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Listen to the ocean

Copernicus Evolution – Research for harmonised and Transitional-water Observation (CERTO)

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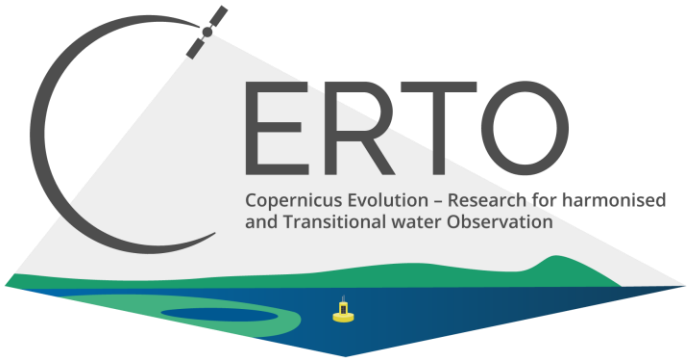
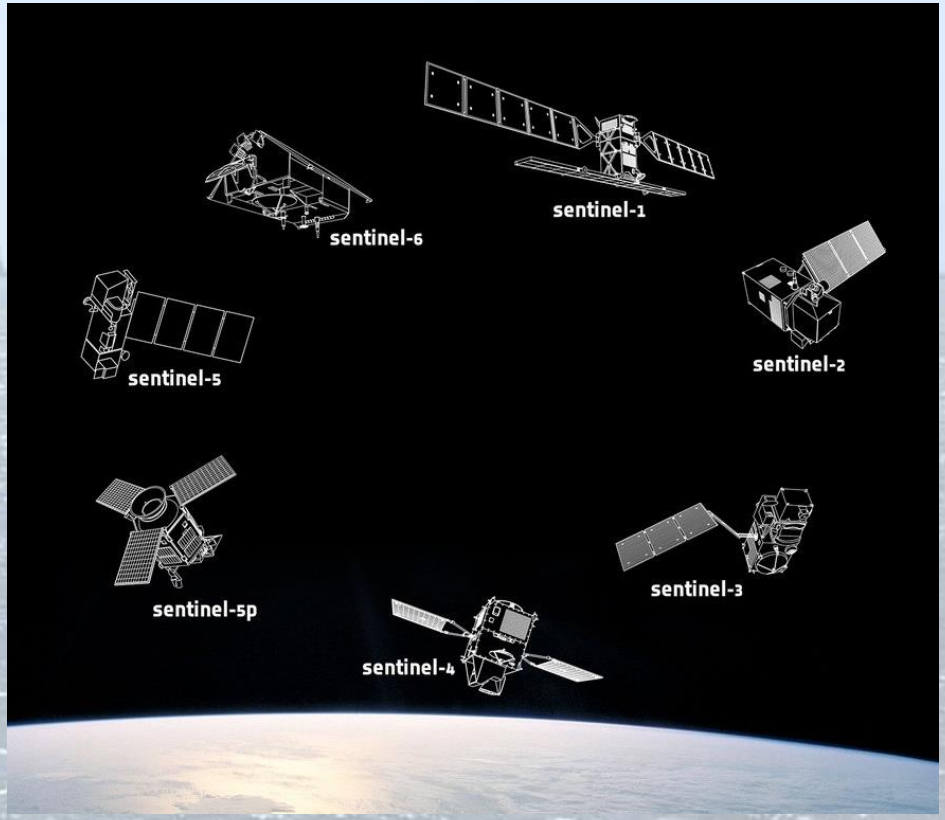


Copernicus Programme

- Copernicus is a major EU initiative to observe the Earth
- European contribution to the GEO system of systems
- Copernicus has, *inter alia*, two key elements:

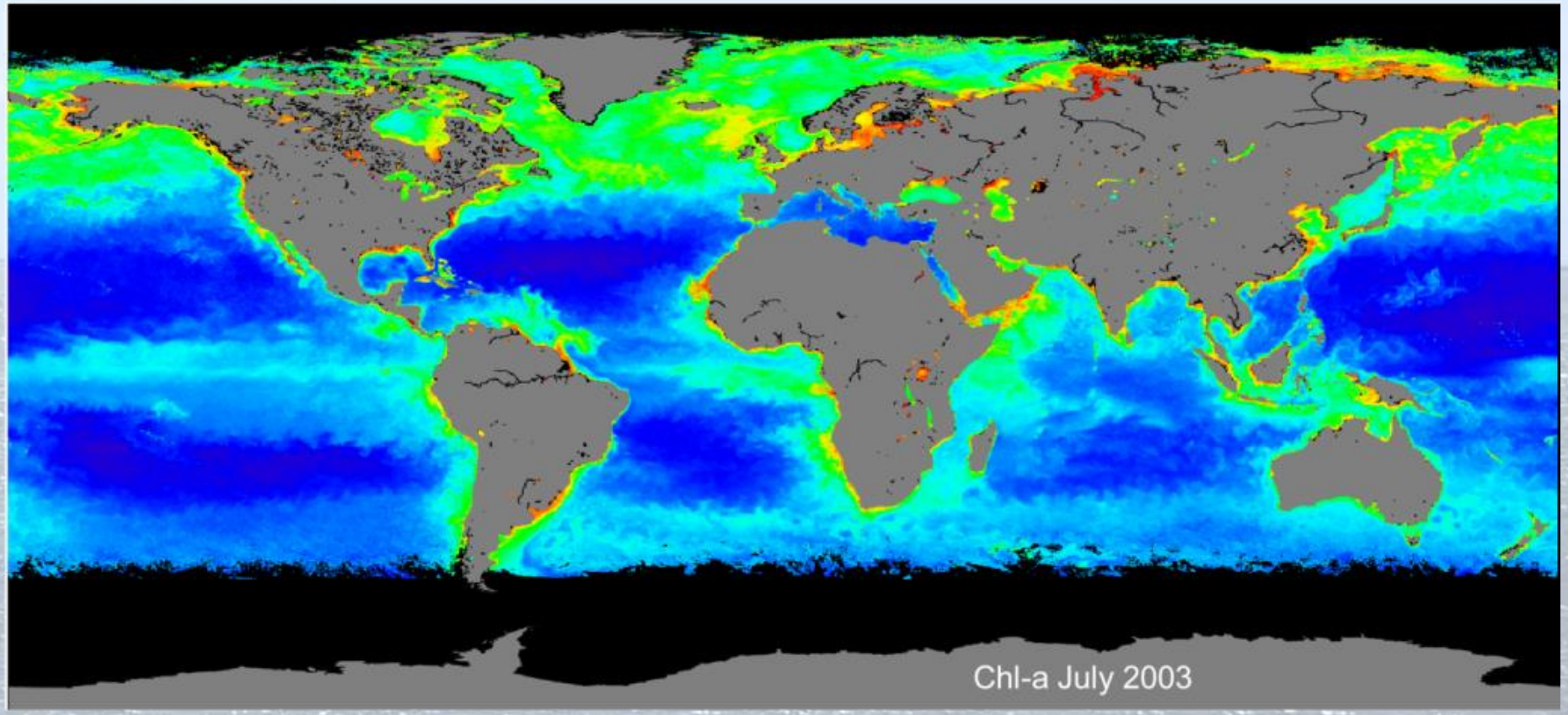
Six thematic services that provide data and forecasts



The Sentinel operational satellite series

Water colour

- Data provided by Copernicus includes “Water colour” governed by water constituents like phytoplankton, sediments or coloured dissolved organic matter



Copernicus Climate Change; Copernicus Marine: global – uses optical water type approach

Water colour

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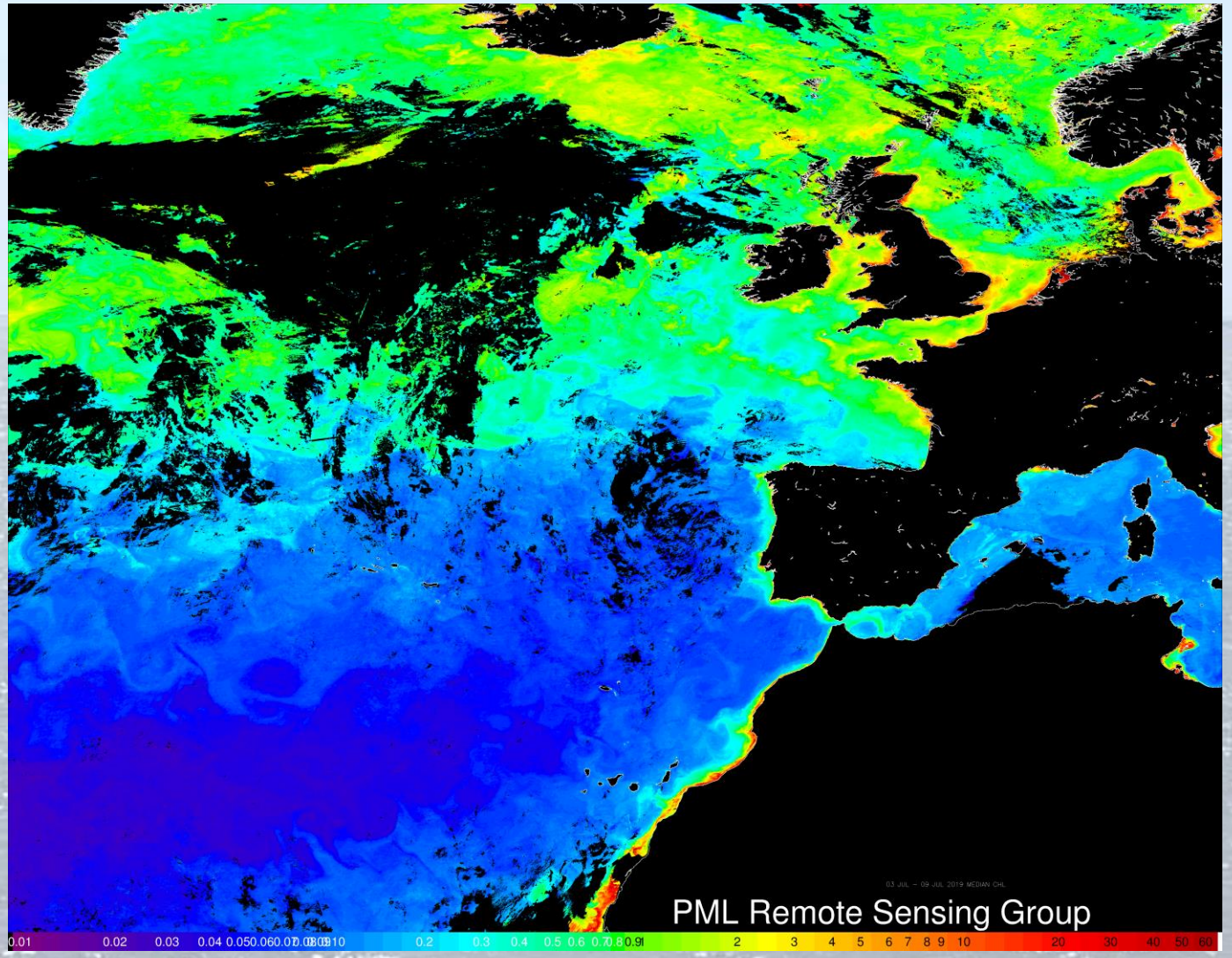

Copernicus Marine

Regionally-tuned chl-a algorithms

Water colour

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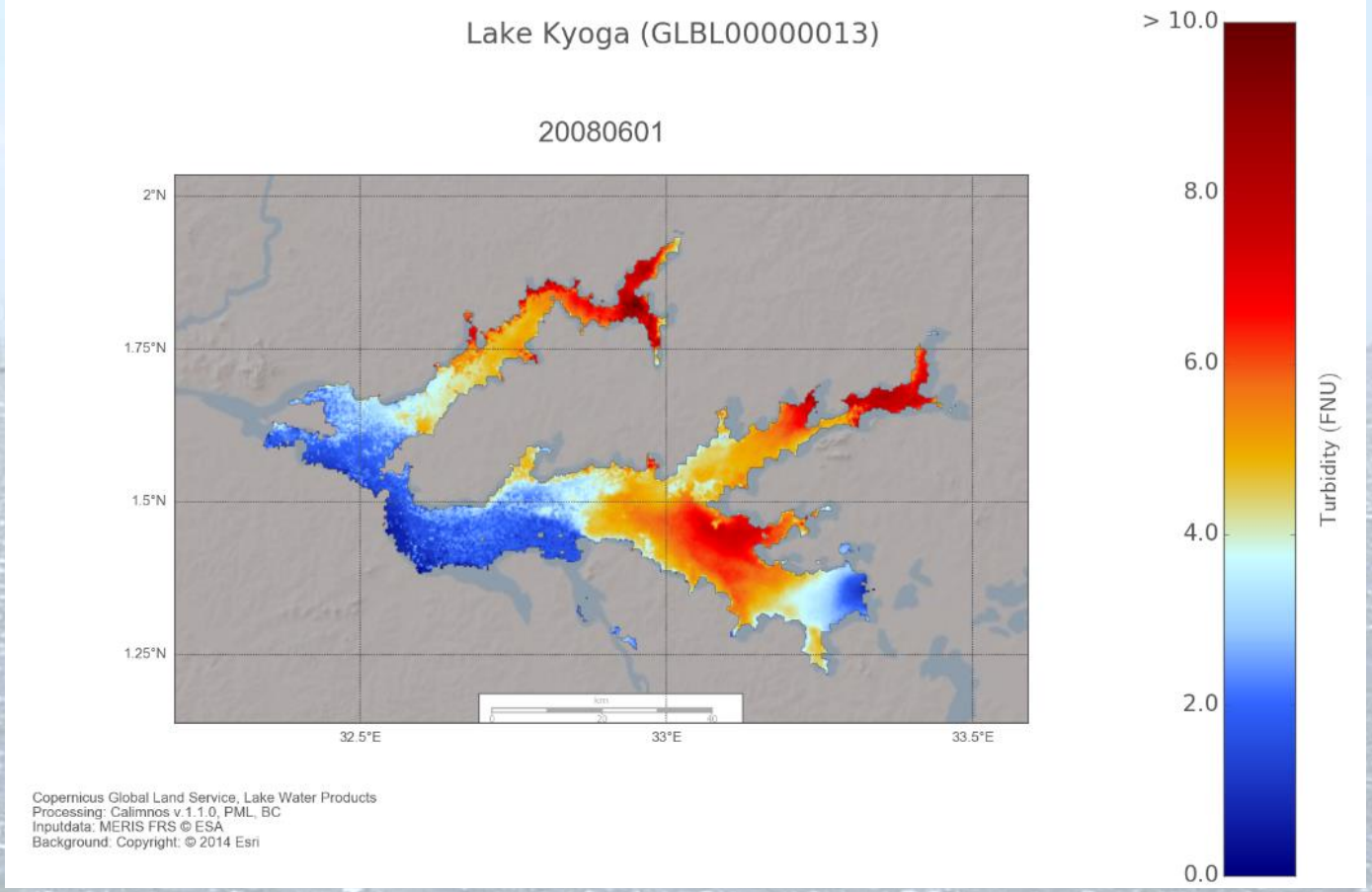

Copernicus Land: optical water type approach

- But each Copernicus service uses different approaches/algorithms

Water colour

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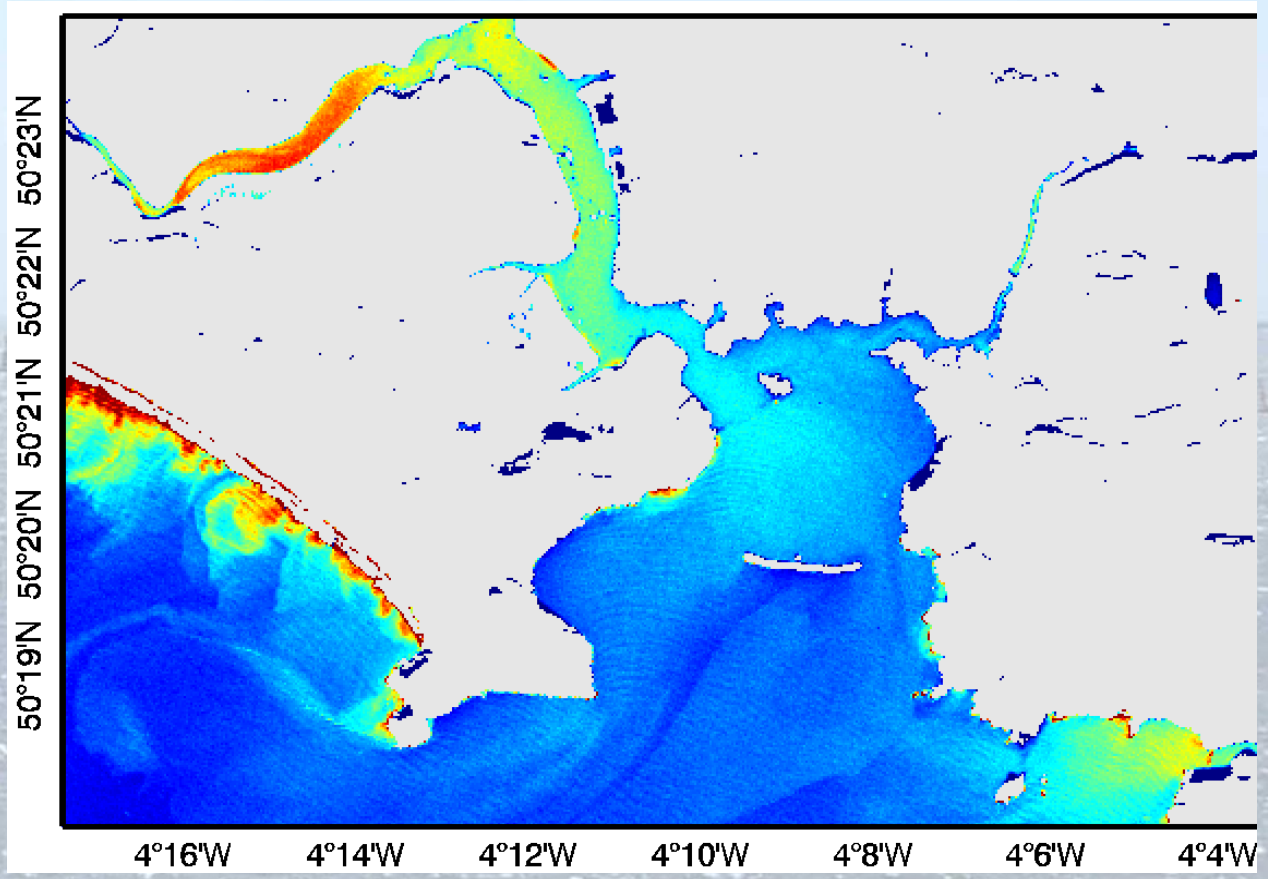
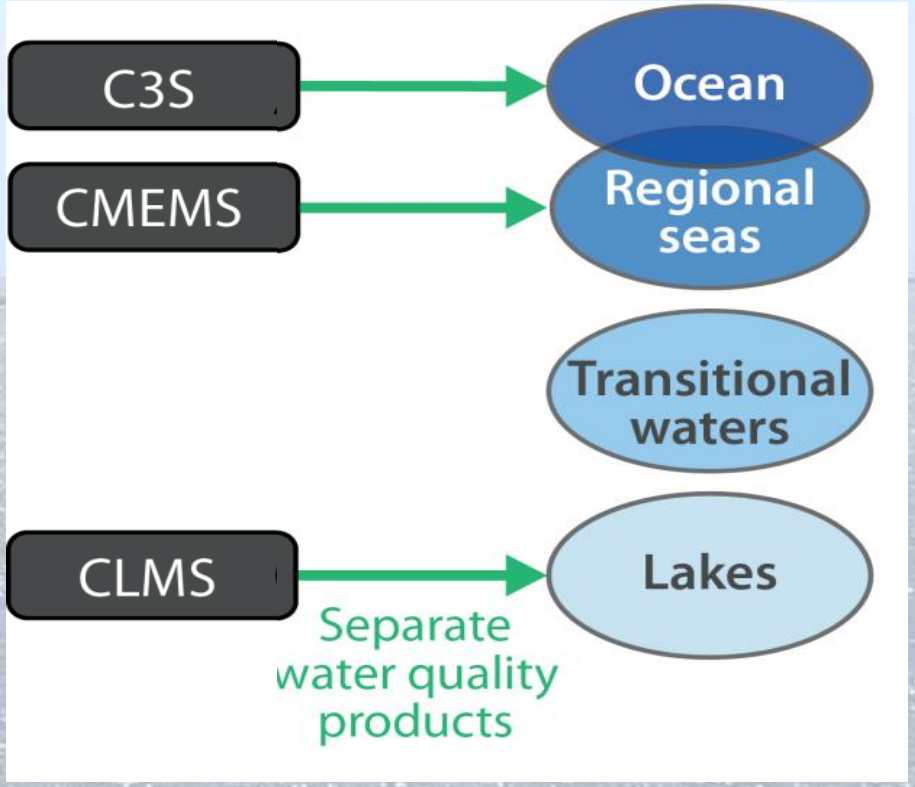


- Some regions (estuaries, lagoons, large rivers) are not covered by any of the Copernicus services

Copernicus water colour production

- Copernicus Marine, Climate Change and Land produce water quality
  - Use different methods for ocean, shelf waters and lakes
  - Variables have different names and formats between services



- Long time series of Essential Climate Variables

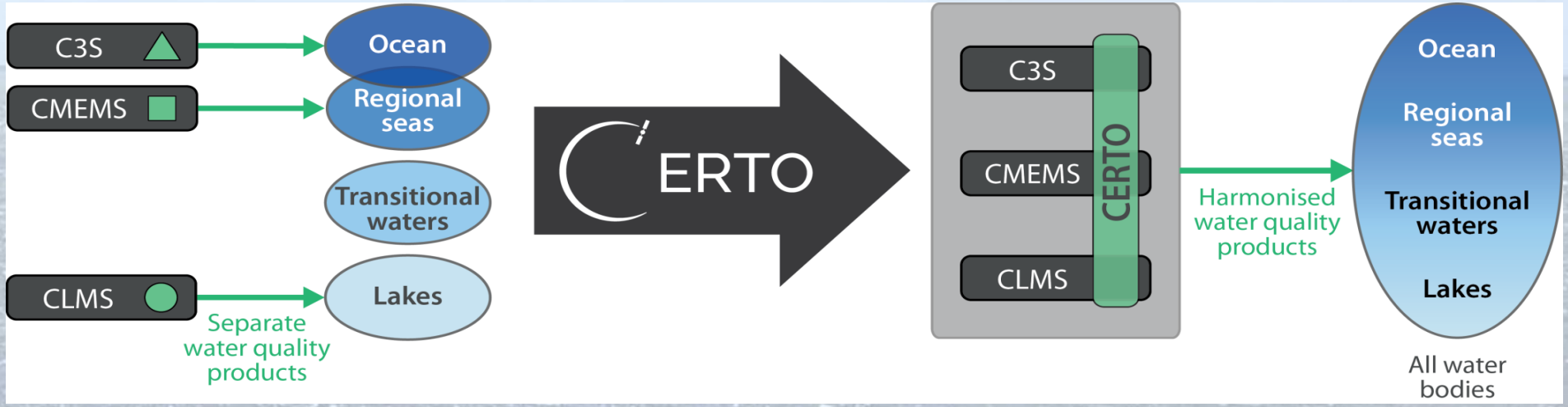
- Long regional time series based on Essential Climate Variables
- Near-real time

- Long time series per lake
- “Near-real time”

  - No service fully covers transitional waters (estuaries, rivers, near-coast and lagoons)

H2020 LC-SPACE-04-EO-2019-2020 call

- Copernicus evolution – Research activities in support of **cross-cutting applications** between Copernicus services
- Hence, Copernicus Evolution – Research for harmonised and Transitional-water Observation (CERTO)



CERTO Objectives

- Harmonise between the different Copernicus services approaches
- Develop specific in-water and atmospheric correction methods for water quality in transitional waters
  - WP3, WP4, WP5
- Implement indicators relevant to management, policy and science users operating in transitional waters
  - WP6
- Interact and consult with commercial, industrial, scientific, policy and monitoring stakeholders
  - WP2, WP8
- Provide a prototype system for exploitation by the Copernicus Services + evidence of its value
  - WP7

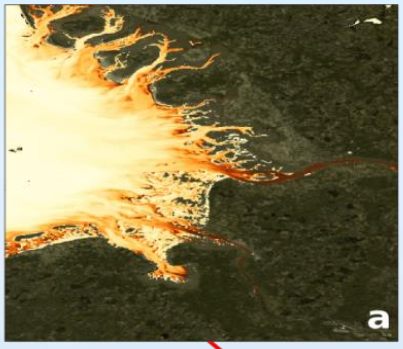
Management: Advisory Board (AB)

- AB provides independent advice and feedback on: R&D objectives; communication with stakeholder groups; and dissemination
- AB will encourage the promotion and wide awareness of CERTO amongst their respective communities.

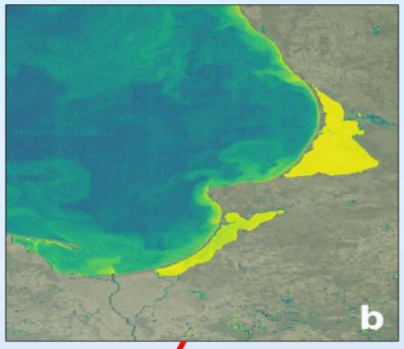
Organisation name	Representative	Role
GEO AquaWatch	Dr S. Greb, Director GEO AquaWatch	Links with GEO AquaWatch; global user community focus
GEO Blue Planet	Dr P DiGiacomo, NOAA, Co-chair GEO Blue Planet	Links with GEO Blue Planet; global user community focus
Future Earth Coasts	Dr S Ferse, Executive Director	Links with Future Earth Coasts; global user community focus
Joint Nature Conservation Committee, UK	Dr G Jones	Links with JNCC; policy / government focus
European Association of Remote Sensing Companies	Dr R Donnelly, Business manager, EARSC	Links with EARSC; focus European companies in remote sensing
Helmholtz-Zentrum Geesthacht	Dr H Krasemann	Scientific expert on water quality and EO methods intercomparison

CERTO User Engagement and R&D Sites

- Six transitional waters: focus of in situ data gathering – radiometry and in water data - and interaction with local and regional users

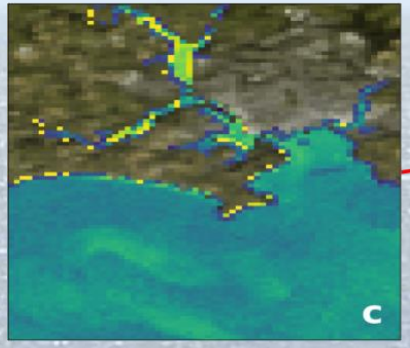


Elbe Estuary, DE

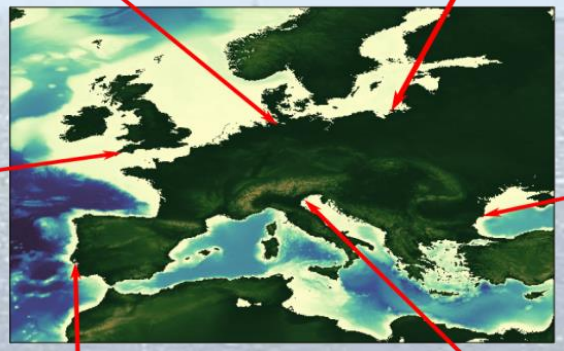


Curonian Lagoon, LI

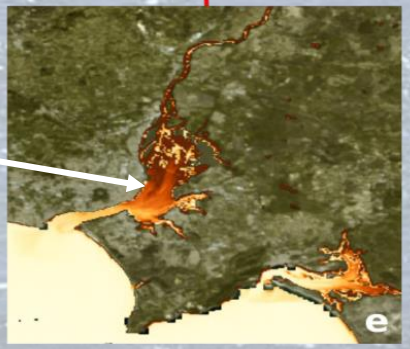
Sinoe-Razelm Lagoon, RO

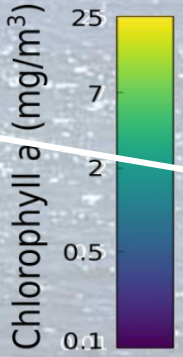


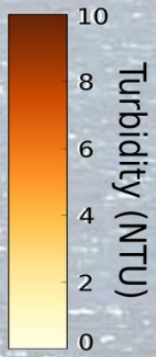
Plymouth Sound, UK



Tagus Estuary, PT







Venice Lagoon, IT

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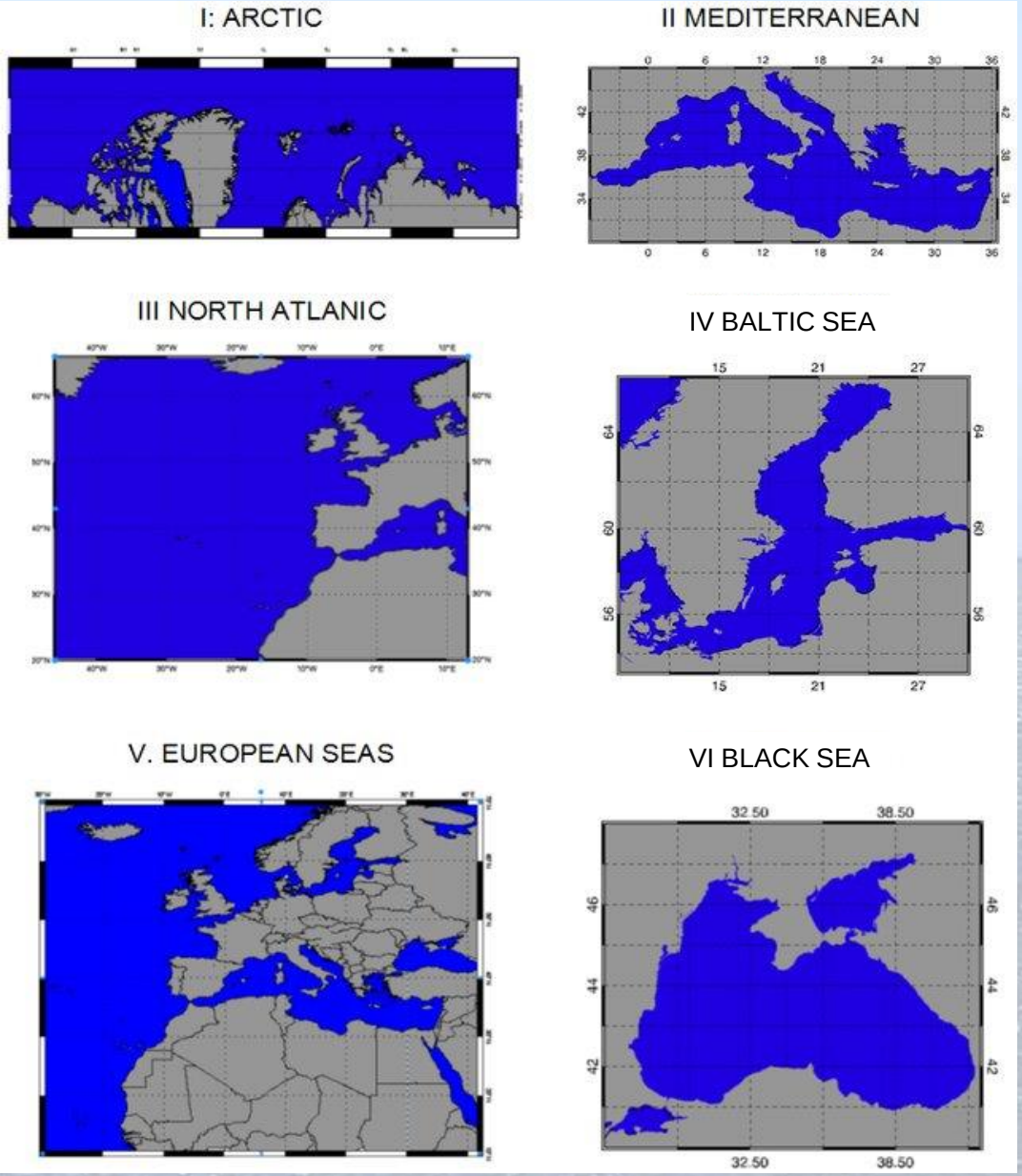
CERTO Study Areas

- Regional: through Copernicus Marine regional areas: Atlantic; Arctic; Baltic Mediterranean; Black Sea

- Globally through key international science groups (GEO Blue Planet; GEO AquaWatch; Lagoons for Life; EC DANUBIUS-RI)



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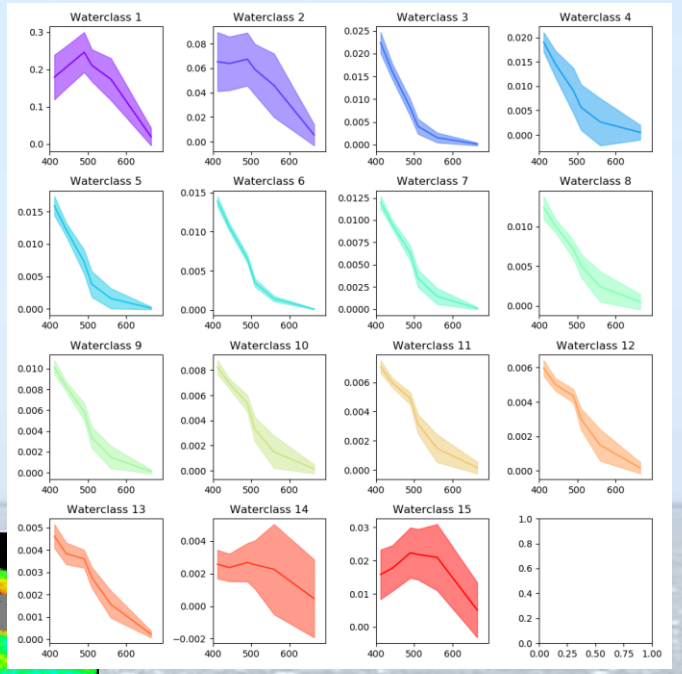
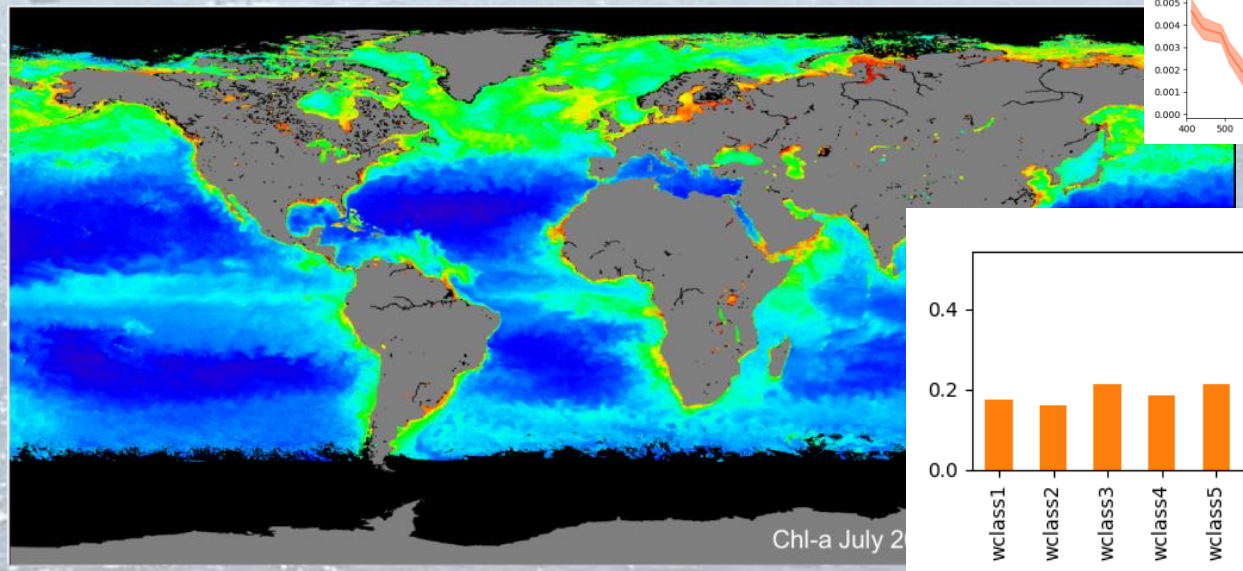
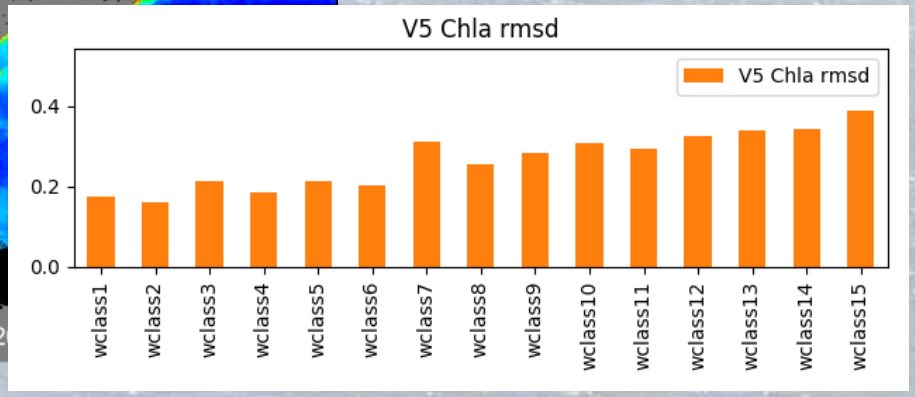
WP4: Optical water type

- Create an optical water type scheme for cross- domain optical water classification
- Generate optical water class sets derived from Sentinel-2 and 3)
- Propagate information on the quality of the per-pixel classification itself into the final product uncertainty.



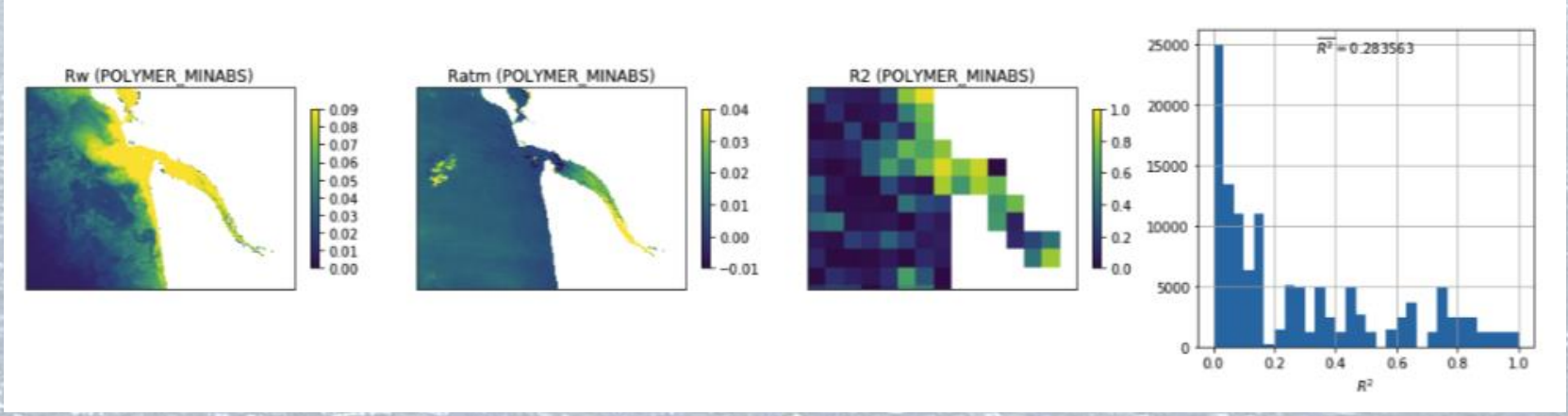




OC CCI uncertainties (based on matchups with satellite data) depend on water class

WP5 Atmospheric correction

- Evaluate, inter-compare, validate and select the best performing atmospheric correction algorithm in transitional waters
  - Adequacy of the water reflectance model used for atmospheric correction in transitional waters.
  - Impact of adjacency effects and bathymetry effect (bottom visibility)
  - Uncertainty propagation scheme



Atmosphere/ocean decoupling test POLYMER atmospheric correction algorithm. Columns show, from left to right, the water reflectance at 560, the atmospheric reflectance at 560, the correlation coefficient between the two parameters over blocks of 35x35 pixels (the smaller, the better) and the histogram of these correlation coefficients.

WP6 Indicators

- Evaluate Indicators harmonised across the water continuum relevant to industry, monitoring agencies, EU policy and scientists

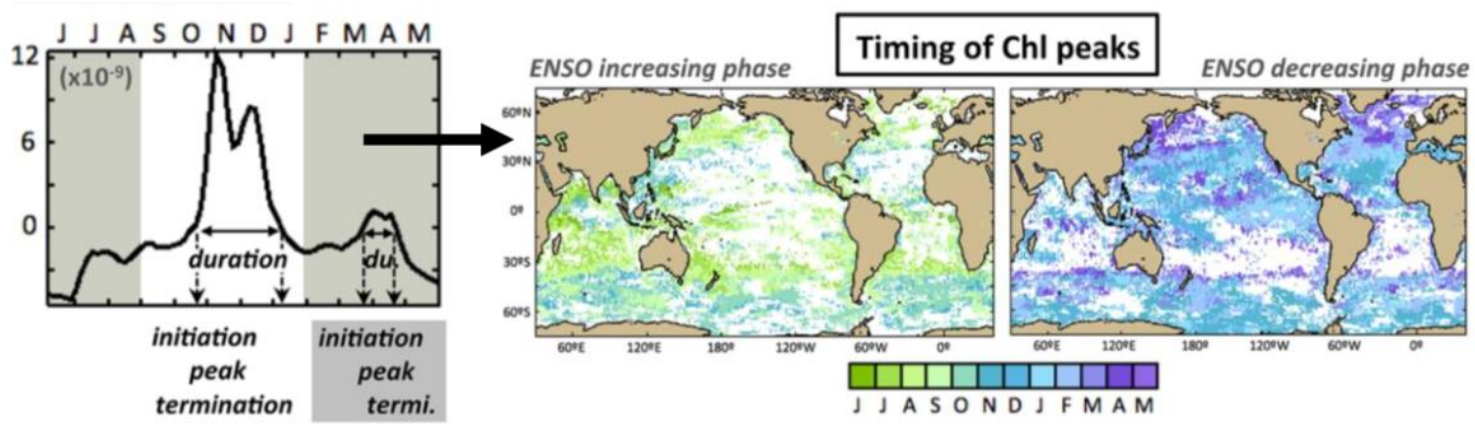
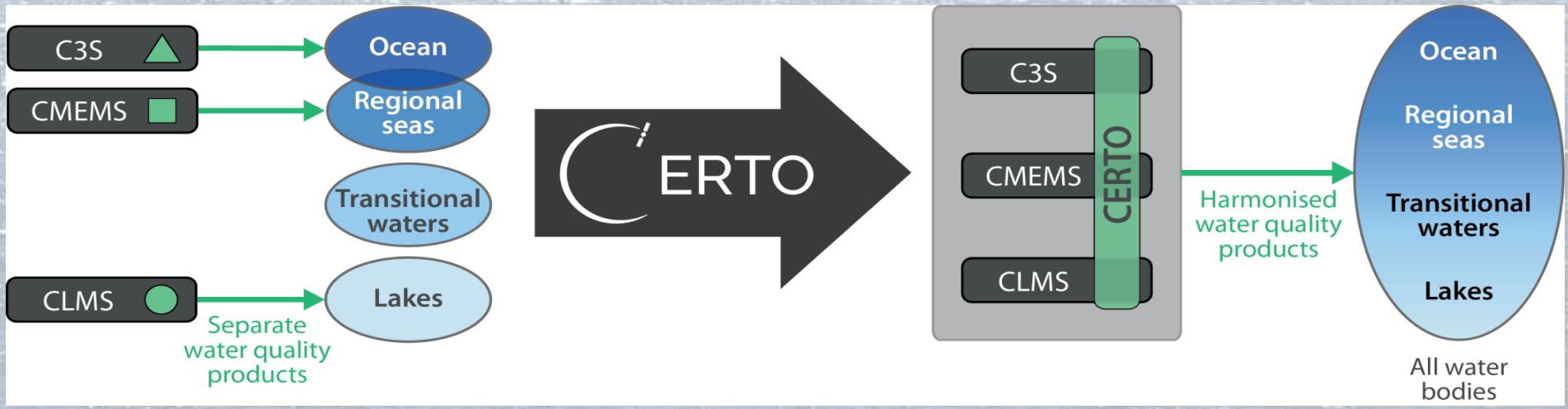


Figure 1.3.3.6.2 – Satellite based phenology applied to changes un chl-a bloom peaks in response to increasing/decreasing ENSO phases (Racault et al., 2017)

Where do we want to be at end of project?

- CERTO prototype produces water colour data harmonised across different aquatic environments
- Evidence of the value of the CERTO prototype in transitional waters
- CERTO prototype is adopted by Copernicus services
- Services and indicators developed in the project continued by downstream data-providers in the project



How can you be involved with CERTO?

- Contribute your in situ data in coastal and transitional waters to the LIMNADES data base
- Link to one of the user case areas or the Copernicus regional seas
- You can specify a user area for which CERTO will produce example time-series data in year 3
- Subscribe to the newsletter and visit the website

- Thank You

- sbg@pml.ac.uk

- https://www.certo-project.org/Home

- @CERTO_project