

Earth observation tool for Monitoring Coastal Eutrophication



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THE ISECA PROJECT

ISECA is an Interreg project running until September 2014 that aims to advance and disseminate scientific knowledge related to eutrophication in the 2 Seas area (English Channel and North Sea). The main objective of ISECA is to develop a demonstration prototype of an information system for monitoring eutrophication of coastal waters. This information system combines in-situ, satellite information and models outputs.

USER-DRIVEN APPROACH

The views of scientific advisors were collected using an on-line questionnaire (still available in the ISECA website).
Main requirements for Earth Observation (EO):

- ✓ Validated with in-situ observations
- ✓ Less than 1 mile from the coast (near shore)
- ✓ Condensed spatial information and easiness of availability,
- ✓ Trend calculation capability

IN-SITU DATA FOR SATELLITE VALIDATION

Three types of datasets have been collected during ISECA, to address the user requirements for EO:

1.-Testing EO with Monitoring Agencies Long Term data

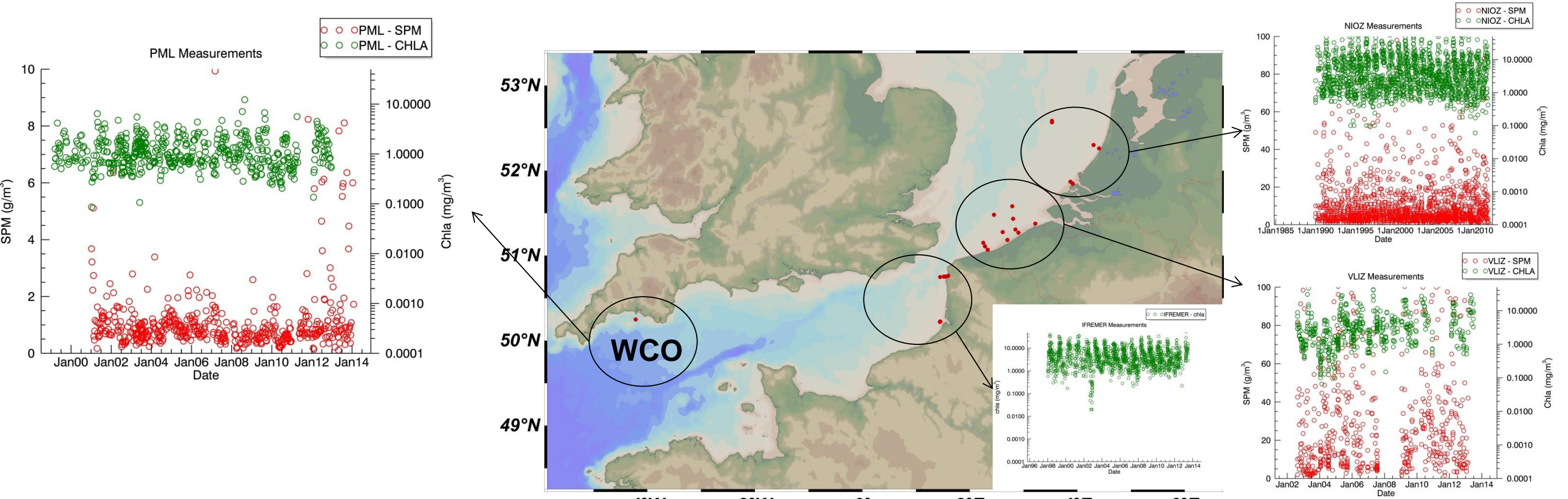


Figure 1. Sites selected for Chlorophyll and suspended sediments concentrations from agencies in the participating countries (PML-UK, IFREMER-France, VLIZ-Belgium and NIOZ-Netherlands). Data have been assembled into a database, for combination with Satellite imagery.

2.-Understanding underlying optical relationships using data from the Western Channel Observatory (WCO)

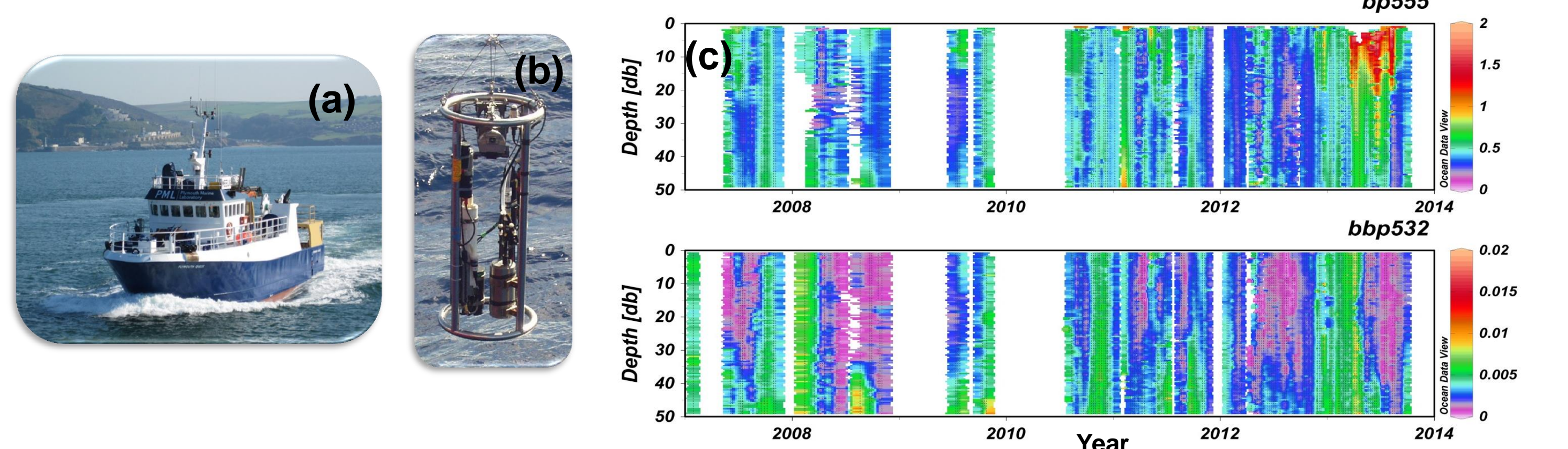


Figure 2. In-situ weekly sampling in the WCO, using Plymouth Quest (a) with a purpose built state-of-the-art optical frame (b). This sampling provides an insight on seasonal variations of vertical-distributions of optical properties (scattering and backscattering, b_p and b_{bp}), (c) that influence ocean colour. (Martinez-Vicente et al, *in prep*)

3.-Prototype for near shore Ocean Colour data collection.

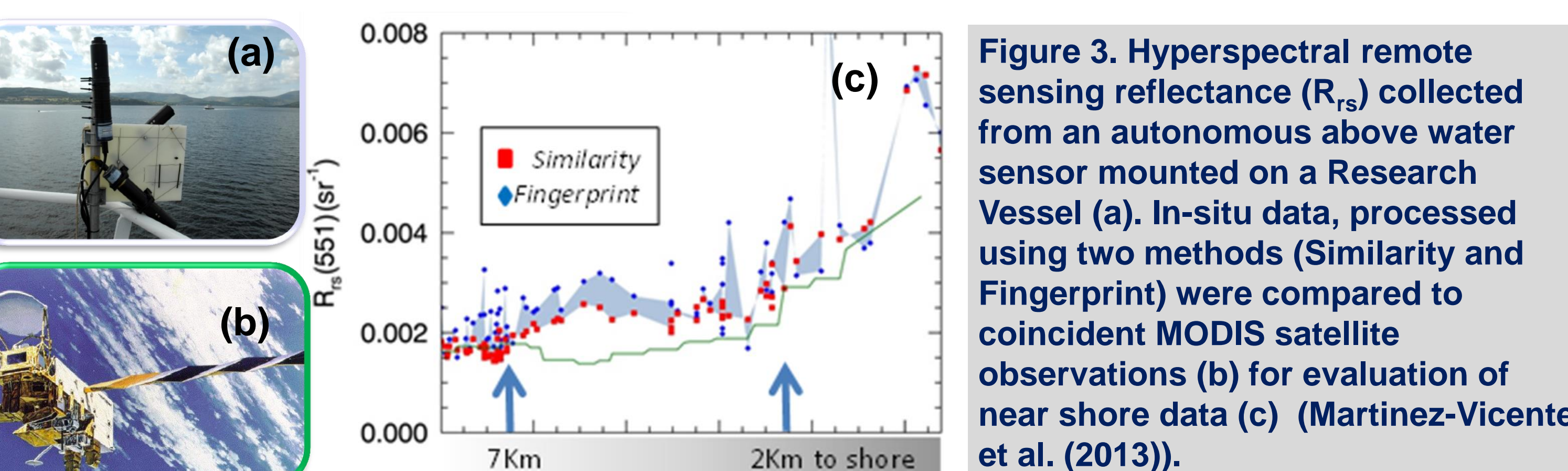
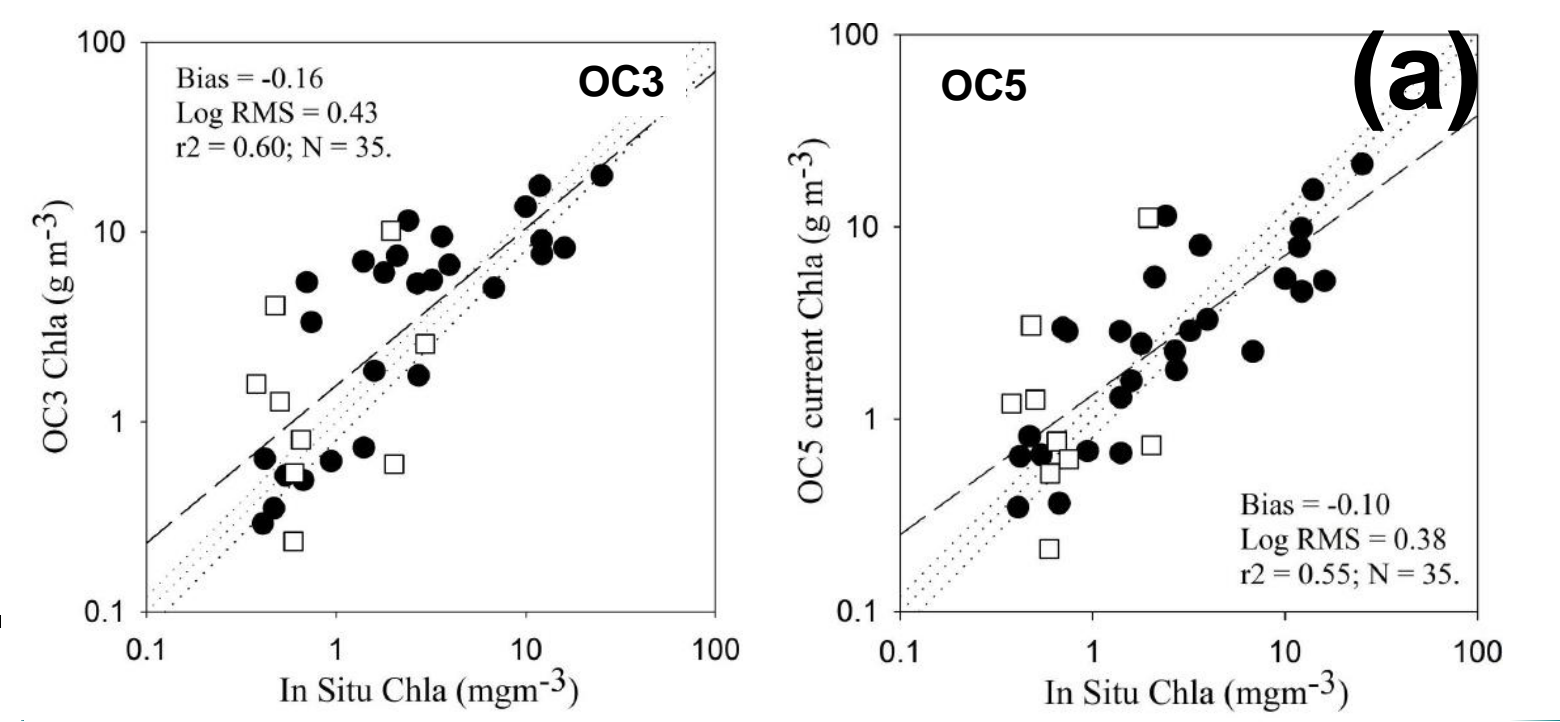


Figure 3. Hyperspectral remote sensing reflectance (R_{rs}) collected from an autonomous above water sensor mounted on a Research Vessel (a). In-situ data, processed using two methods (Similarity and Fingerprint) were compared to coincident MODIS satellite observations (b) for evaluation of near shore data (c) (Martinez-Vicente et al. (2013)).

EO ALGORITHM COMPARISONS AND VALIDATION

One of the main limitations to the use of Earth Observation products for Eutrophication environmental assessments is the limited knowledge of the uncertainty of the satellite products in coastal waters.



During ISECA several performance assessments have been conducted for different algorithms against in-situ data. Better performance have been obtained with more sophisticated algorithms.

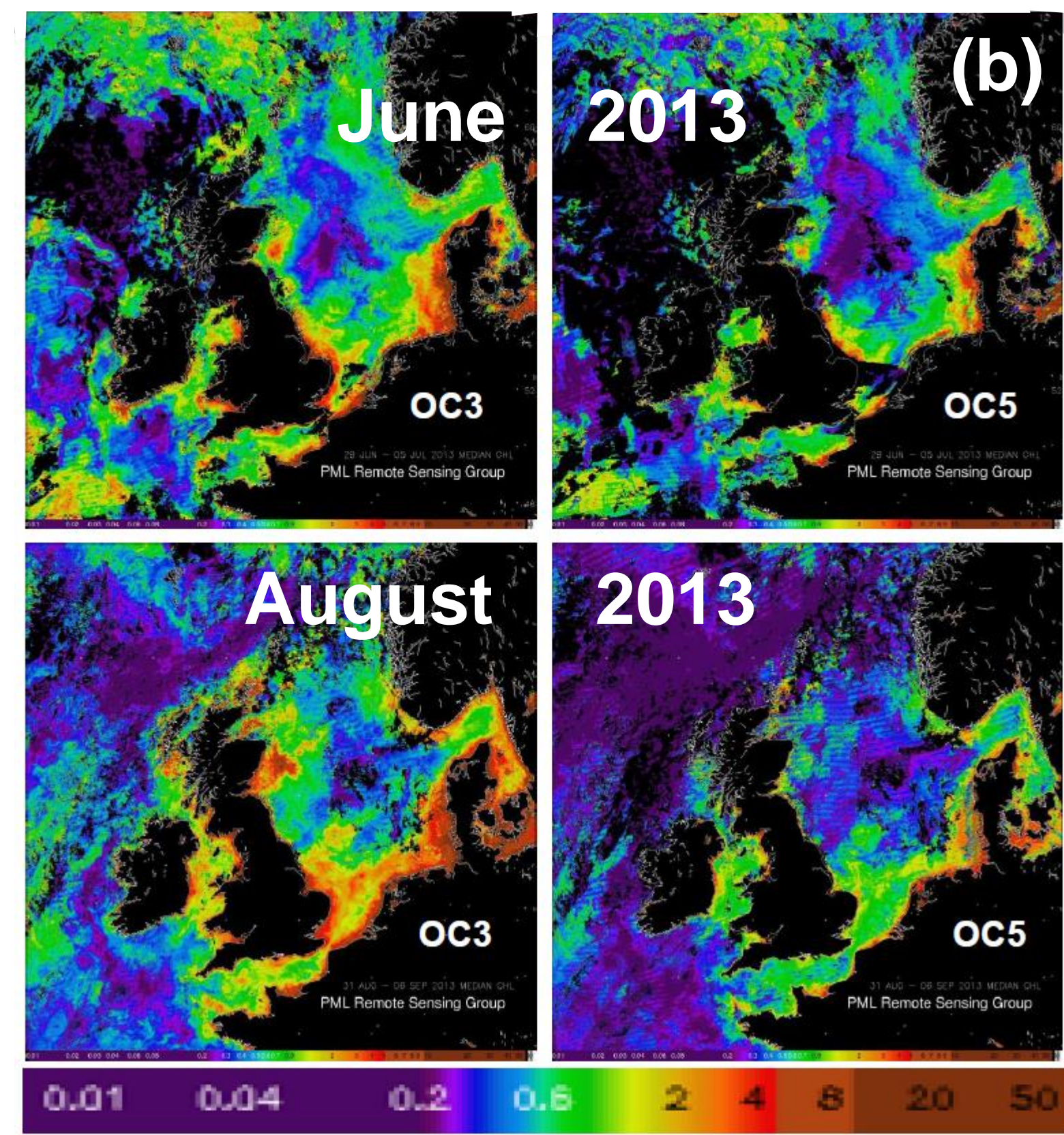


Figure 4. (a) Comparison between Chlorophyll concentrations derived from Ocean colour algorithms (OC) version 3 and 5 with matching in-situ data within 1 hour of the satellite overpass. (b) Illustration of the effects of the differences from the matchup analysis on actual MODIS imagery for the Summer 2013. (Tilstone et al. *in prep.*)

THE WEB-BASED APPLICATION SERVER (WAS)

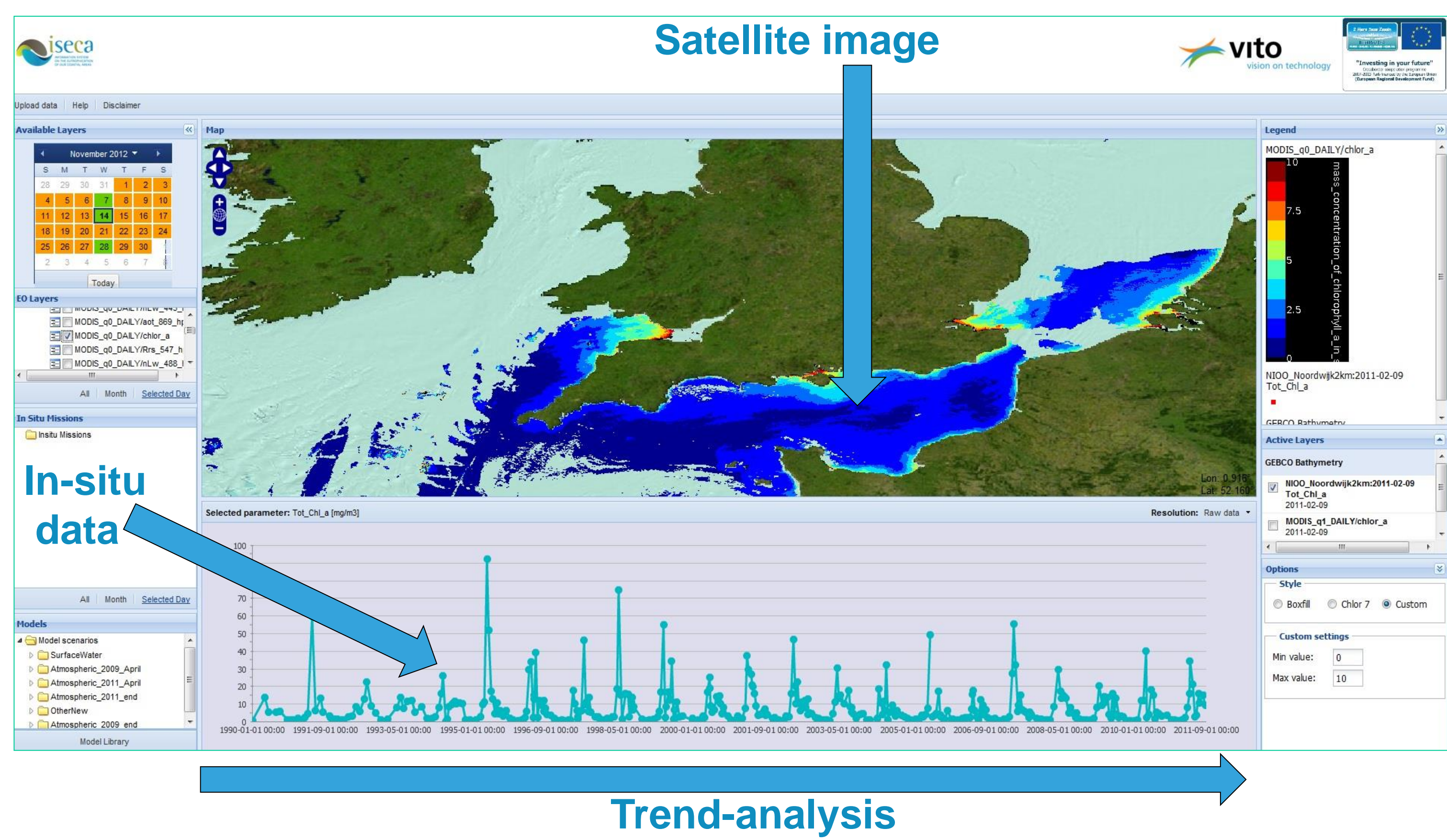


Figure 5. The Web-based application system is the main ISECA project product. It is aimed to be a user-friendly demonstration product of the potential of combining in-situ observations (from regular monitoring stations) with satellite Earth Observation to increase the spatial scale of the environmental assessment.

CONCLUSIONS AND FUTURE DEVELOPMENT

User requirements have been addressed throughout the project life, resulting in a demonstration web-tool that combines in-situ, satellite and modelling data for eutrophication monitoring.

- Further work needs to be done to:
- ✓ Collect more in-situ observations to improve confidence in EO products,
 - ✓ Extend the validity of EO products to near-shore with new algorithms,
 - ✓ Make the prototype WAS operational
 - ✓ Encourage the regular use of Earth Observation data by scientific advisors.

Final project conference will take place on the 30th June to 1st July 2014, in Nausicaá, Boulogne-sur-Mer, France. Visit www.iseca.eu for details.

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 References: Martinez-Vicente et al. (2013). J. Europ. Opt. Soc. Rap. Public. 8, 13060