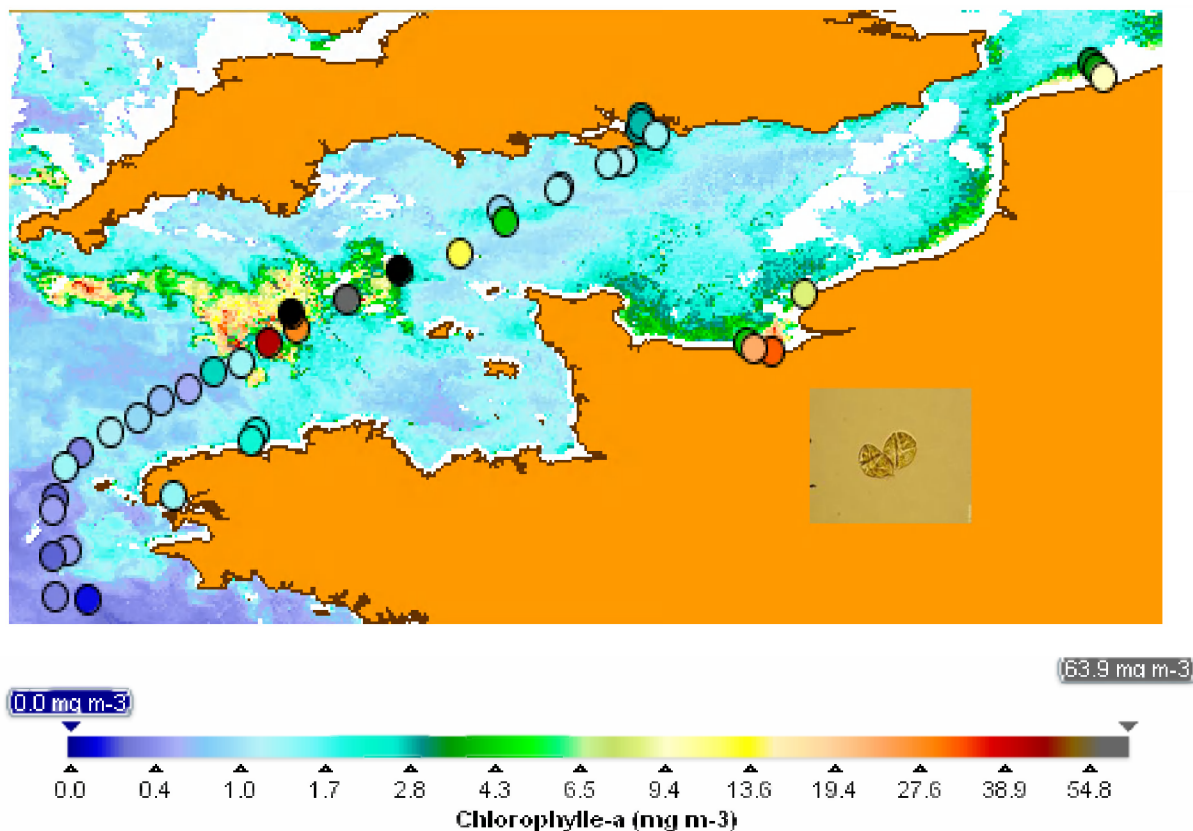


Phytoplankton monitoring from Earth Observation by Francis Gohin Ifremer/Dyneco/Pelagos



2 main in-situ monitoring networks in France

-RESOMAR (INSU/CNRS) : RESeau des Stations et Observatoires MARins

-REPHY (Ifremer): REseau d'Observation et de Surveillance du PHYtoplancton et des Phycotoxines

The REPHY is fully dedicated to the monitoring of the phytoplankton

Observation and Monitoring Network for Phytoplankton and Phycotoxins

- Geographical area : the whole coast of France + French overseas islands

- Implemented by Ifremer since 1984

- Two objectives

- Environmental** : long term time-series of phytoplankton populations

- Sanitary** : monitoring of toxic phytoplankton

REPHY sampling stations



All phytoplankton species
on 55 stations

Only dominant and harmful species
on 93 other stations

Time series

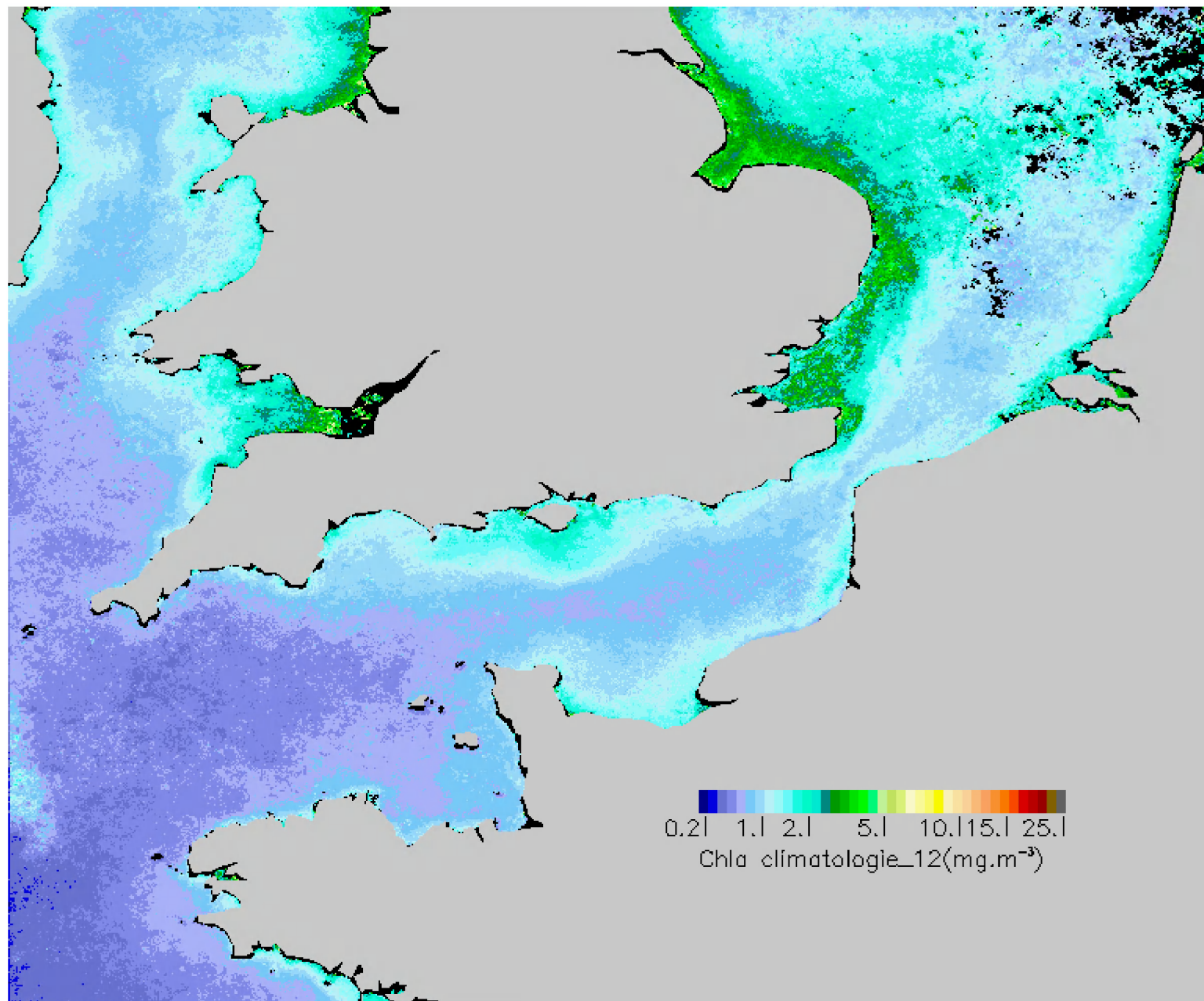
25 years
on ~ 20 stations

10-20 years
on numerous stations

**The annual cycle of Chlorophyll-a
(indicator of the phytoplankton biomass)
on the English Channel**

Contribution of Earth Observation to our knowledge
of the phytoplankton development

Annual cycle of the chlorophyll concentration (from SeaWiFS/MODIS/MERIS 1998-2008)



Monitoring for the WFD (Water Framework Directive)

Indicators of the phytoplankton quality

for the Eutrophication risk

Biomass (Chl-a), Abundance (number of blooms), Harmful blooms

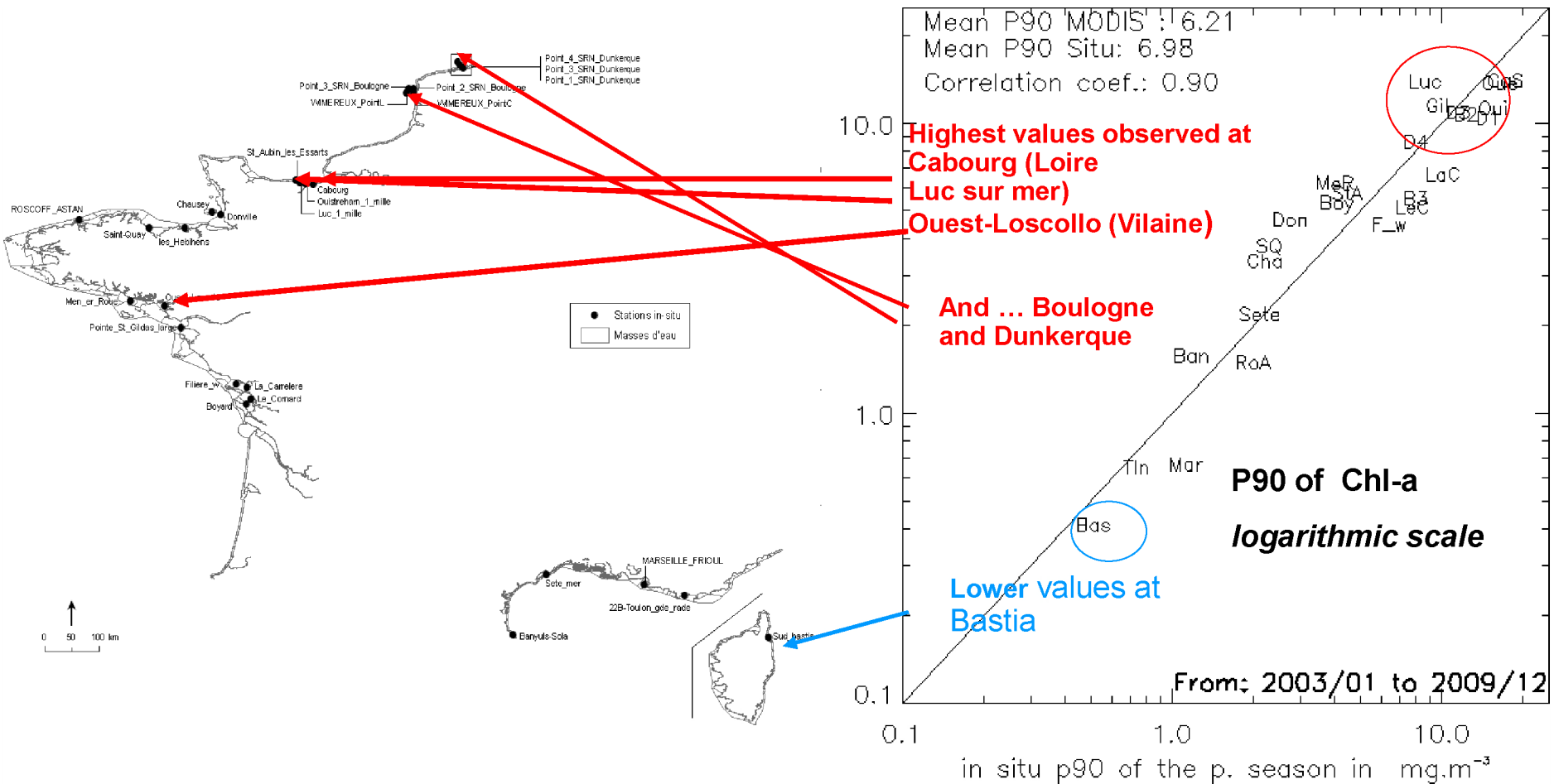
The quality indicator for the biomass is the percentile 90 of the Chl-a during the productive period (March to October)

Ecological Status	High	Good	Moderate	Poor	Bad
Level of the P90 chl- <i>a</i> (mg.m ⁻³)	0 – 5	5 – 10	10 – 20	20 – 40	> 40

Limits of the P90 classes applied to the coastal water bodies for the Atlantic Coast

Observation from space and in-situ

CHL MODIS 2003-2009

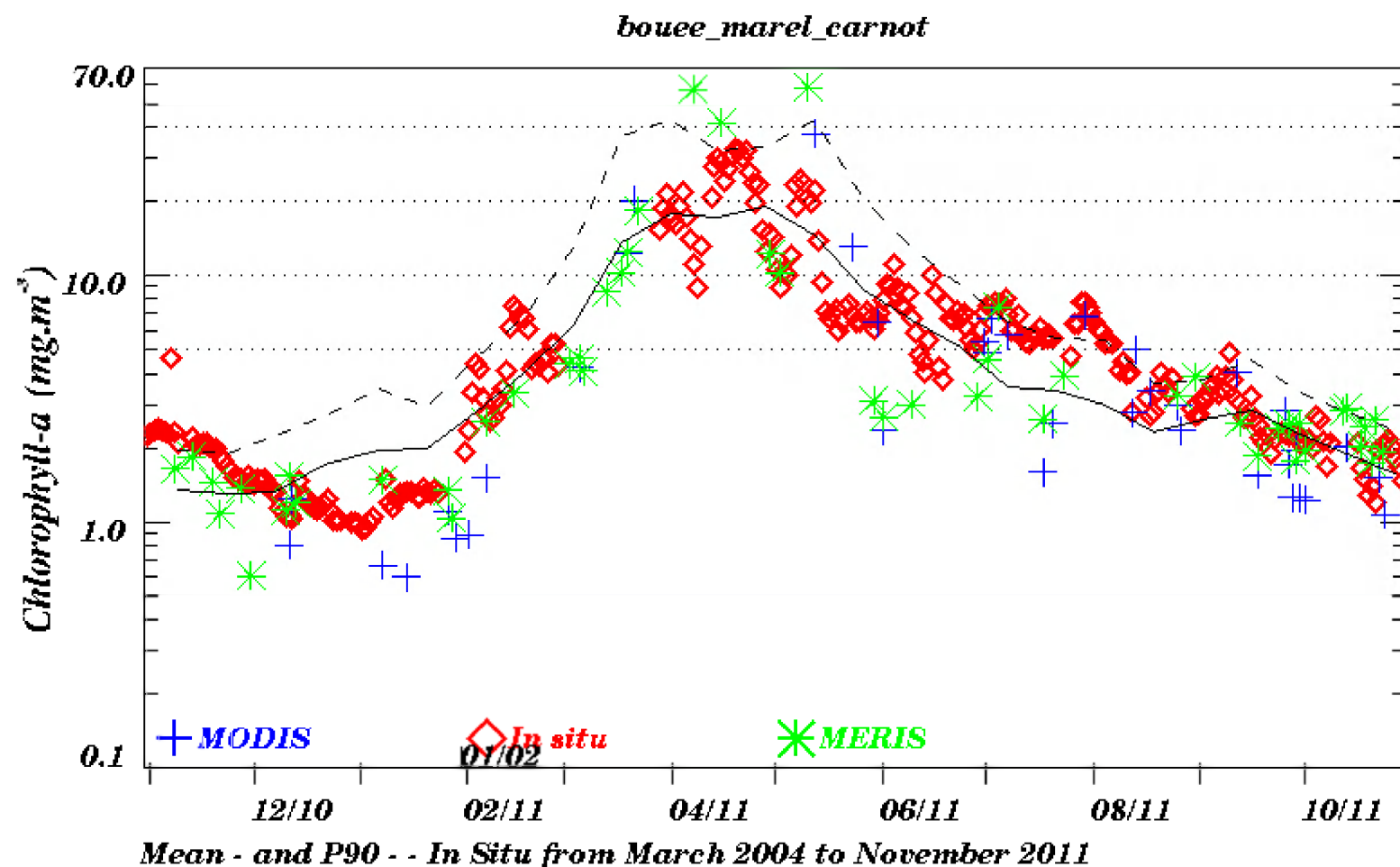


From : Atlas de la Température, de la concentration en Chlorophylle et de la Turbidité de surface du plateau continental français et de ses abords de l'Ouest européen.

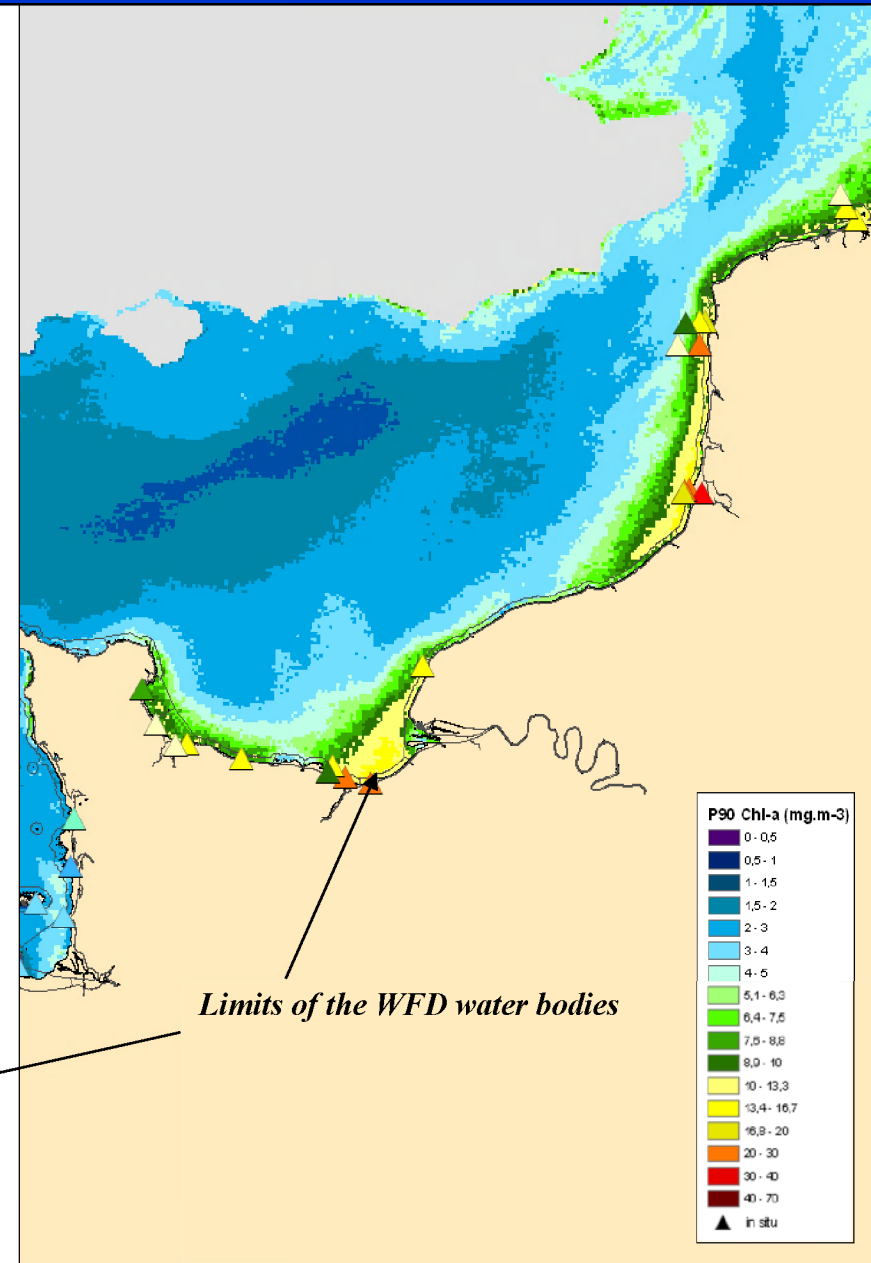
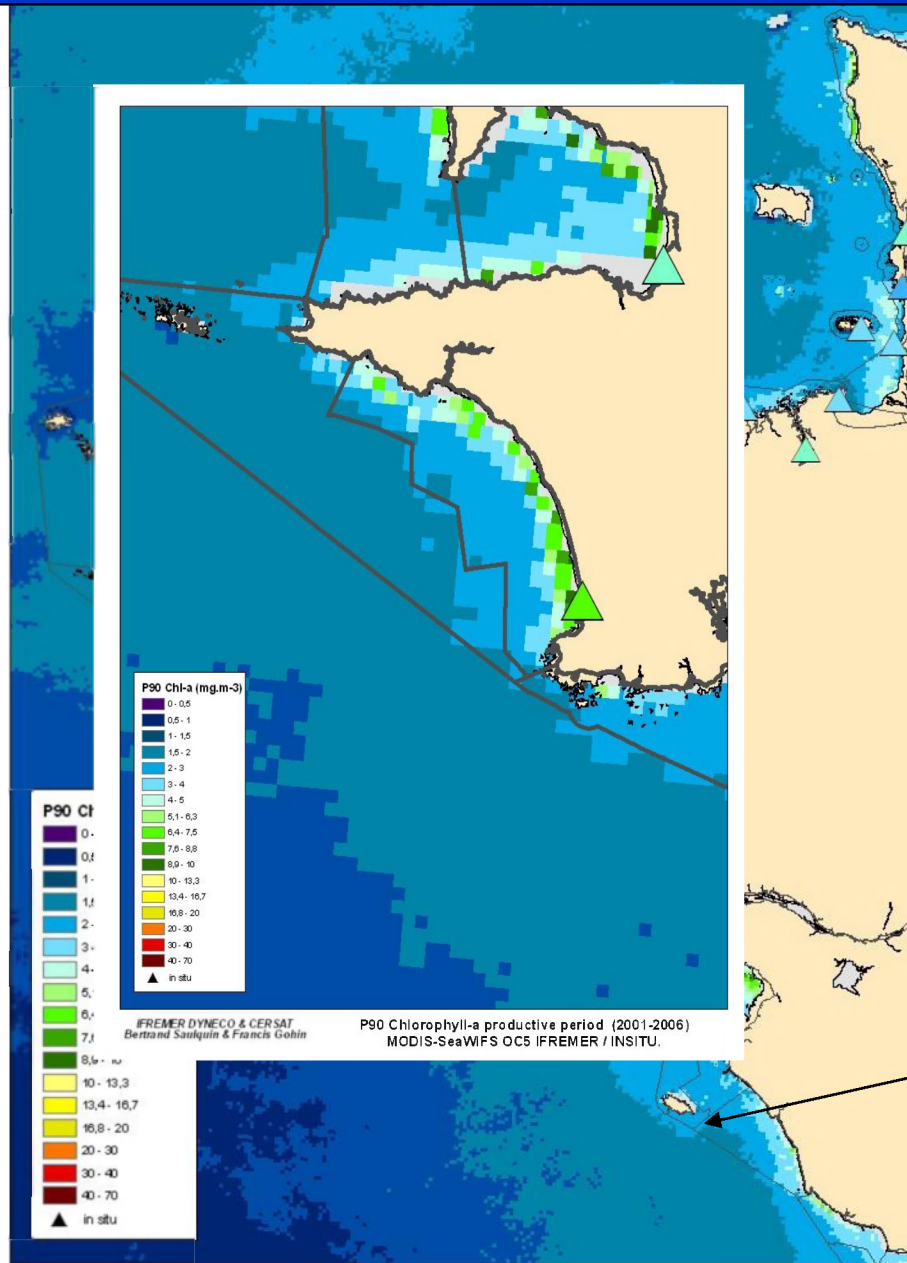
Rapport DCSMM Ifremer janvier 2011 : <http://archimer.ifremer.fr/doc/00057/16840/14306.pdf>

Comparisons at the MAREL instrumented buoy of Boulogne

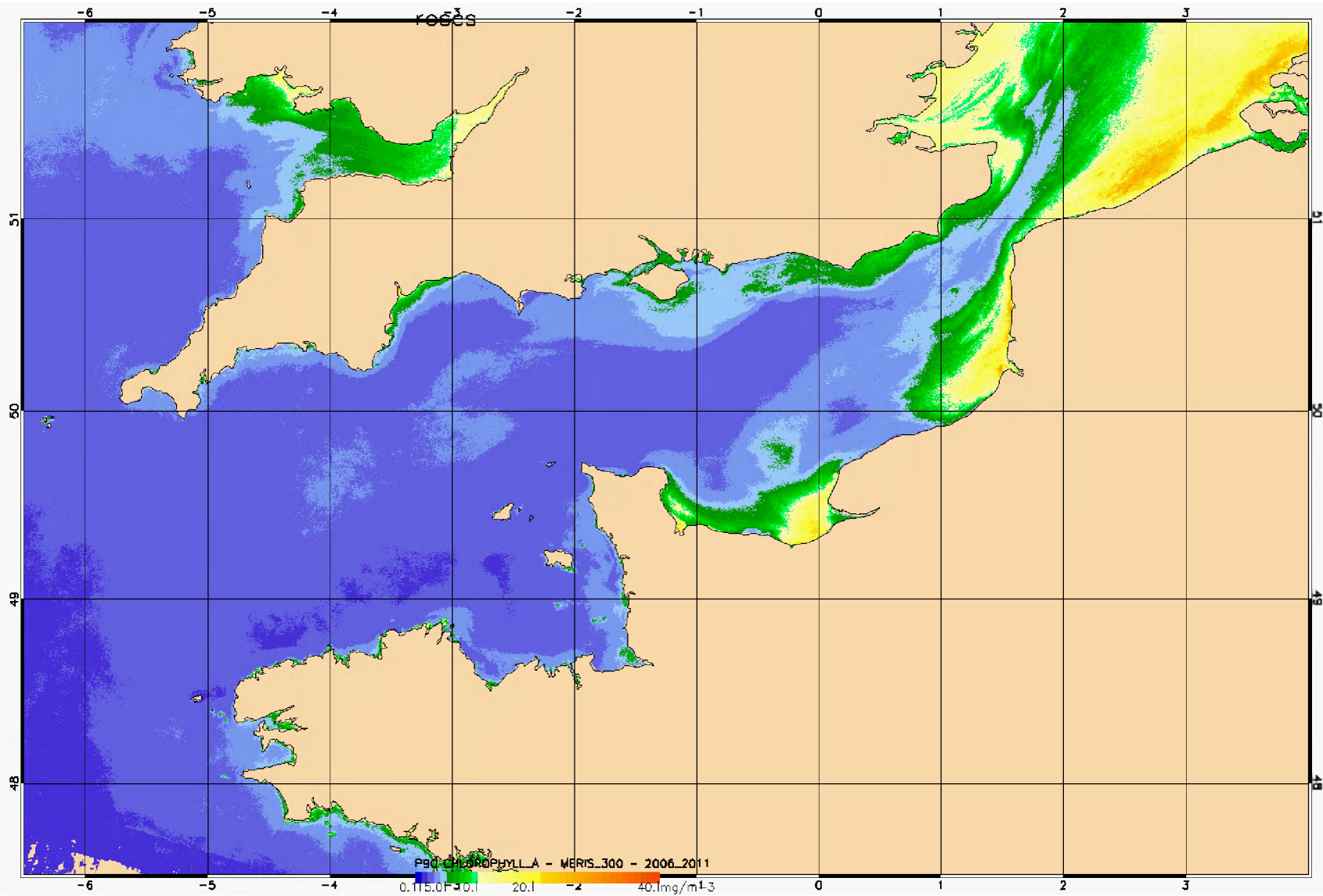
Chl derived from in-situ fluorescence and from satellite reflectance



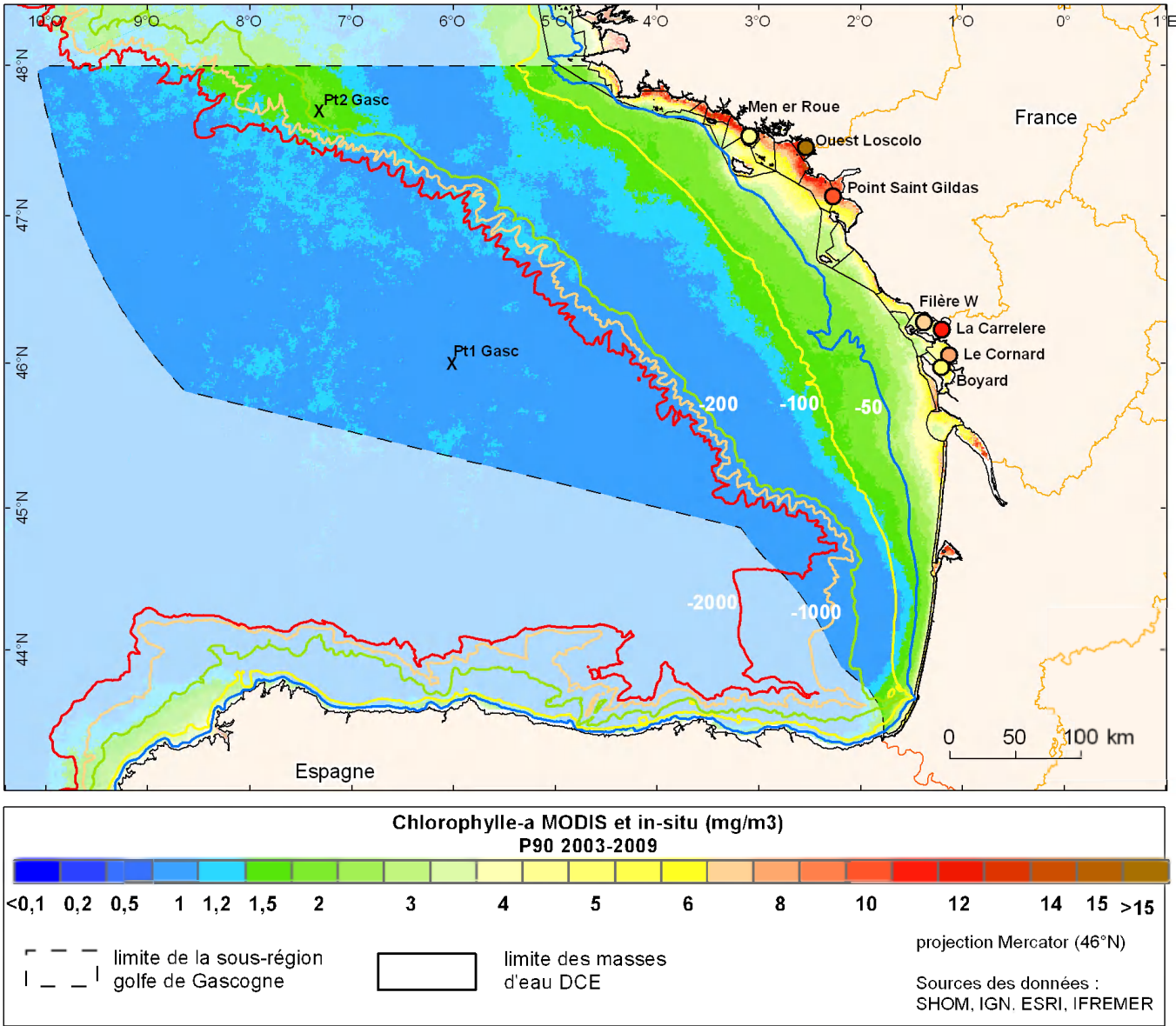
But the best contribution of the satellite is clearly the spatial coverage



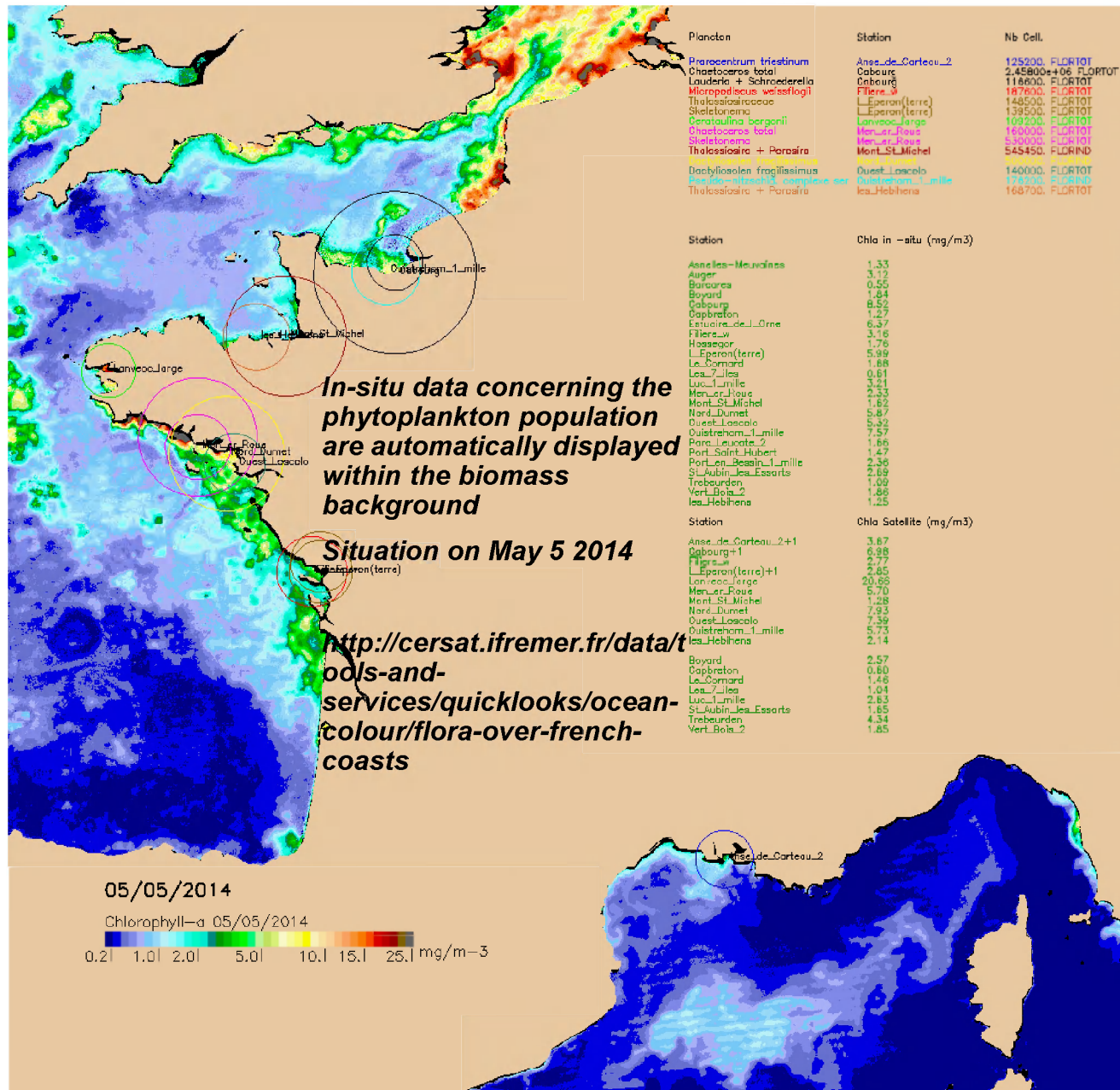
Several sensors have been used, here P90 of MERIS-derived Chl at Full Resolution
(300m) 2006-2011



New P90 maps on marine regions are provided for the European Marine Strategy Framework Directive

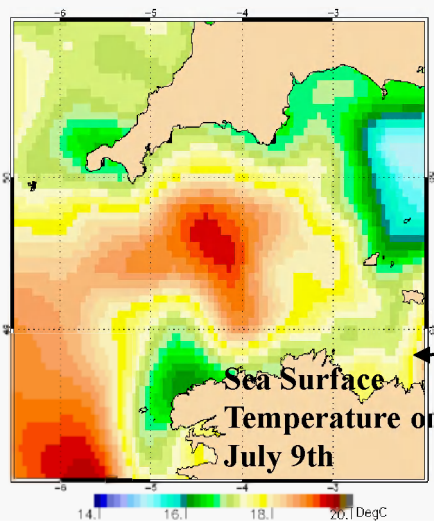
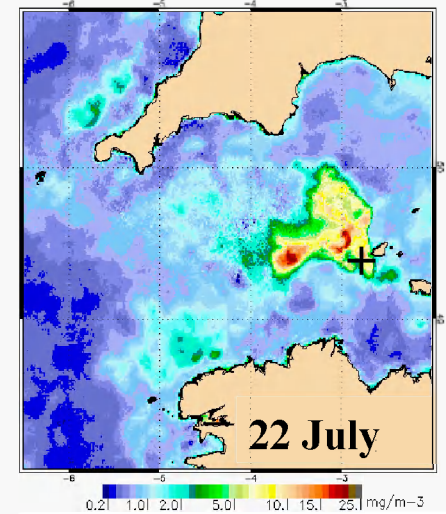
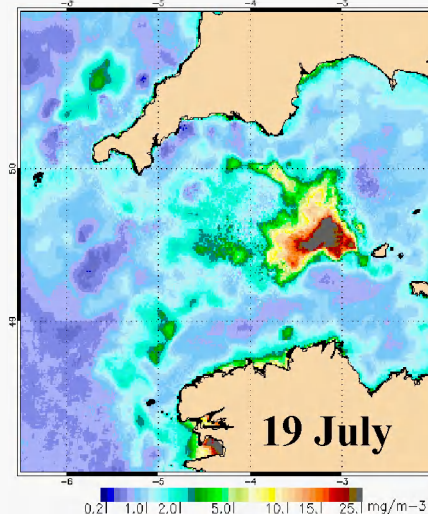
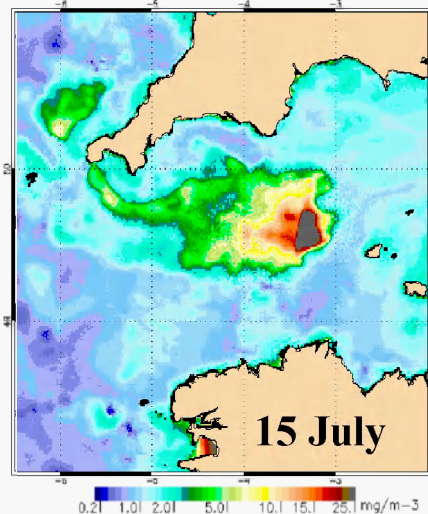
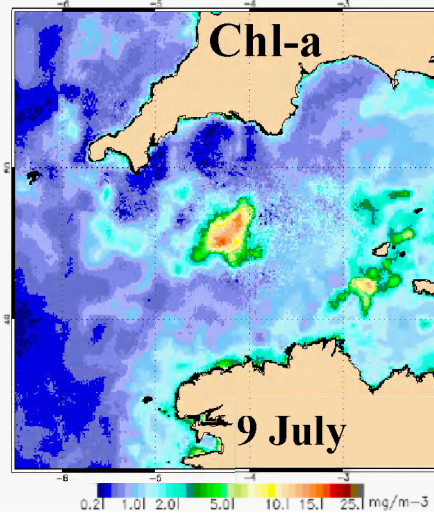


Monitoring the biodiversity : satellite and in-situ observations



Monitoring of Harmful Algal Blooms (here *Karenia mikimotoi*)

Example of the 2010 summer Bloom in the western channel



The fisheries Department of the states of Guernsey is alerted on July 19th

+ 2 sea samples are collected and analysed by CEFAS

>1 million de cells/L

The bloom starts on the stratified area observed on the Sea Surface Temperature map of July 9th

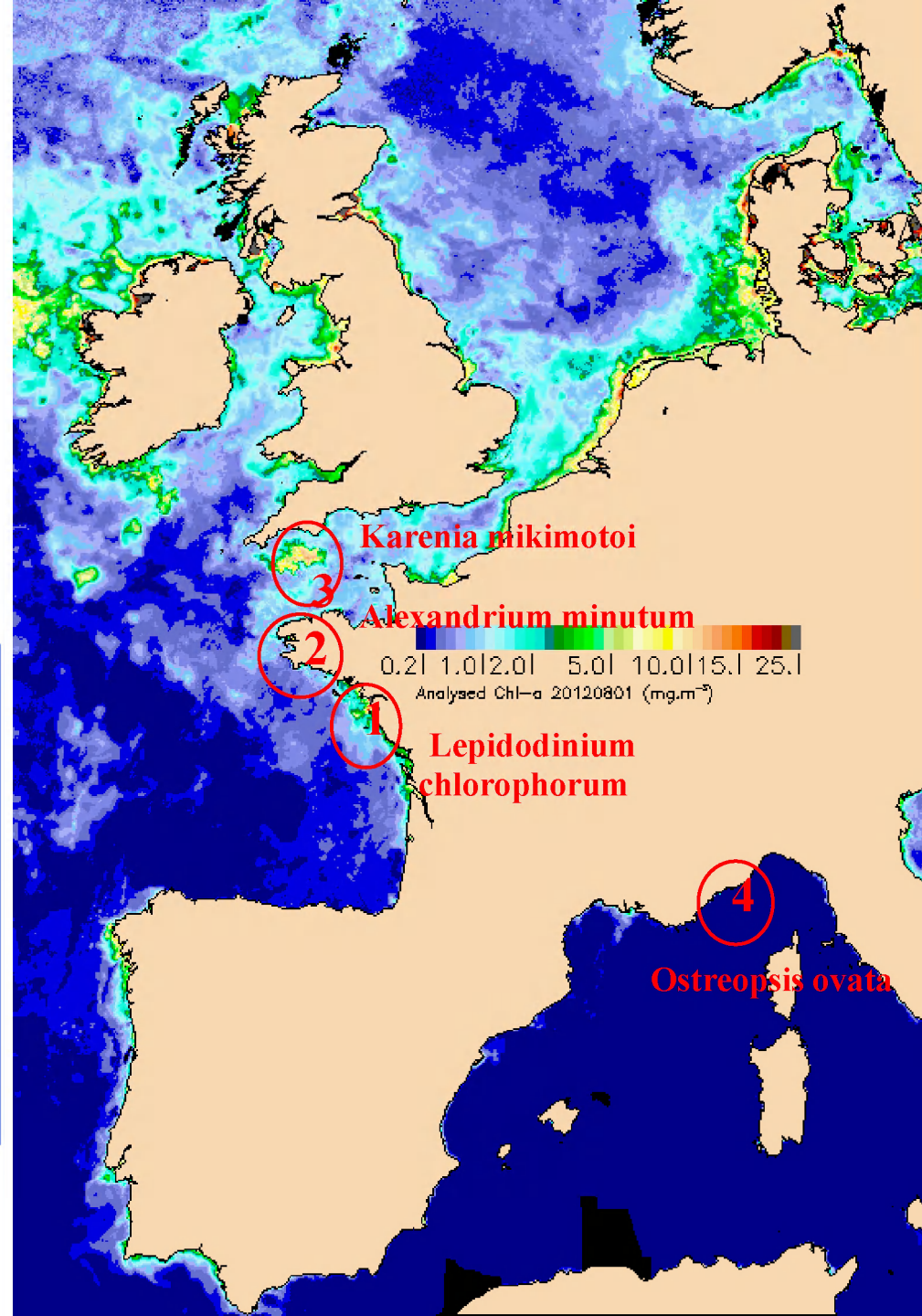
Rapport MarCoast2 à <http://archimer.ifremer.fr/doc/00178/28883/27369.pdf>

Observations of the biodiversity and the Harmful Algal blooms

4 dinoflagellates are simultaneously blooming on August 2012

PHENOMER : a new project of participatory science where citizens take part in the observing network of red tides

<http://www.phenomer.org/>



Future in Earth Observation in Europe

- Much is expected from OLCI on Sentinel-3 launched in 2015) a follow-on to MERIS (ESA/EUMETSAT)
- Data will be provided by Copernicus/MyOcean (PML and ACRI-ST for the Eastern Atlantic Ocean)

Thanks for your attention !