DLR

esa

living planet symposium | BONN 23–27 May 2022

TAKING THE PULSE OF OUR PLANET FROM SPACE

EUMETSAT ECMWF EUSPA

MedEOS - Land-based pollution assessment & monitoring in the Mediterranean coastal waters

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25th May 2022 – Agora Atlantic Regional Initiative

deimos

mission

To develop and produce

✓*daily,*

✓*high-resolution,*

✓*gap-free*

maps of experimental Earth Observation water quality products.

MedEOS

coastal water monitoring

https://medeos.deimos.pt/

By employing data fusion techniques to combine

✓*the high temporal resolution of S3-OLCI and*

✓*high spatial resolution of S2-MSI data.*

MedEOS is a project funded by the ESA Mediterranean Regional Initiative within Future - Science for Society ESA programmatic line, under the reference AO/1-10376/20/I-EF

services & products

EO Directly Derived Water Quality Products

environmental information derived directly from reflectance measured by Sentinel-2 and Sentinel-3

- Total Suspended Matter
- Turbidity
- Chl-a Concentration
- Secchi Depth
- Colored Dissolved Organic Matter

EO Indirectly Derived Water Quality Products

produced by combining different satellite-derived parameters, numerical modelling, in situ measurements, statistical analysis and Artificial Intelligence (AI) techniques

- Fecal bacterial contamination indicators
- Eutrophication indicators
- HAB Indicator
- Global environmental anomaly detection

River Plume Monitoring

systematic detection of plumes related to major rivers discharging freshwater into the Mediterranean basin

project team

Project leader
Pilot leader
Pilot: Spain

Service provider
Data fusion
Pilot leader
Pilots: France, Tunisia

Service provider
EO Directly Derived Water Quality Products

Service provider
EO Indirectly Derived Water Quality Products; River Plume

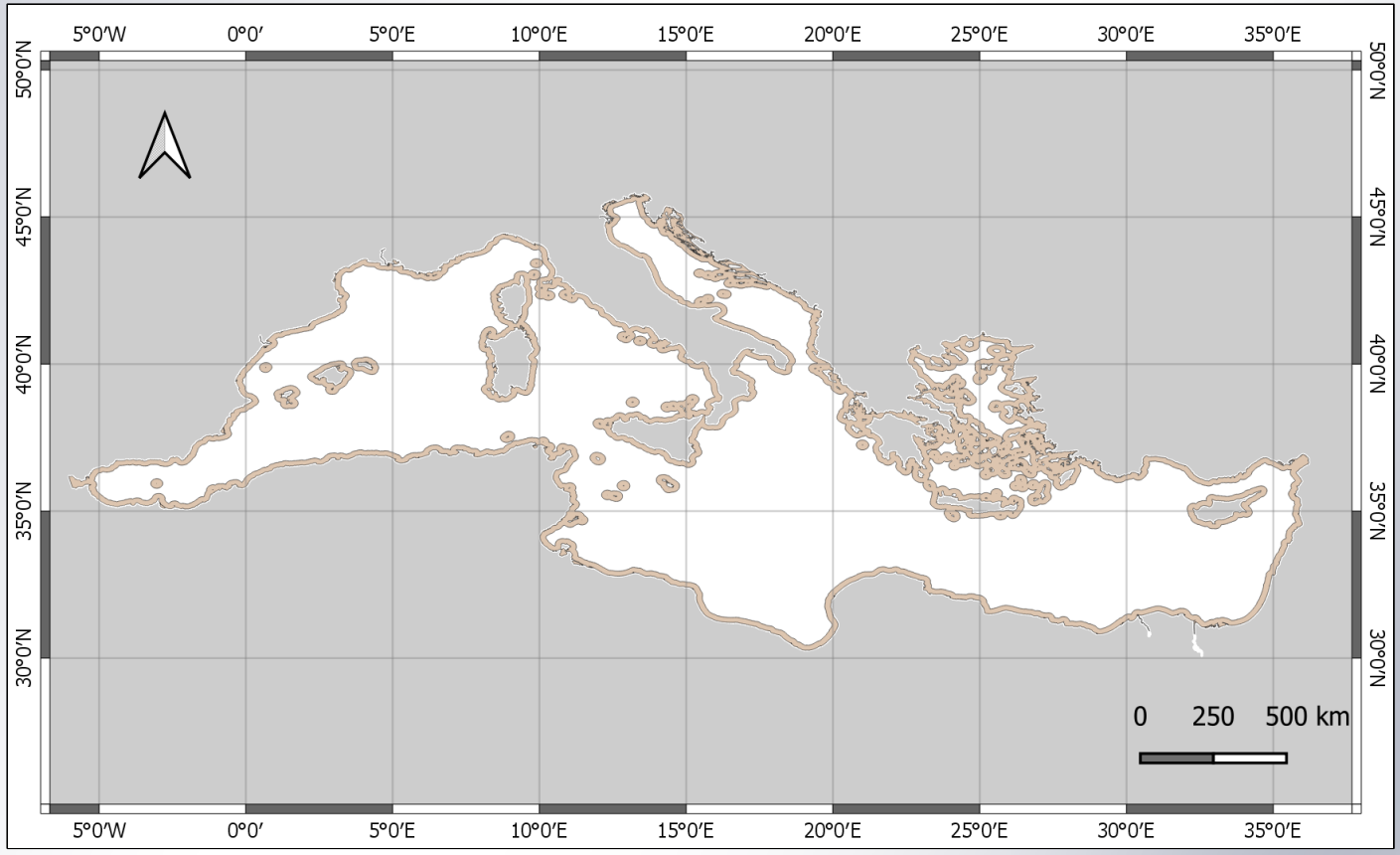
Pilot leader
Pilot: Greece

Pilot leader
Pilot: Egypt

Project promotion and dissemination

MedEOS in numbers

- ✓ From March 2021 to March 2022
- ✓ 5 pilot areas (year 1)
- ✓ 8 engaged end users
- ✓ 120+ user requirements identified
- ✓ 46 000 km of coastline (year 2)
- ✓ 3.5-year period, from March 2019 to September 2022



user requirements

- ✓ Review of existing documents and surveys
- ✓ Workshops 6 electronic survey with pilot areas stakeholders
- ✓ Workshop with UNEP-MAP

23 requirements

+

94 requirements

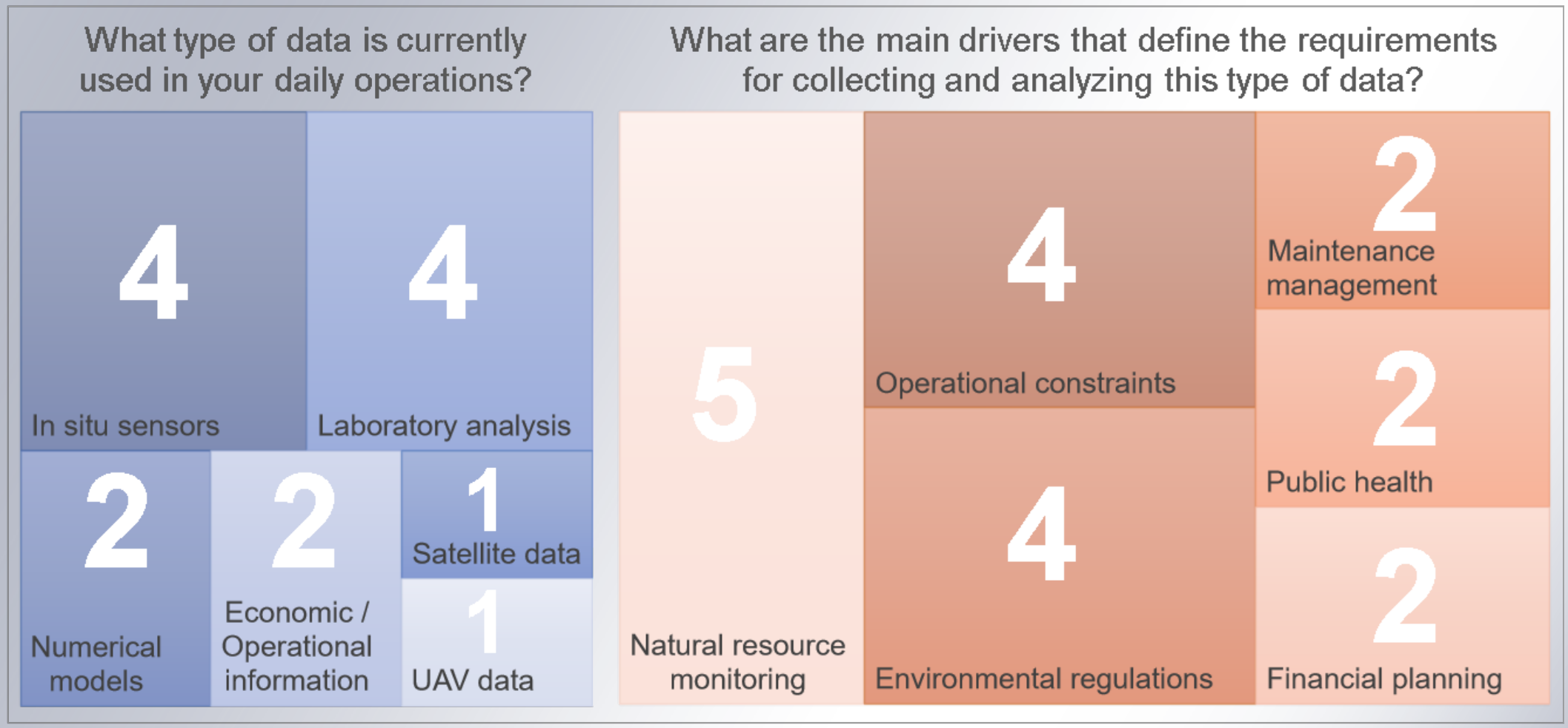
+

6 requirements

=

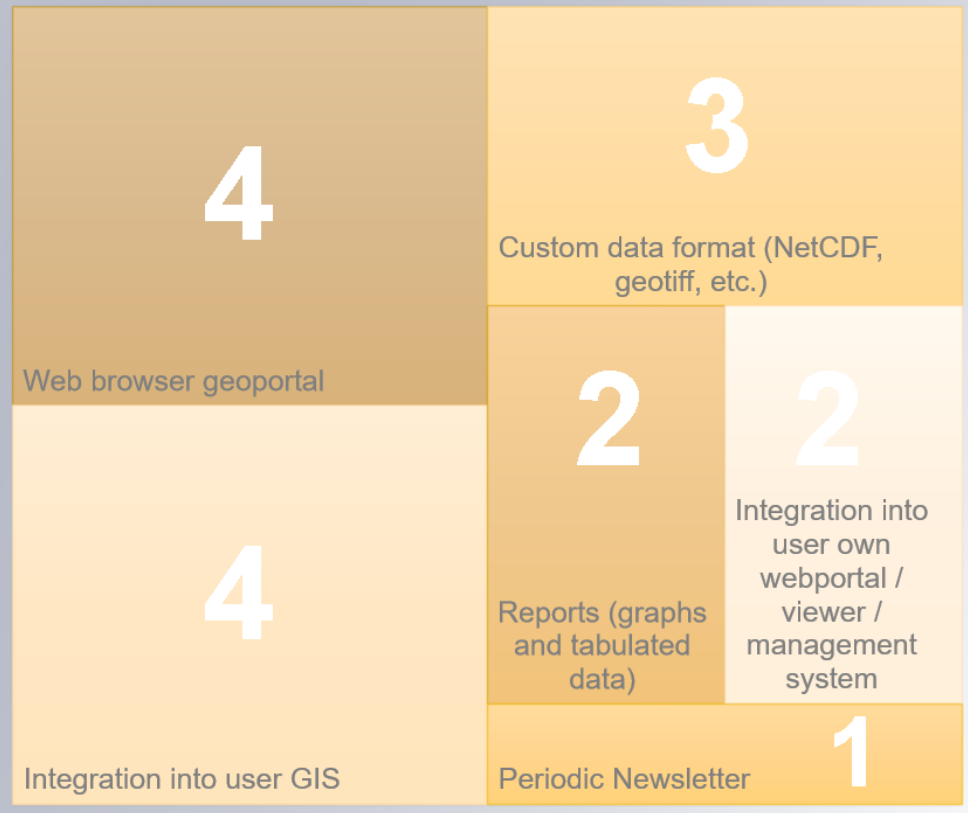
123 requirements identified

user requirements

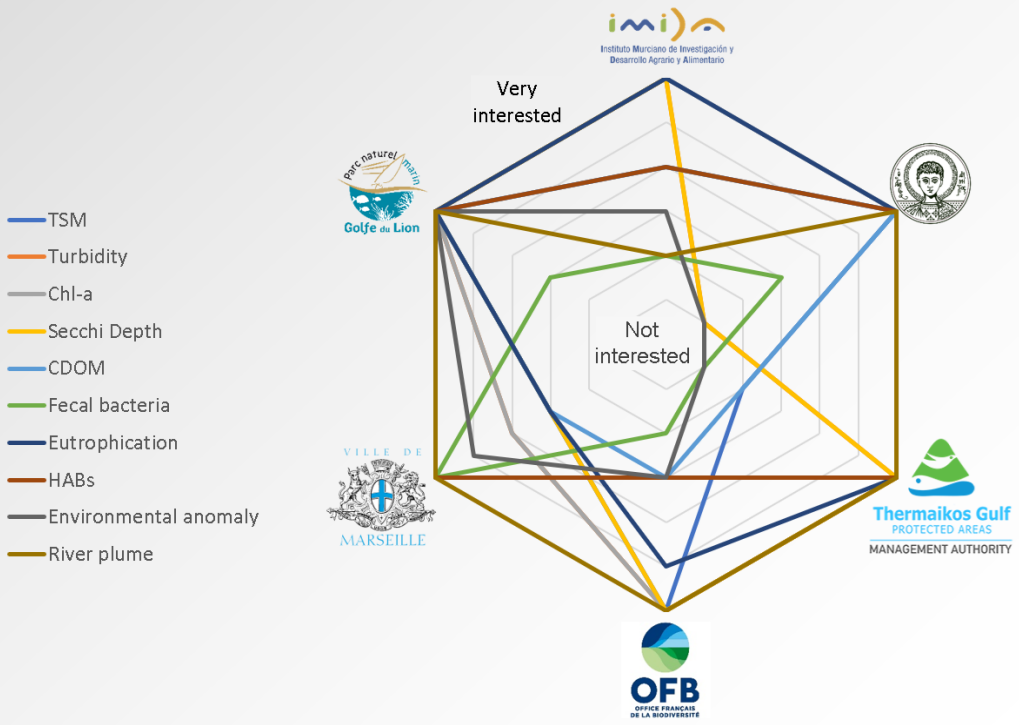


user requirements

What would be your preferred approaches for delivery of the information provided by the MedEOS services?

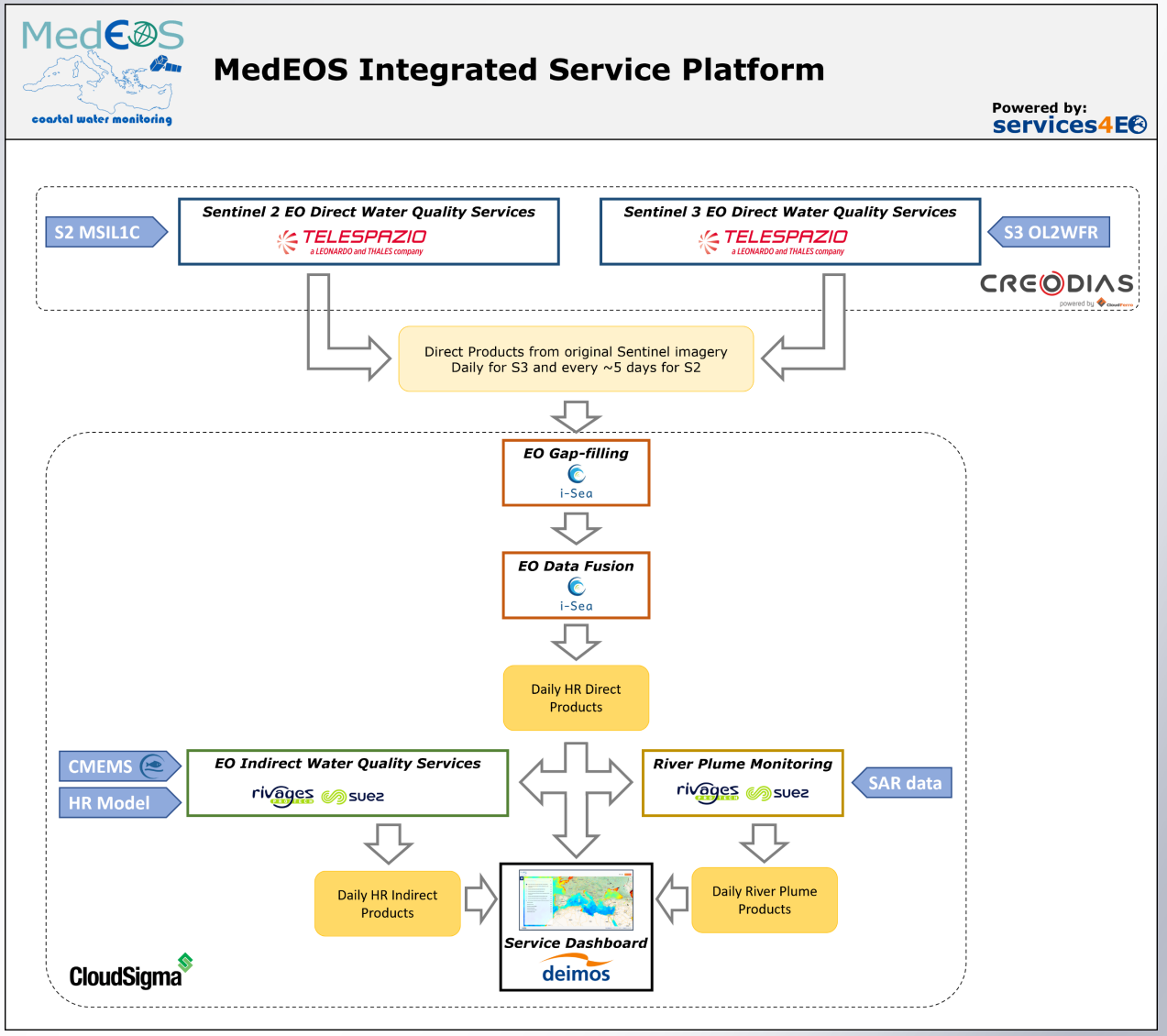


For each of the information services that are foreseen under MedEOS, what is your level of interest in testing prototypes?

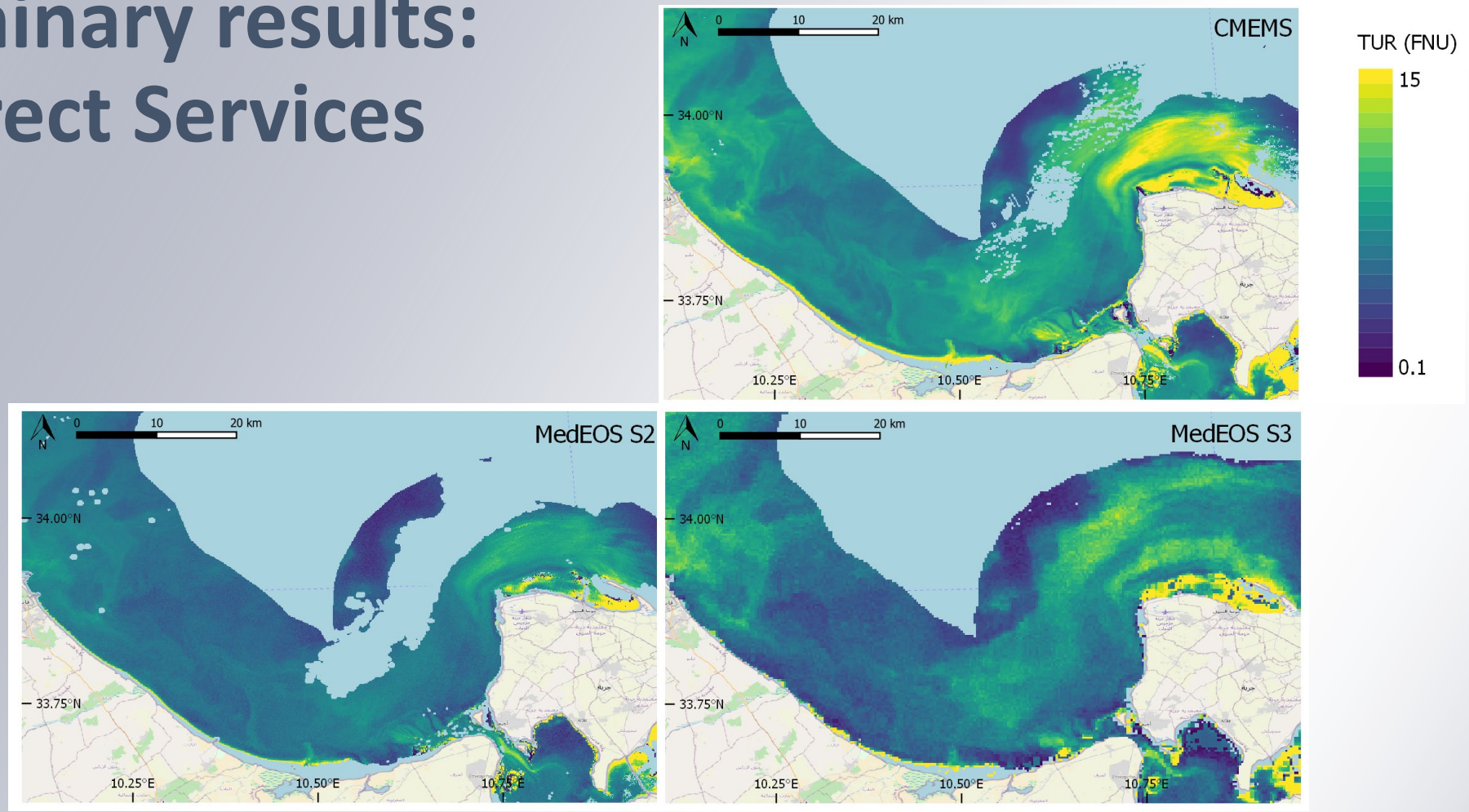


MedEOS supply chain

- ✓ Distributed on two different ICT cloud providers sponsored by ESA NoR and supported by services4EO
- ✓ EO Direct WQ Services + gap-filling & data fusion in year 1
- ✓ EO Indirect WQ Services + geoportal in year 2

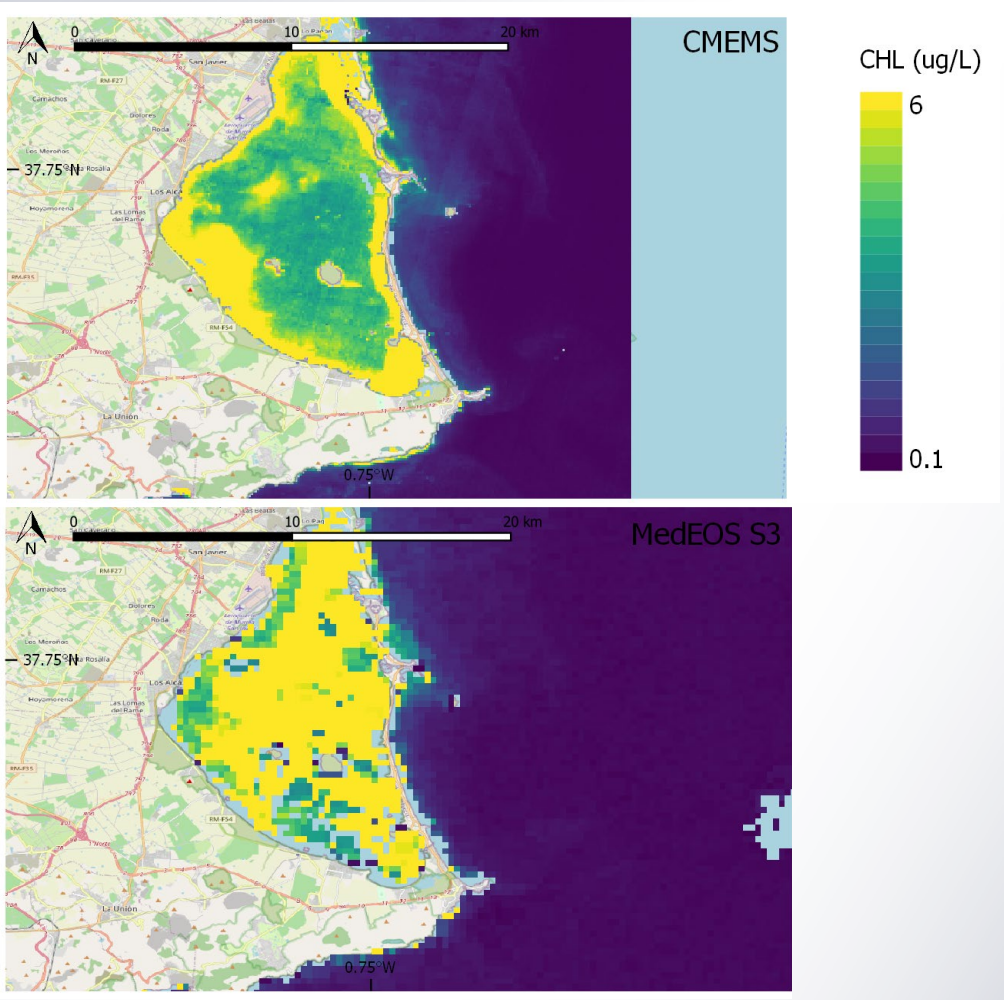


preliminary results: EO Direct Services



Turbidity from: CMEMS HR OC (top); MedEOS Sentinel 2 (bottom-left) and MedEOS Sentinel 3 (bottom-right), computed for pilot area IV (Tunisia) on 17/09/2020 using Nechad et al. (2009) algorithm

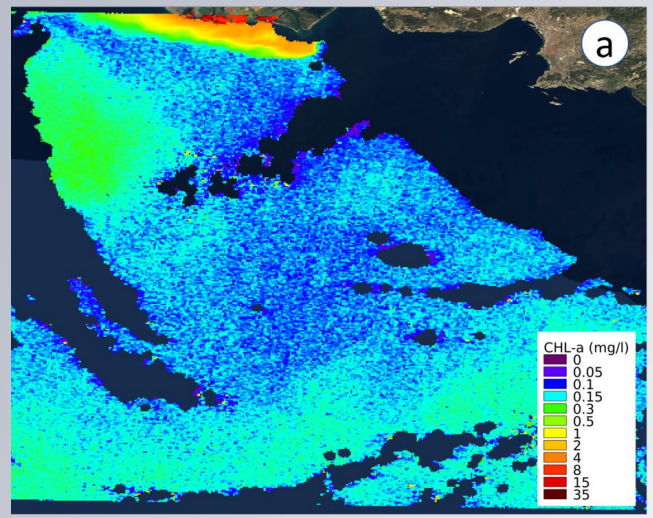
preliminary results: EO Direct Services

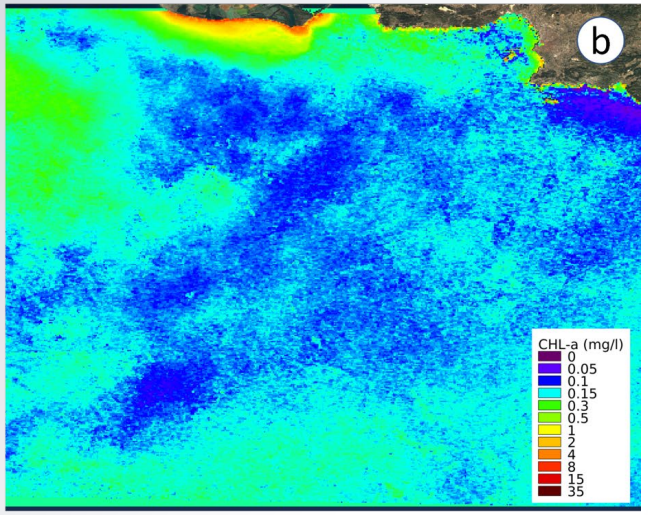


Chlorophyll-a concentration from: CMEMS HR OC (top); MedEOS Sentinel 2 (bottom-left) and MedEOS Sentinel 3 (bottom-right), computed for pilot area III (Spain) on 27/09/2020 using OC3 + Gons et al. (1999) algorithms

preliminary results: gap-filling

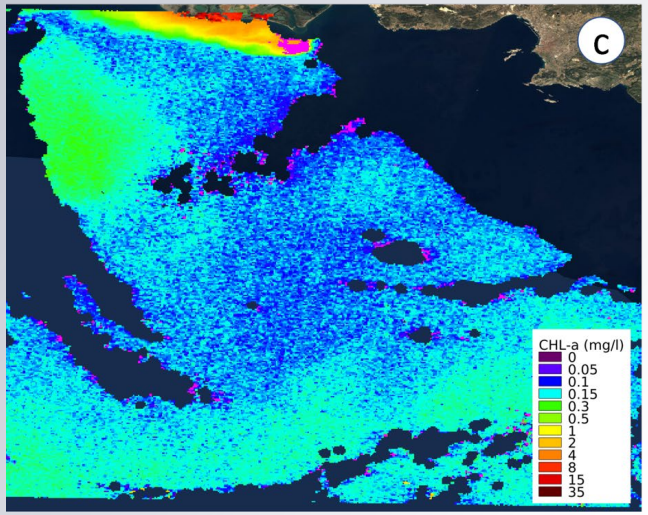
original product with cloud gaps

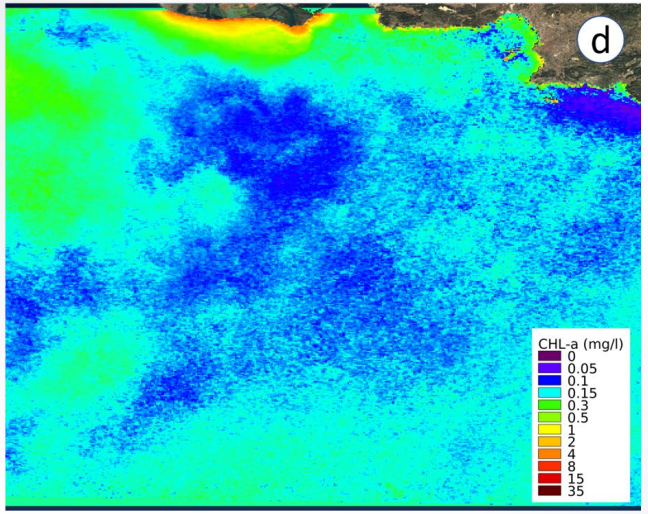




DINEOF result after first run

outliers detected in pink

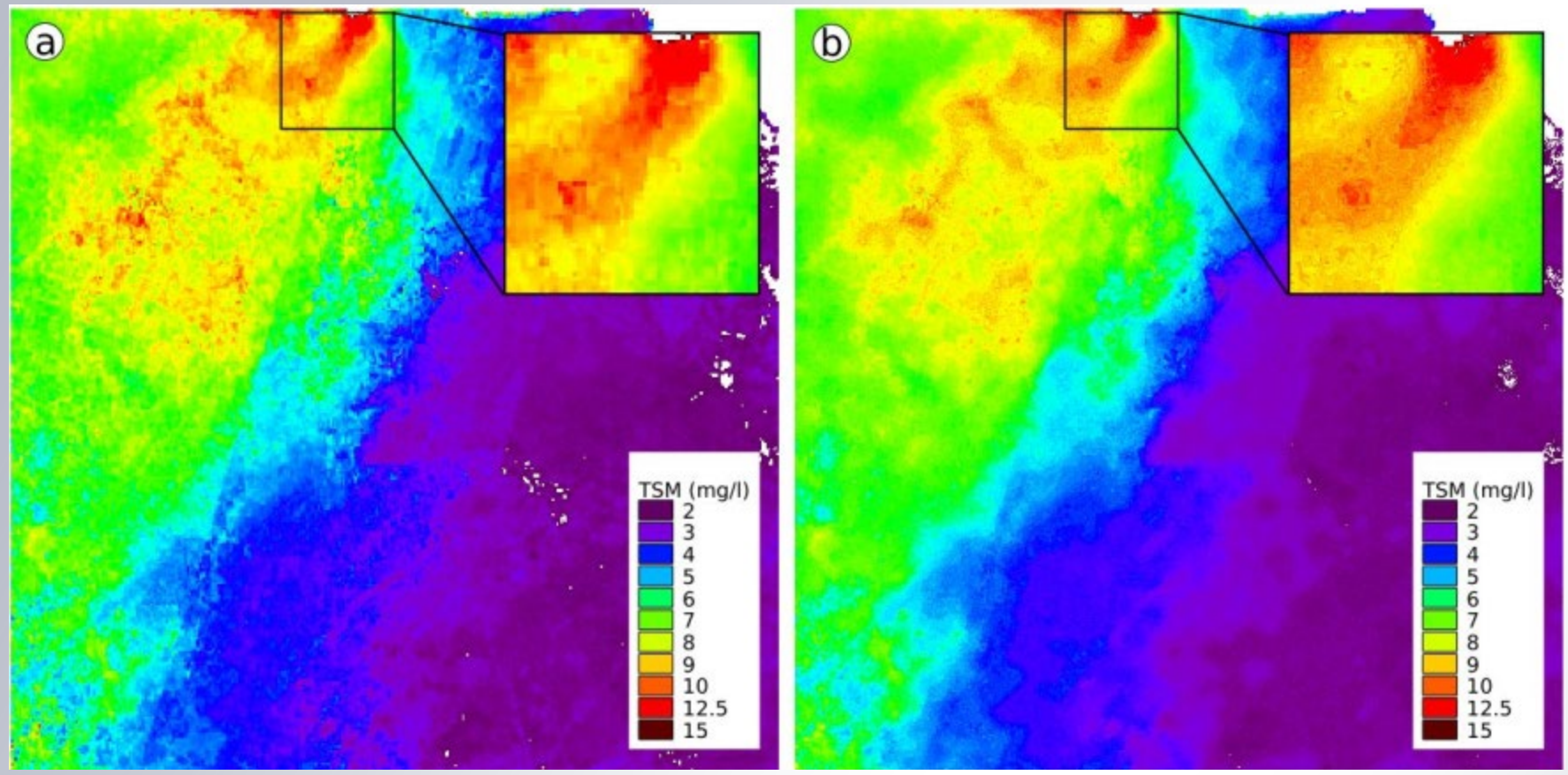




DINEOF result after second run without outliers

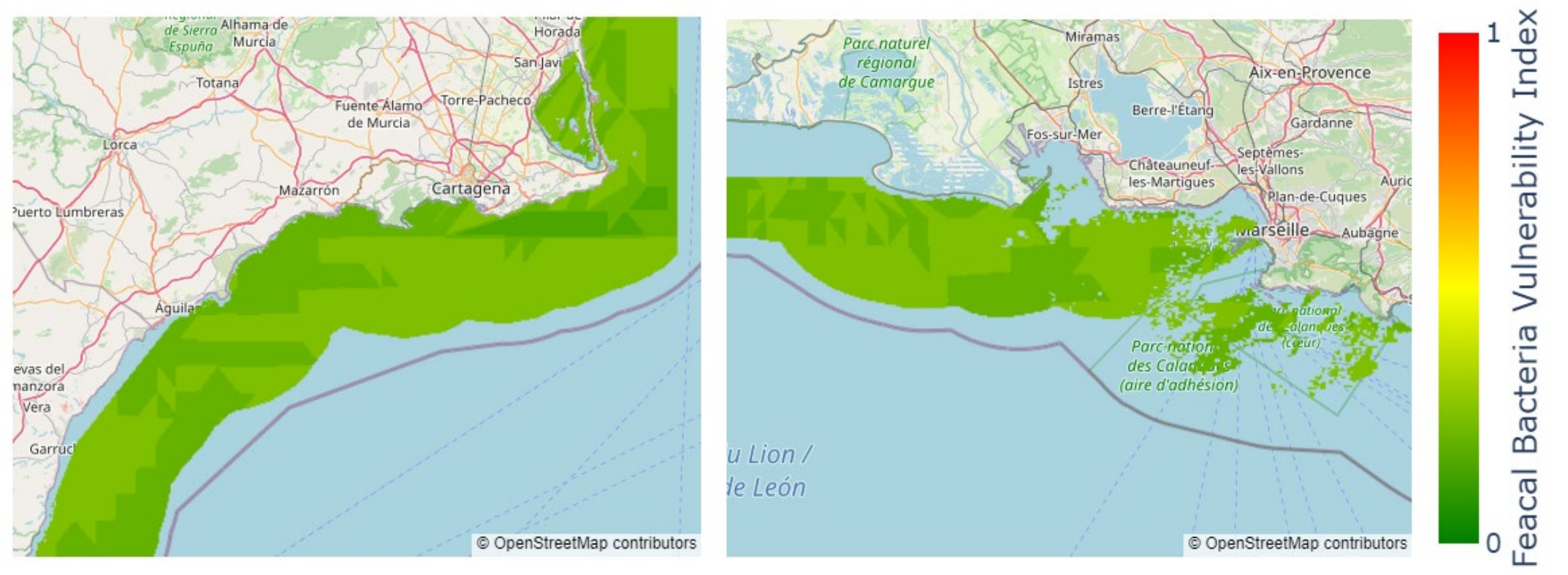
DINEOF - Data Interpolating Empirical Orthogonal Functions

preliminary results: data fusion



Example of result on TSM: Sentinel 3 derived TSM after gap-filling (a); TSM data fusion output at 20 m (b)

preliminary results: EO Indirect Services



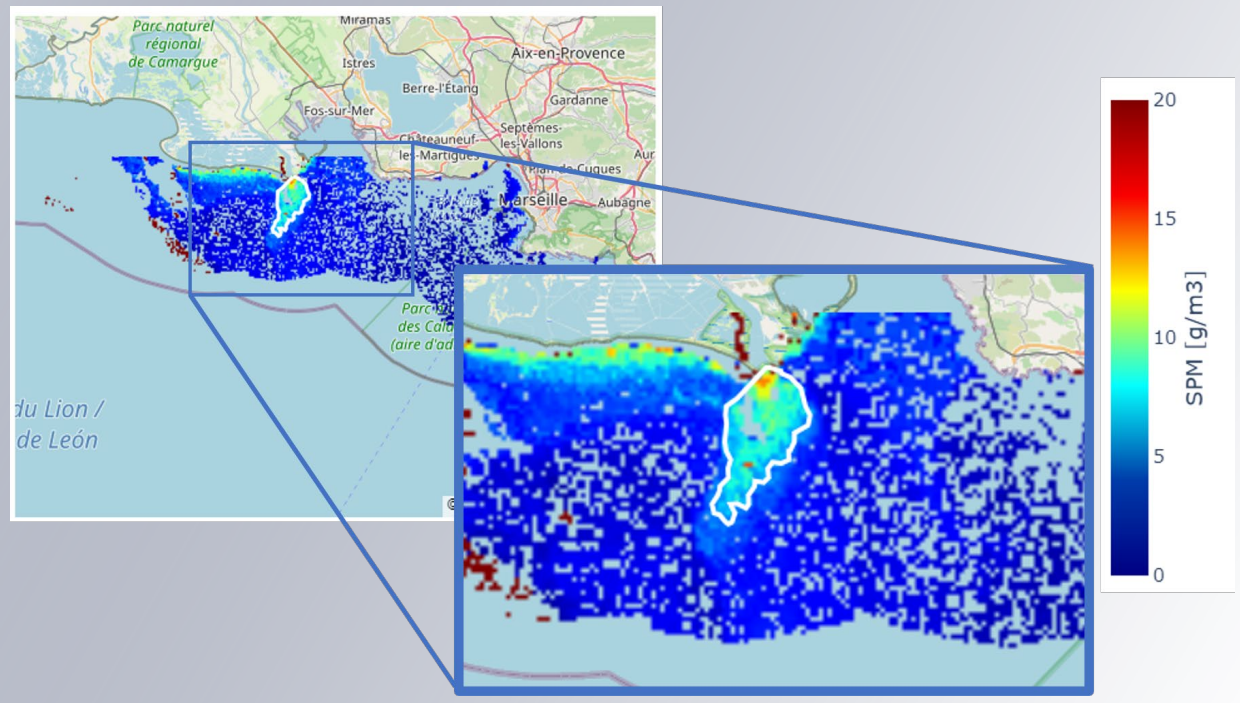
Fecal Bacteria Vulnerability Index computed in pilot area V (Spain, left) and pilot area I (France, right) on 2020/10/03 and 2020/10/10 respectively

preliminary results: river plume

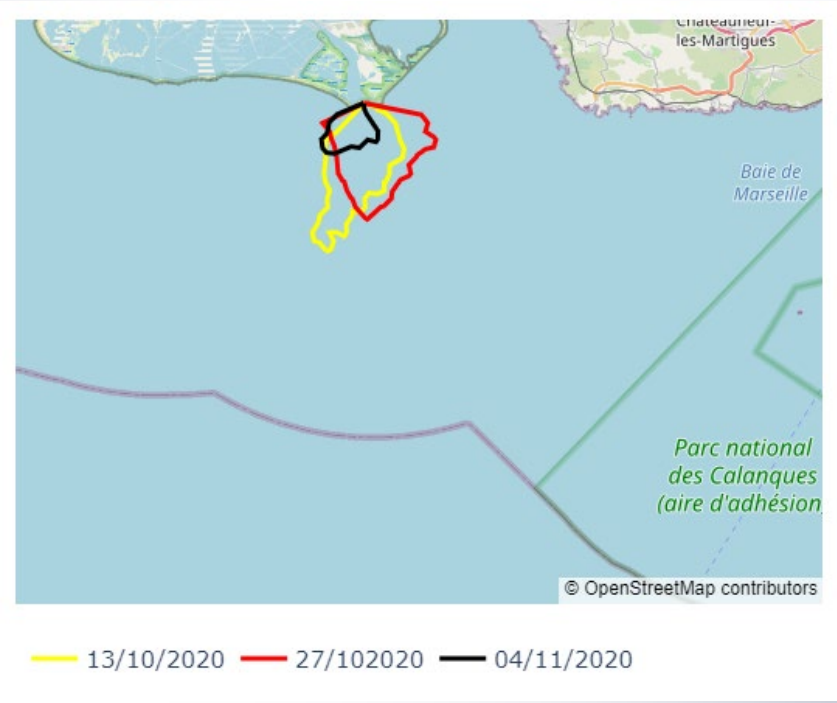
Pilot Area I

Rhône river plume tracking :

EO Direct Sentinel-3 image on the 13th of October 2020



Evolution of detected Rhône river plume position and extension



current status and next steps

- ✓ EO Direct WQ Services + gap-filling & data fusion fully developed and integrated in services4EO EO exploitation platform
- ✓ Final integration / production tests ongoing
- ✓ Production for year 1 to start in early June 2022
- ✓ Final product resolution to be defined considering validation results and feedback from engaged users
- ✓ Impact assessment: end users to perform own validation and evaluate usefulness of MedEOS outputs

Thanks!

Check info here:

Services 4EO collaborative Earth observation ecosystem

Visit us at Booth #6 and register for a present!