ISECA Earth Observation products for monitoring eutrophication in European coastal waters.

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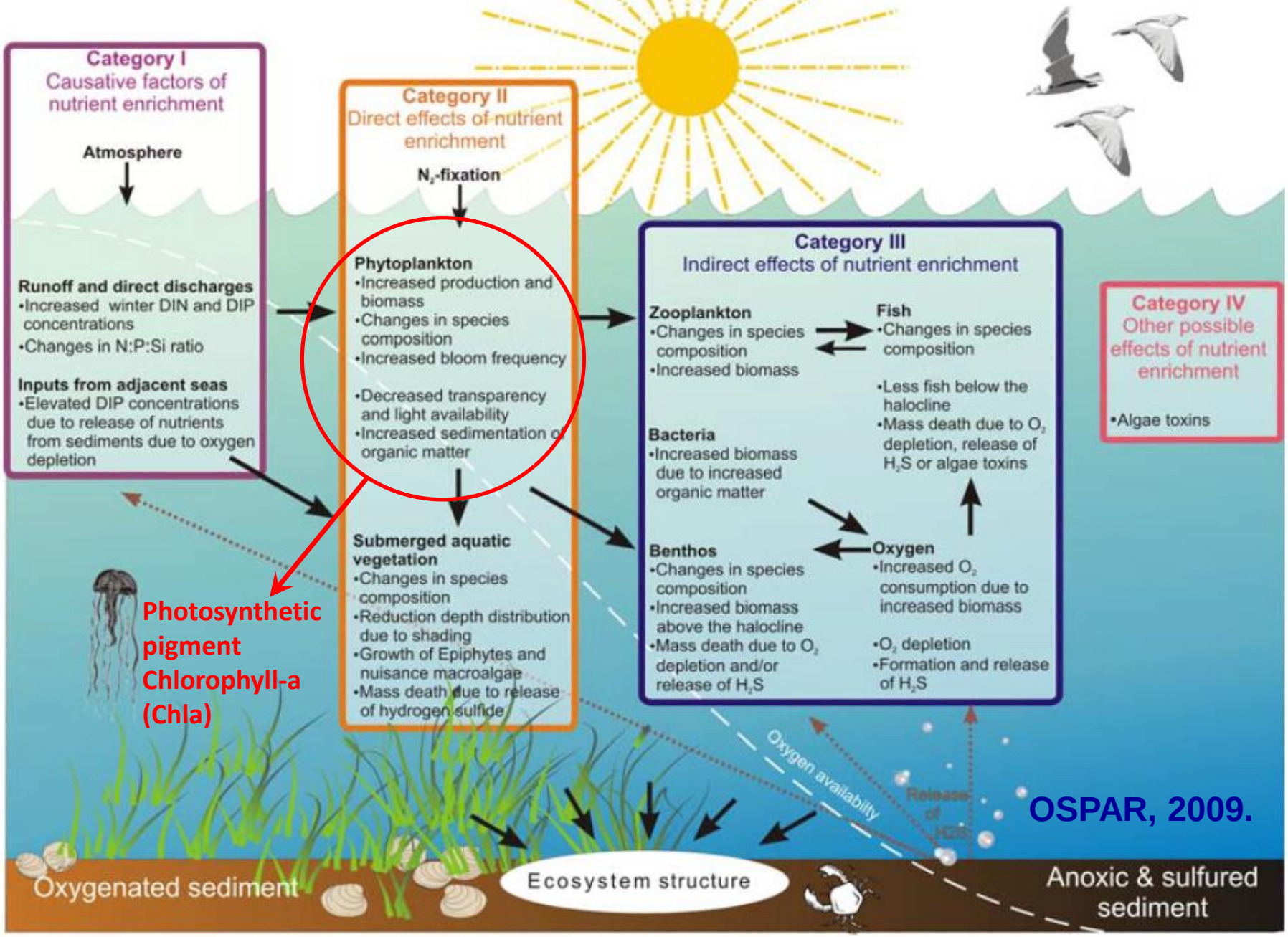
iseca
INFORMATION SYSTEM ON THE EUTROPHICATION OF OUR COASTAL AREAS

2 Mers Seas Zeeën
INTERREG IV A
"Investing in your future"
Crossborder cooperation programme
2007-2013 Part-financed by the European Union
(European Regional Development Fund)

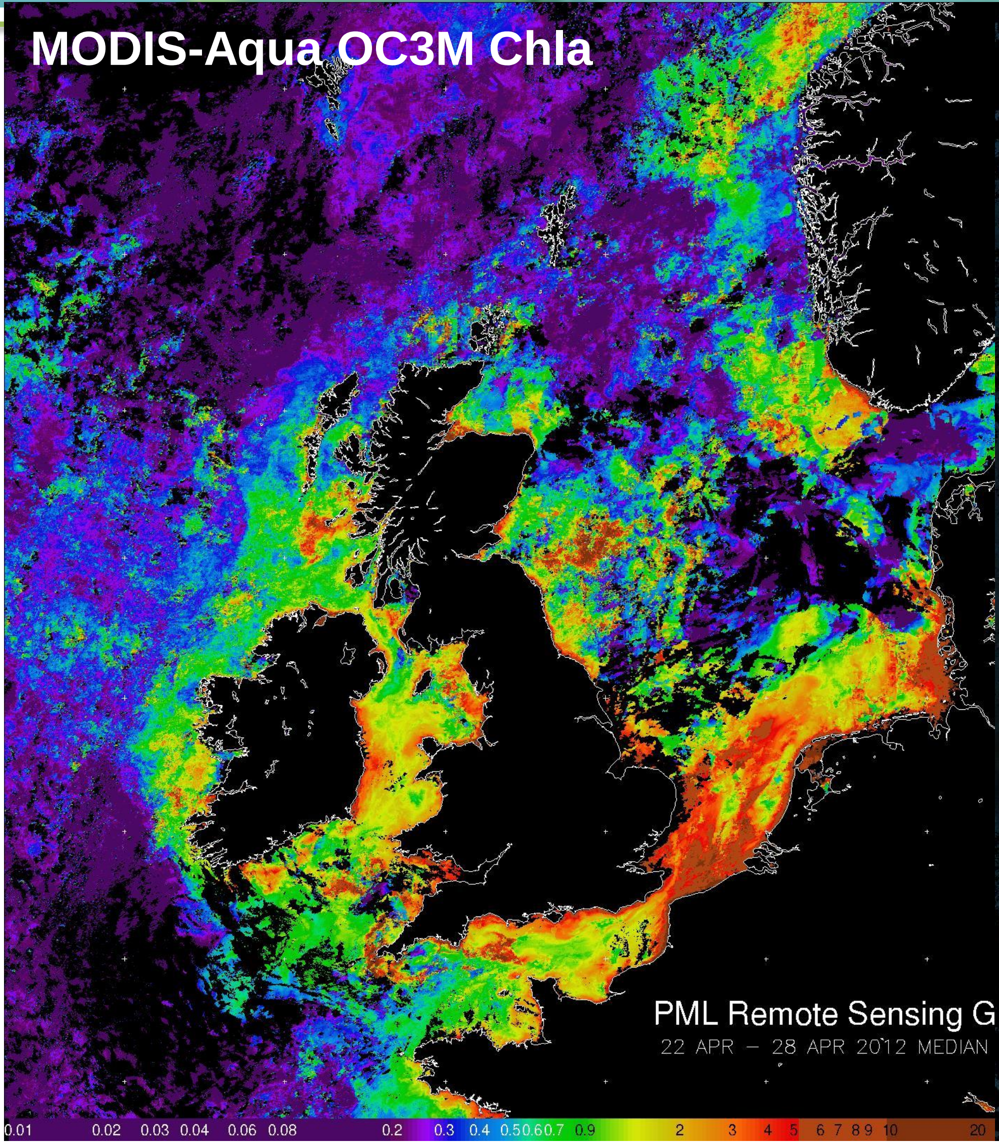
A cross discipline and cross border integrated project on eutrophication offering information, education and science to stakeholders and the public at large in the Interreg 2 Seas Zone (Belgium, England, France and the Netherlands).

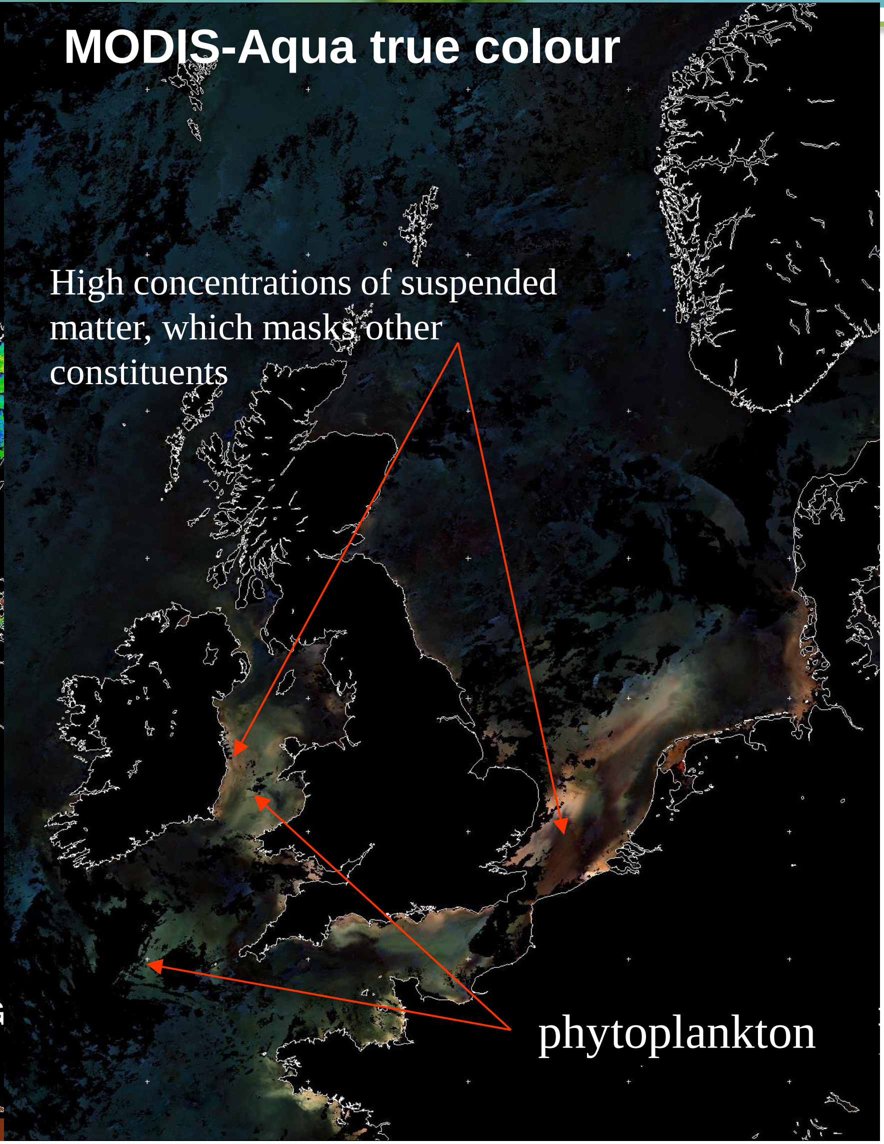
Eutrophication – Defintion & detection.



OSPAR, 2009.

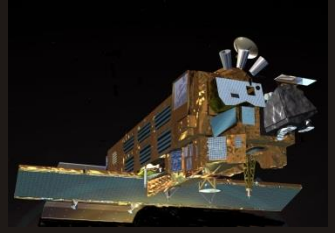
What can ocean colour sensors see in the coastal zone?



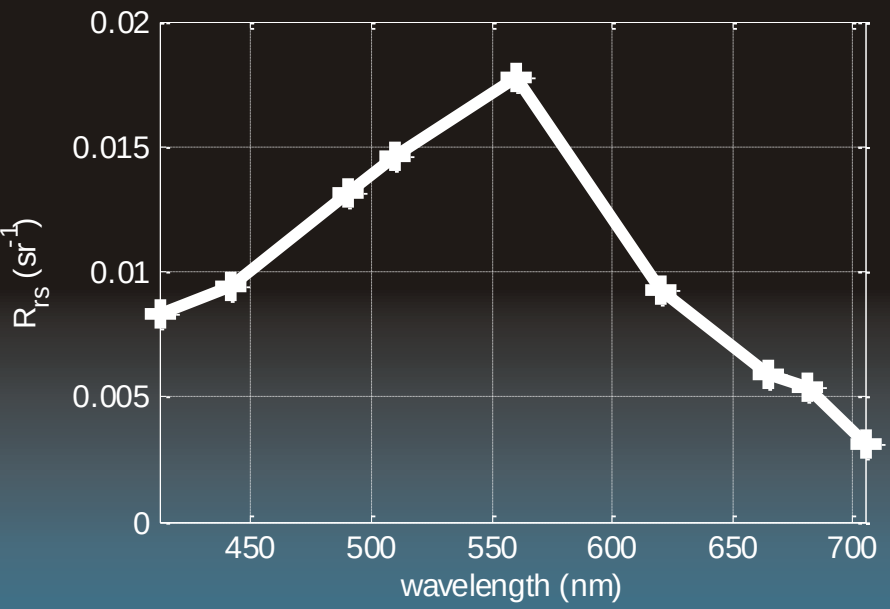


To obtain accurate Chla products for coastal waters need to validate algorithms suitable for moderate (MODIS & MERIS) spectral resolution sensors.

Shortly after launch SeaWiFS Images used as an indicator of eutrophication by policy makers in the North Sea.



surface reflectance



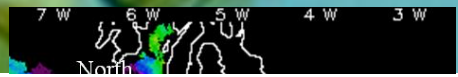
Aerosols
Aerosols
Rayleigh scattering

Foam
Foam
Freshwater

Algae
Minerals
Organic material
Dissolved matter

- Chla, a_{ph}
- TSM, a_{NAP}
- a_{CDOM}

Characterising optical properties of coastal waters.



Western English Channel – inherent optical properties

CDOM
Phyto
NAP
Seawater

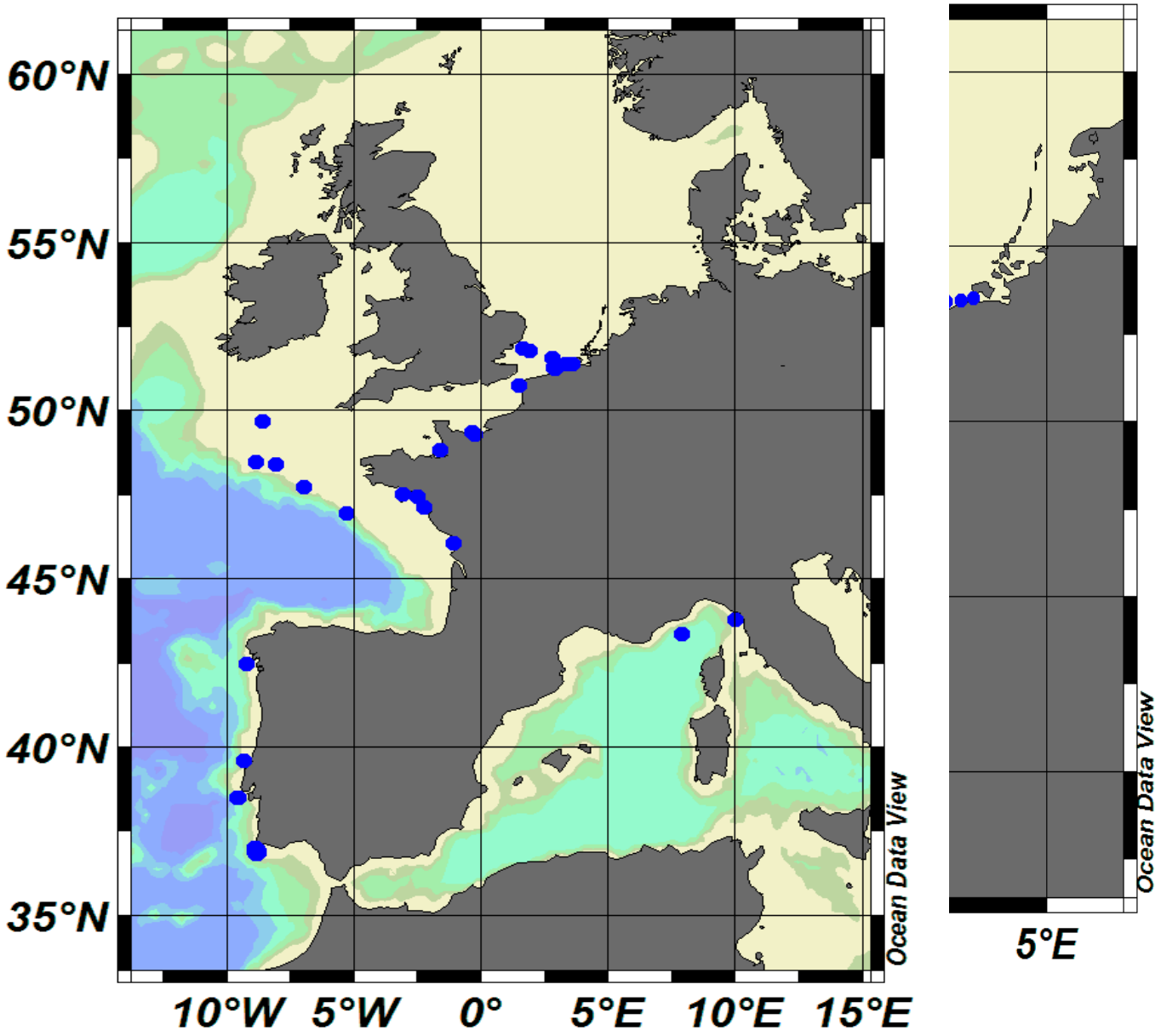
Absorption (m^{-1})

0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00

0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0

400
450
500
550
600
650
700

ISECA satellite ground truth.



Initial Validation data:

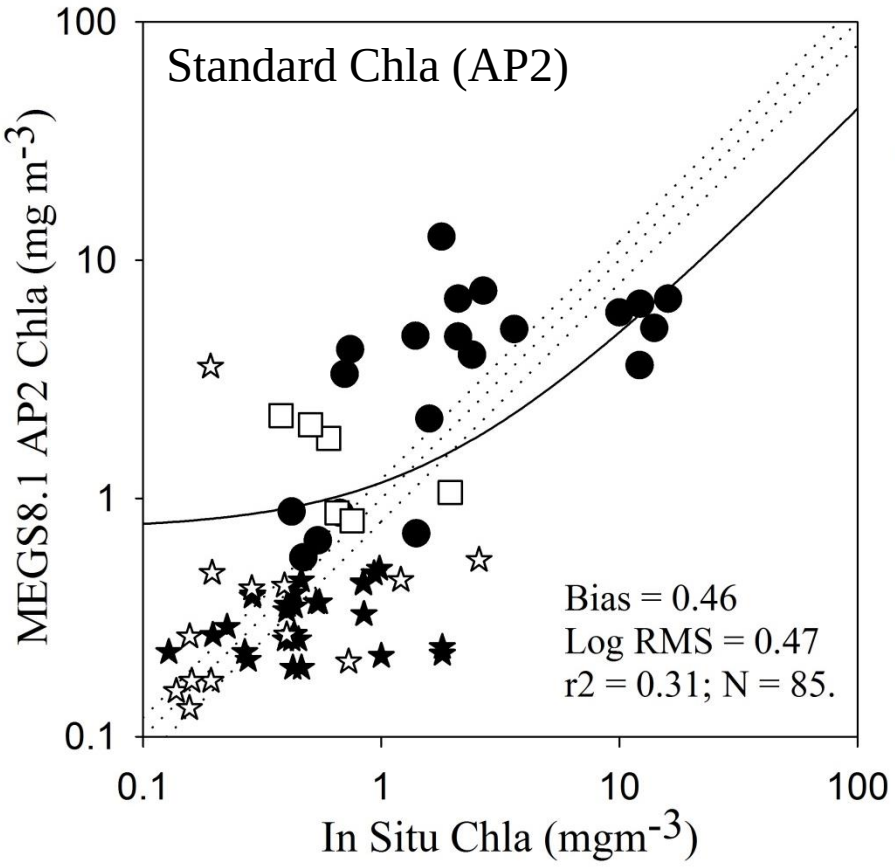
Initial in situ data set ~500 pts. Due to the dynamic nature of coastal waters, match-up time between in situ sampling and satellite over pass <1 hr. With this criteria 35 stations obtained.

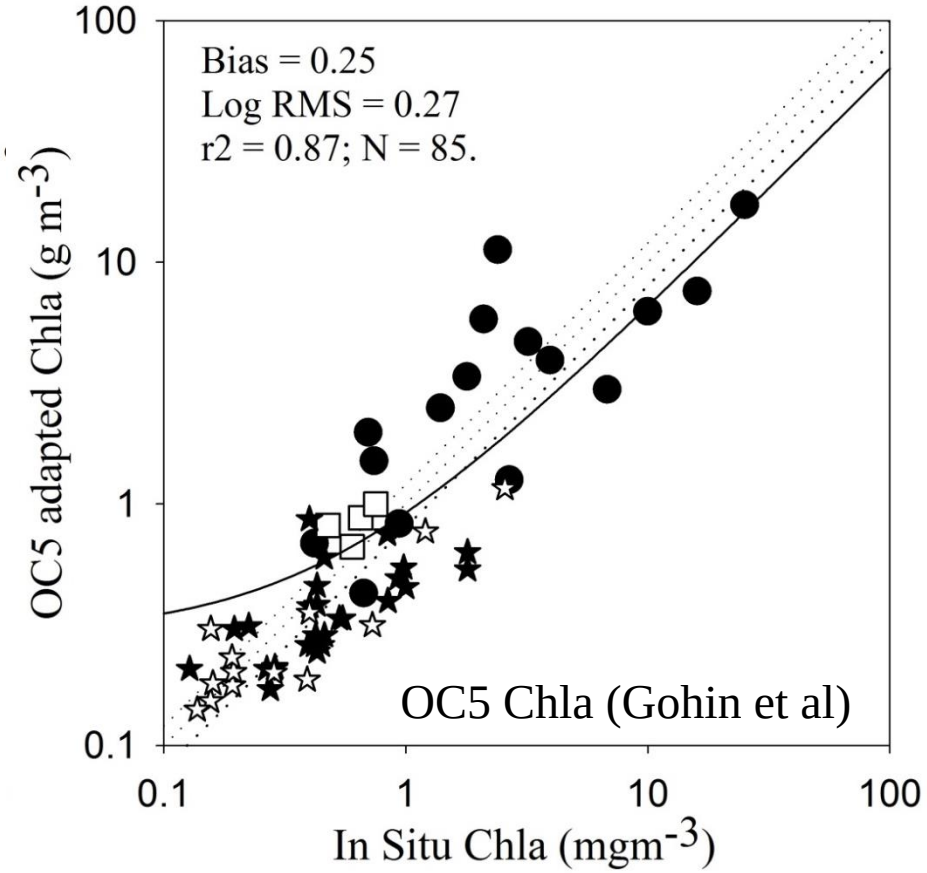
Updated Validation data:

Further data obtained from the coasts of Portugal & Mediterranean (BOUSSOLE) to increase match-ups to >90 stations.

ISECA satellite Chla ground truth.

Assessment of in situ versus MERIS Chla; Match-up time <1 hr.

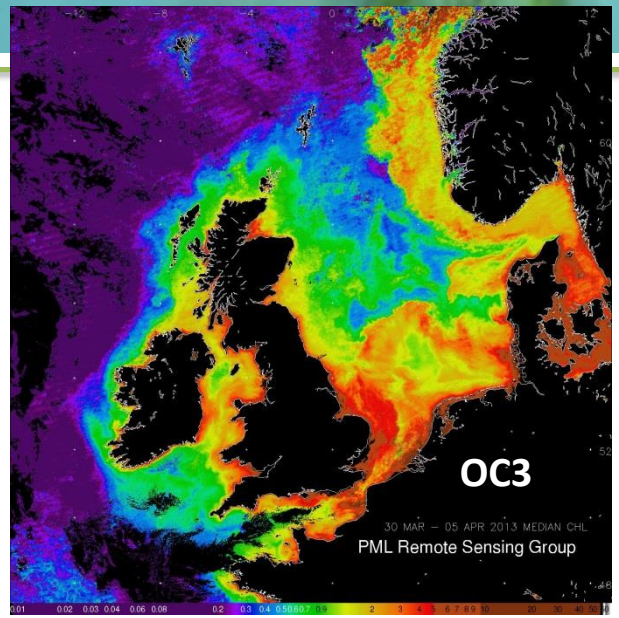


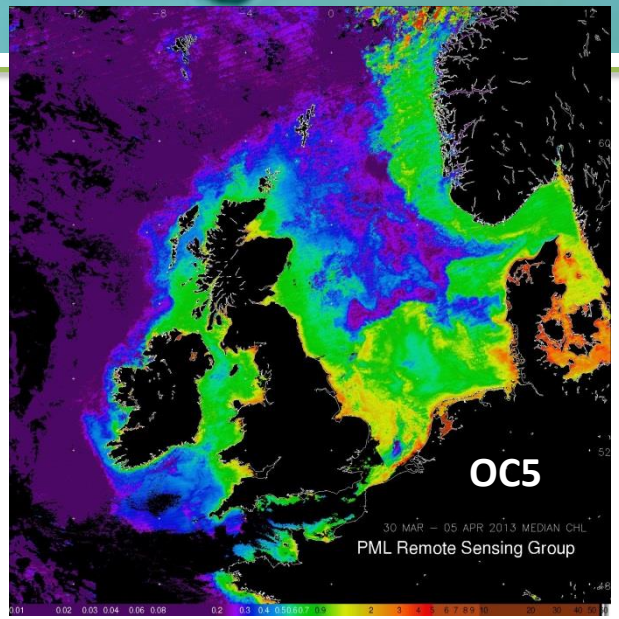


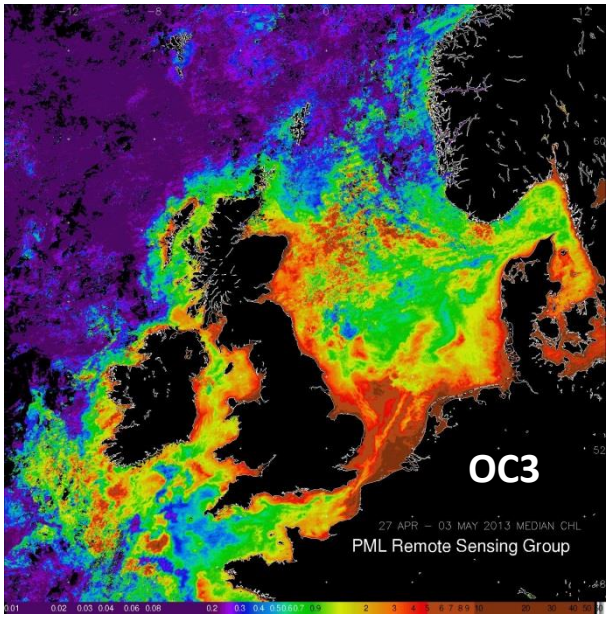
85 Chla match-ups 2003-2010 using in situ data from North Sea (filled circles), Western English Channel (open squares), Portuguese Coast (open stars), Mediterranean Sea Fr (filled stars).

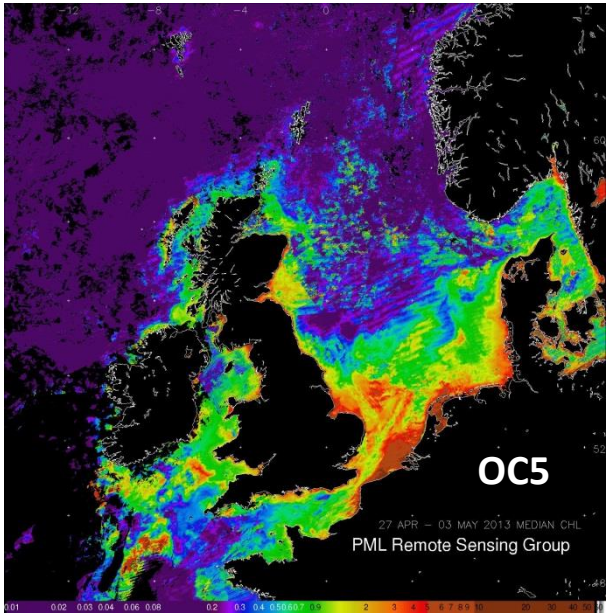
MERIS OC5 Chla more accurate than standard AP2 & OC3.

MODIS-Aqua Chla 2013 – OC3 & OC5 comparison.









30 March – 05 April 2013:

SW UK L4 WEC

OC3 1-4; OC5 <1 mgm^{-3}

SE UK plume

OC3 10; OC5 <2 mgm^{-3}

Brittany Coast

OC3 1; OC5 0.5 mgm^{-3}

Belgium Coast

OC3 10; OC5 <2 mgm^{-3}

27 April – 03 May 2013:

SW UK L4 WEC

OC3 >4; OC5 1 mgm^{-3}

SE UK plume

OC3 >10; OC5 2-4 mgm^{-3}

Brittany Coast

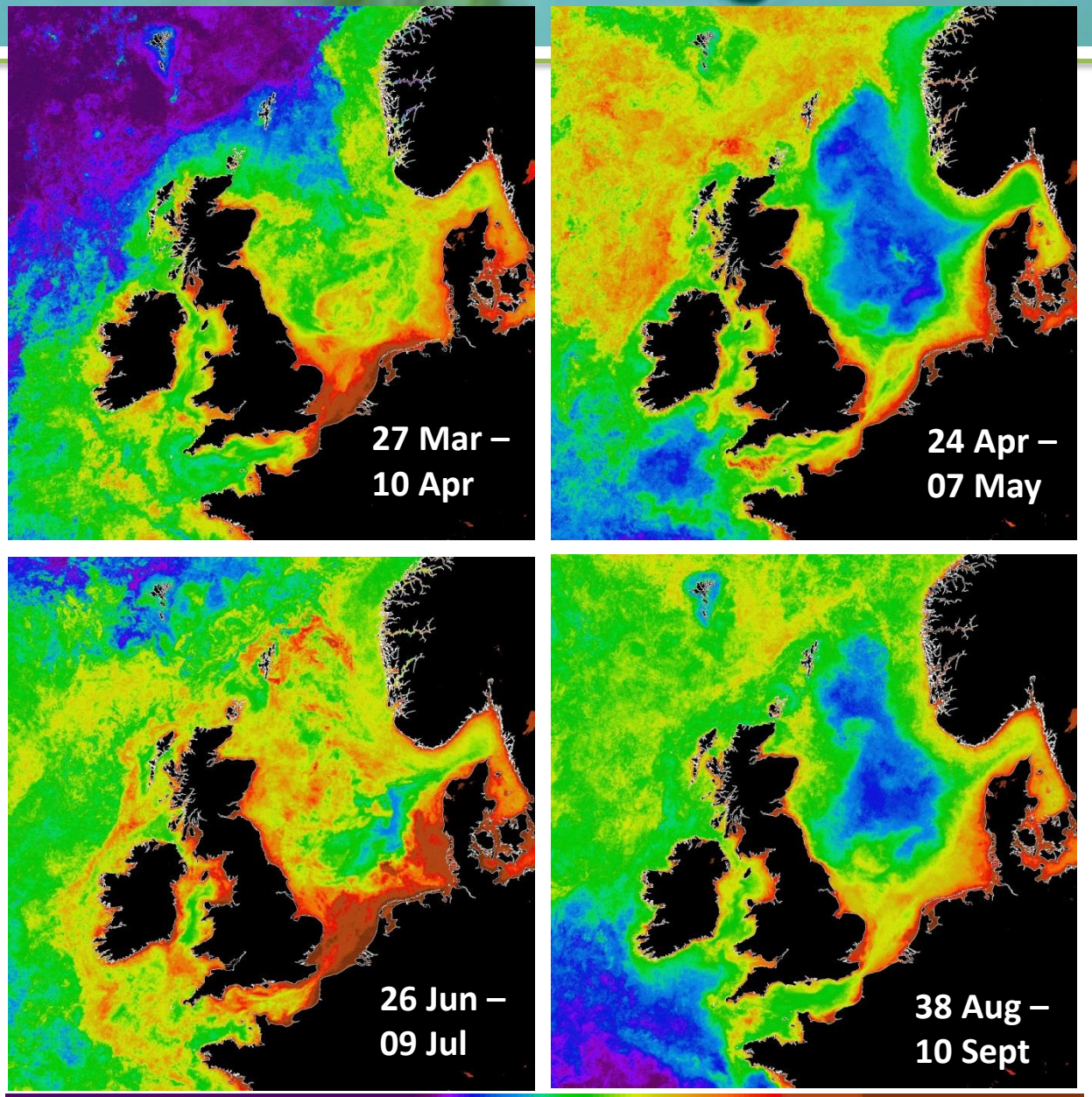
OC3 1-2; OC5 1 mgm^{-3}

Belgium Coast

OC3 >10; OC5 5-10 mgm^{-3}

5 to 10 fold difference between OC3 and OC5 in spring.

MODIS-Aqua OC5 Chla P90 - 2013.



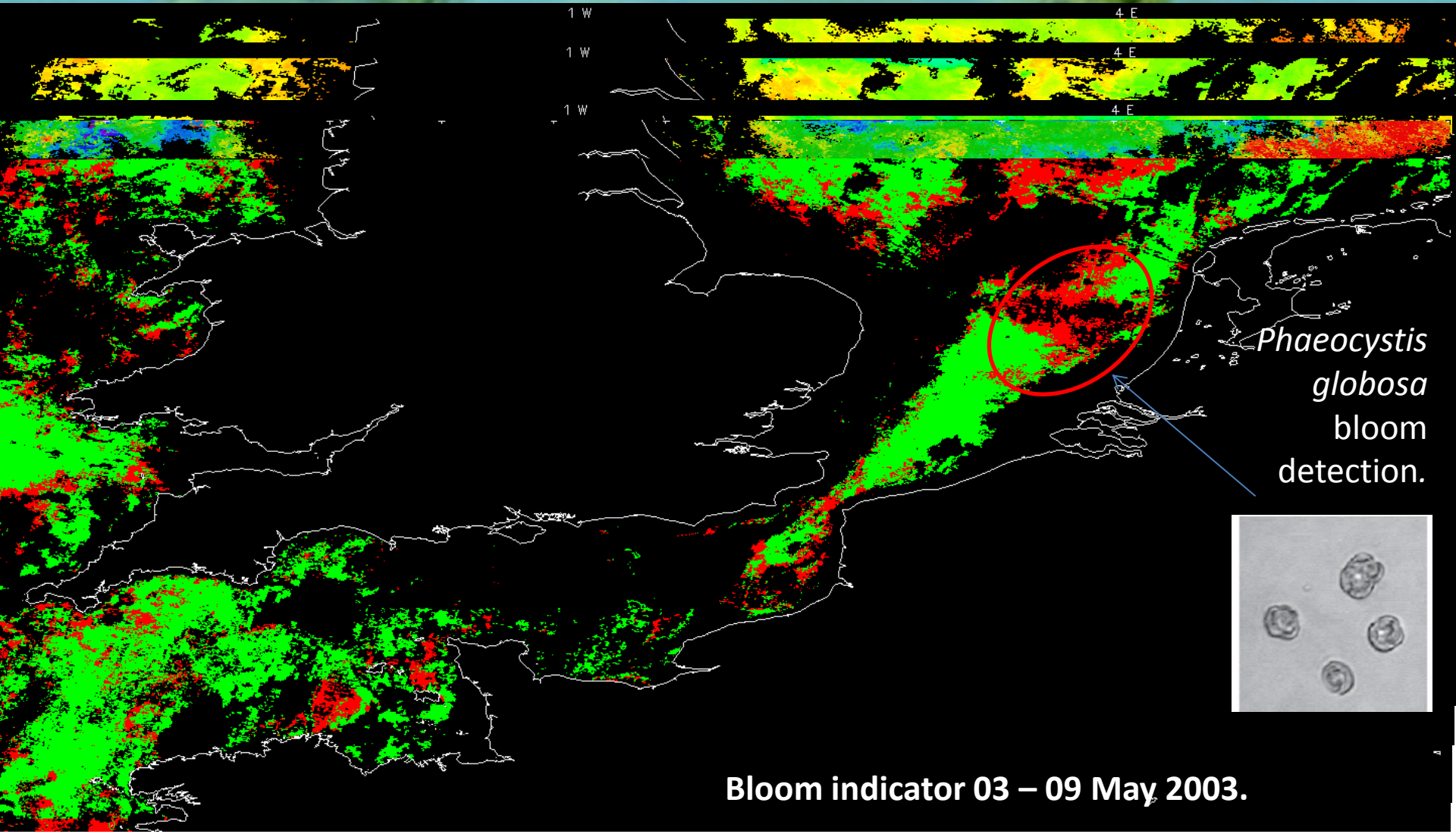
Definition -

Chla P90 is used to detect abnormal levels of Cha in an ecosystem & is the level at which 90% of observations are lower than this value.

Application -

It is used to identify the Eutrophication & water quality status by OSPAR and under the EU Water Framework Directive. A threshold is defined (15 in coastal and 10 mgm^{-3} in offshore waters) and compared to the actual P90 value to determine eutrophication risk and non-risk areas.

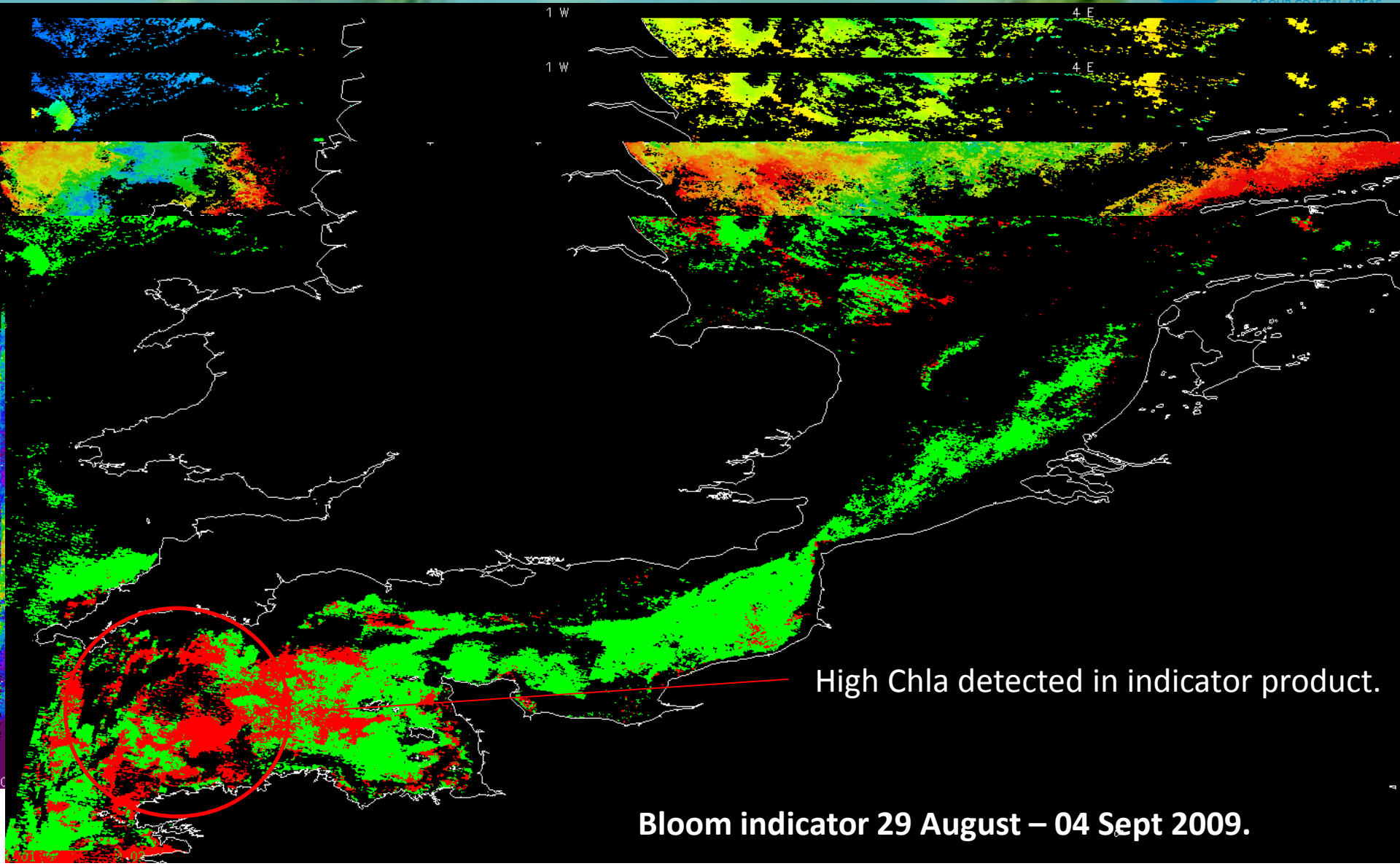
ISECA EO tools: detection of *Phaeocystis* blooms.



GREEN – No problem; **RED** – further investigation.

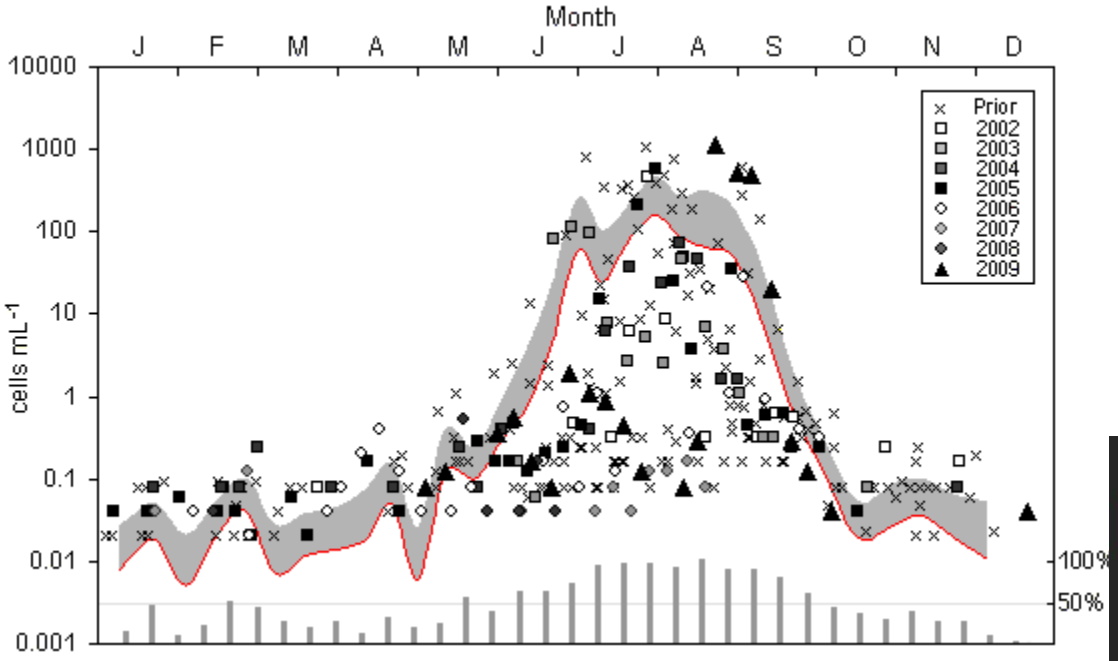
The indicator product goes red if that specific day goes above the P90 Chla.

ISECA EO tools: detection of *Karenia mikimotoi*.

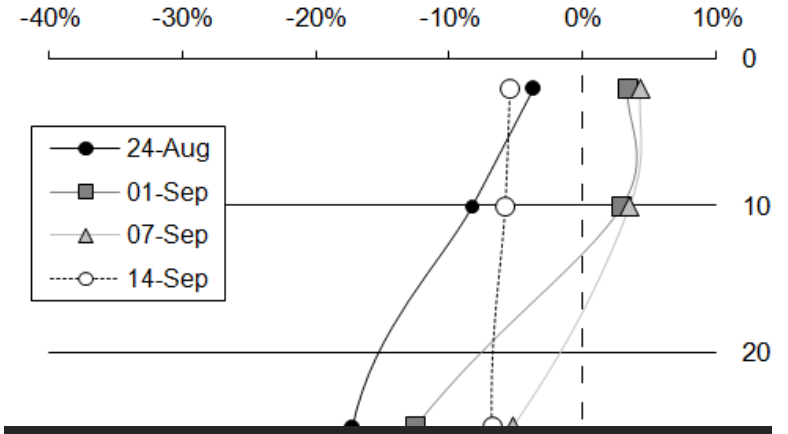


Algal blooms in the Western English Channel: *Karenia mikimotoi*.

Abundance of Karenia at WEC



Biological oxygen saturation anomaly

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NEWS

Page last updated at 18:53 GMT, Friday, 14 August 2009 19:53 UK

Fishing stops after algae deaths

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- National Marine Aquarium
- Red Tide Algae
- Plymouth Marine Laboratory
- Shellfish Association

Four shellfishing areas are being closed after the deaths of thousands of fish along the coast of Cornwall.

The Food Standards Agency (FSA) said the temporary closure was a sensible precaution after an algal bloom caused fish deaths in St Austell Bay.

Shellfishing is being stopped in the St Austell bay, Fal, Fowey, and Helford waterway areas, the FSA said.

An algal bloom, known as Red Tide, is believed to behind the first discovery of dead fish in St Austell Bay on Thursday after water samples were analysed by scientists from the Plymouth Marine

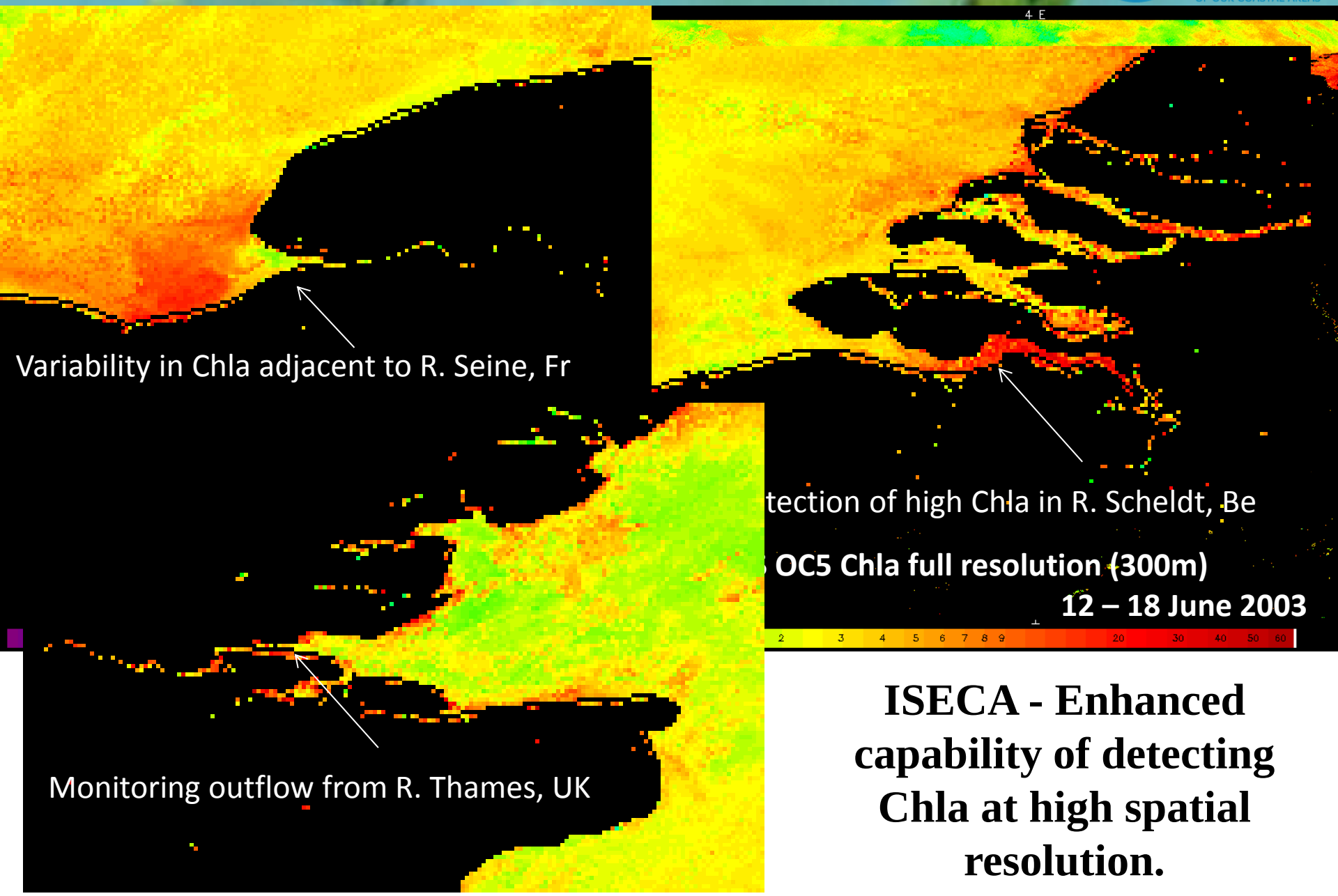
- High Abundance of *Karenia*: in 2005 & 2009 > 1000 cells mL^{-1}

- Caused substantial oxygen depletion at depth in 2009.

- Resulting in fish kills along the Cornwall coast.

Barnes, Tilstone et al. PROOCE (submitted).

Examples MERIS FR (COASTCOLOUR) OC5 Chla.



ISECA - Enhanced capability of detecting Chla at high spatial resolution.

Conclusions.

ISECA Objectives:

- The scope of ISECA was to advance and disseminate scientific knowledge related to eutrophication in 2Seas selected area.
- The main objective of ISECA was to develop a technologically advanced and flexible information system for the detection of eutrophication in coastal waters.
-

To this end ISECA has:

- Used a **combination** of existing and new **in-situ measurements** and **EO products** to facilitate **assessment of eutrophication** in 2Seas area.
- **Improved** and **validated** at a regional scale of **Earth Observation (EO) products**.