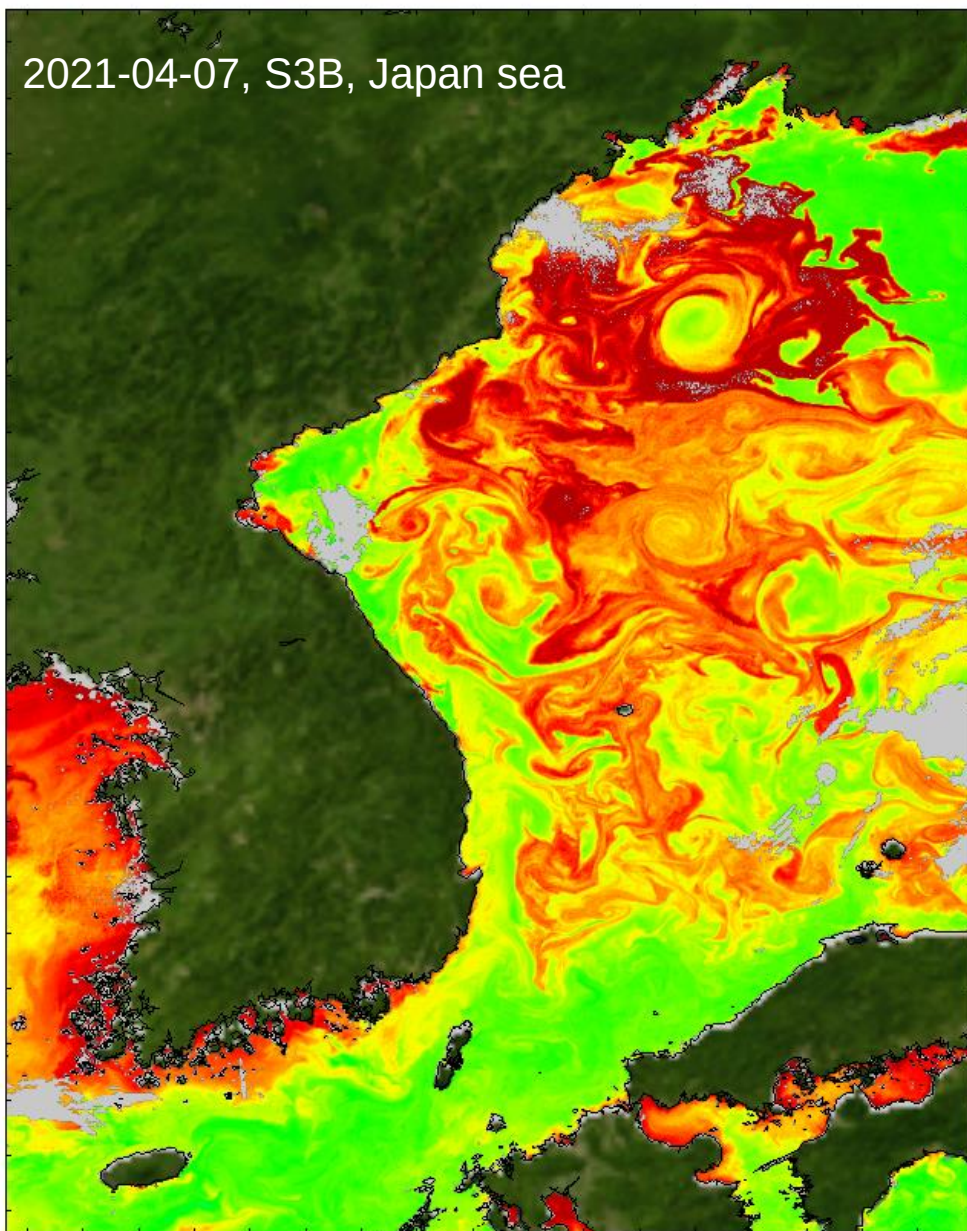
Chl (mg/m3)



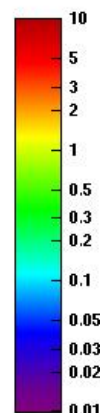
South Australia

- First release will be available in May 2021 (period Jan-2021 to present)
- The timeseries will be extended (from 2016) when the reprocessing level-2 will be made available by EUMETSAT
- Feedback from end users is waited: more than 200 km?

2021-04-07, S3B, Japan sea



Chl (mg/m3)



**Thanks for your
attention !**

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