

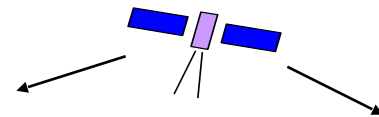
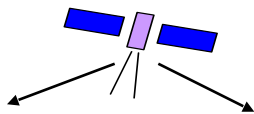
“The complexity of the coastal ocean cannot be well understood if interconnection between physics, biogeochemistry and biology is not guaranteed. Such an integration requires new technological developments allowing continuous monitoring of a larger set of parameters.” (The JERICO-RI consortium, 2014)

observatories.





# JERICO-NEXT: Quicklook



EOOS



**Marine Core Services (CMEMS)**  
**SEADATANET/SEADATACLOUD**  
**EMODNET (DG MARE)**

# How does JERICO-RI contribute to monitor the marine life?

**F. Artigas, CNRS-LOG**

**I. Puillat, Ifremer**

**[jerico@ifremer.fr](mailto:jerico@ifremer.fr)**



# How to?

Method  
ol.  
Assessm  
ent



Tech.  
Develo  
pment

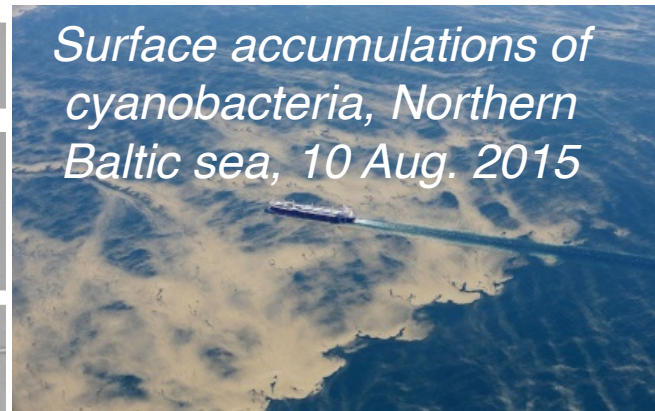
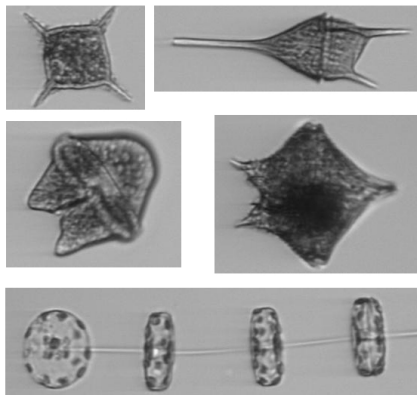


Test &  
Proof  
at sea



Feedbac  
k

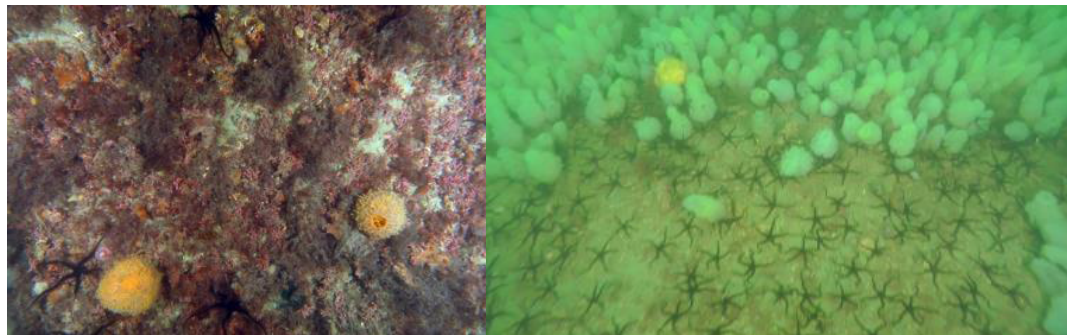
Focus on: phytoplankton dynamics



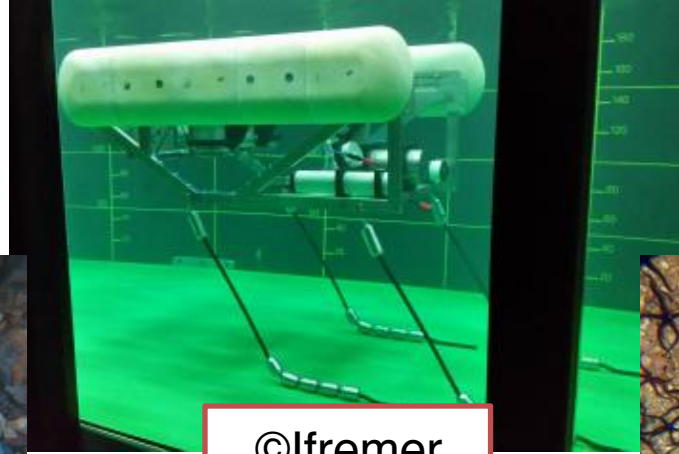
*Surface accumulations of  
cyanobacteria, Northern  
Baltic sea, 10 Aug. 2015*

*Photo by the Swedish Coast Guard*

Focus on: benthic organisms

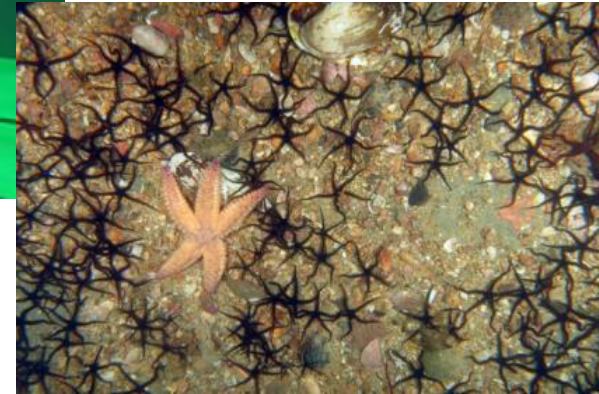


# Benthic marine life



©Ifremer

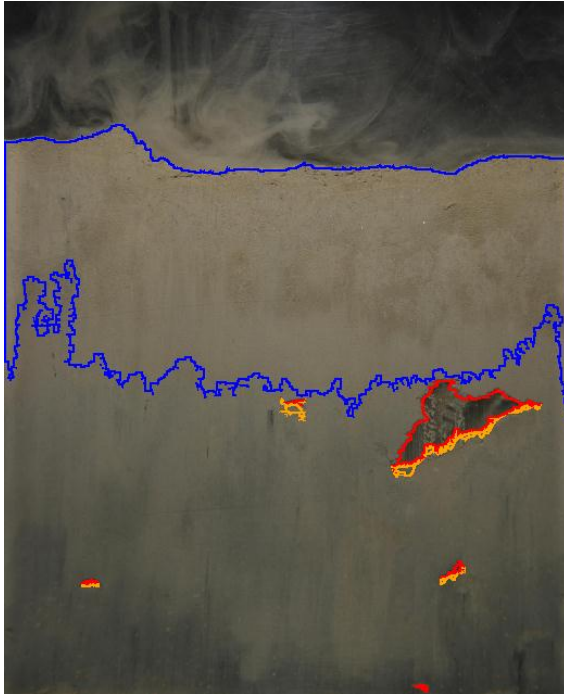
Reduced impact on the bottom



- **Challenge to monitor** biological diversity, non-indigenous species, commercial shellfish, seafloor integrity or marine litter
- **Need:** investigate benthic biodiversity and habitat over large spatial scale with cost-effective and easily deployable tools

# Benthic marine life

## Sediment Profile Imager

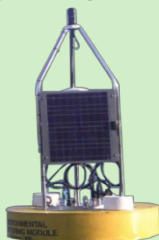


# Phytoplankton and HAB

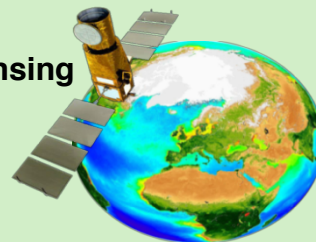
Research /  
Opportunity  
Vessels



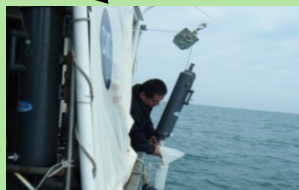
Moorings  
Gliders



Remote sensing



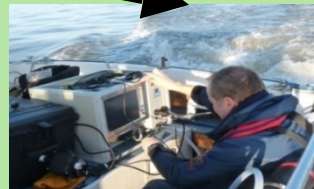
Monitoring  
strategy



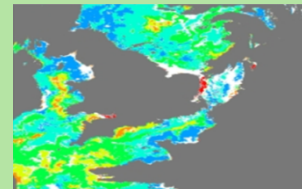
Discrete sampling



Profiles



Continuous pumping/  
recording



Synoptic/regional

Sampling strategy

At the laboratory/ On  
board

Real time

Real time

Real time

Analysis

Microscopy  
Pigment analysis  
Total/Spectral  
Fluorometry  
Flow cytometry  
Image Analysis  
Molecular tools

*In vivo* Total/Spectral  
Fluorometry  
Optic probes  
Scanning Flow  
cytometry  
Analysis

CTD  
Total/spectral  
Fluorometry  
Scanning Flow  
cytometry  
Image Analysis  
tools

Ocean optics from  
satellites  
Development of  
new Algorithms  
Comparison with  
*in situ* data

Techniques

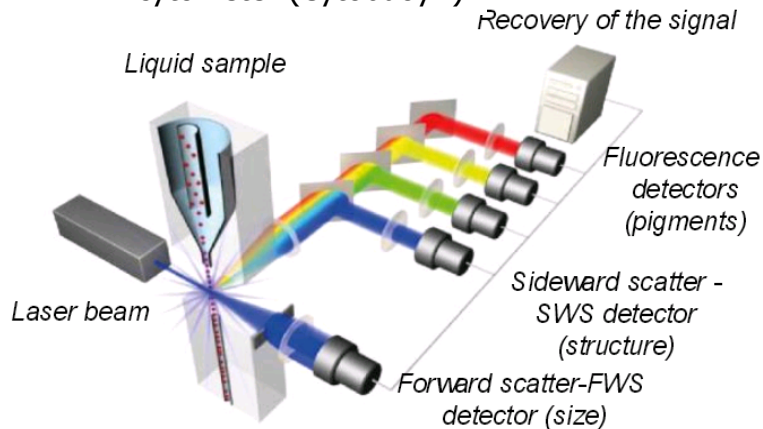


# Phytoplankton and HAB

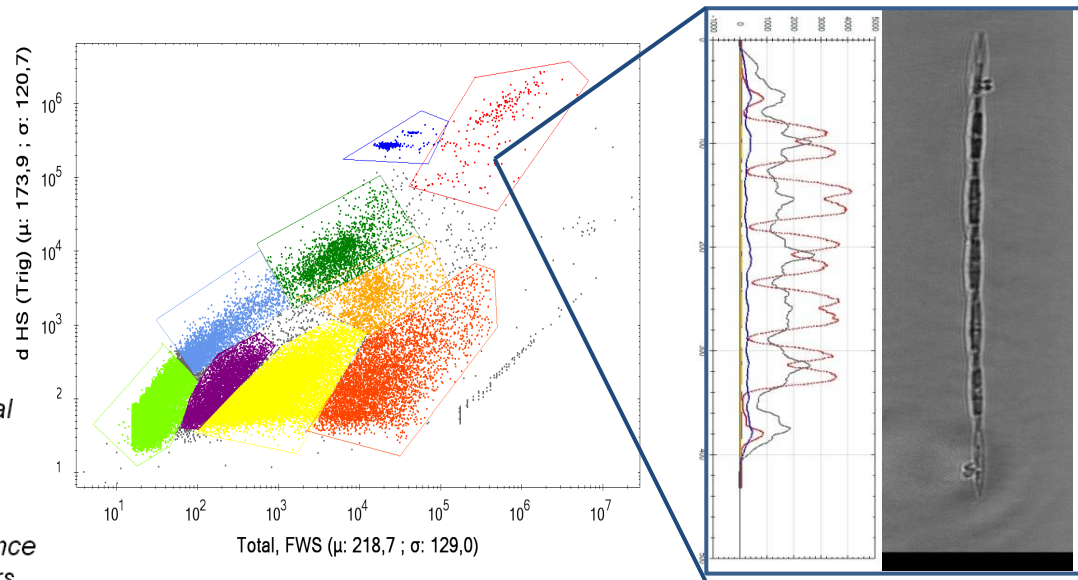
## Single-cell analysis: Pulse-shape recording flow cytometry + imaging



The CytoSense flow cytometer (Cytobuoy©)



Recovery of the signal



Cytogramme : Multidimensional representation of all cells analysed according to their optical features.

Optical profile (fluorescence, forward scatter and sideward scatter) of a particle (colony of *Pseudonitzschia* sp.) and associated image

# Phytoplankton and HAB



**CytoSense–  
Fluoroprobe  
FRRF  
continuous +  
profiler**

**Fluorometer +  
FRRF**



**Ifremer/CNRS-BOREA  
Smile Buoy**



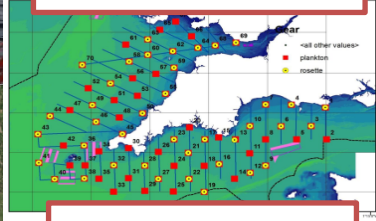
**Fluorometers,  
Imaging Cytobot**



**VLIZ cruise “Simon  
Stevin” R/V**



**Cefas cruises  
« Endeavour » R/V**



**FB + CytoSense**

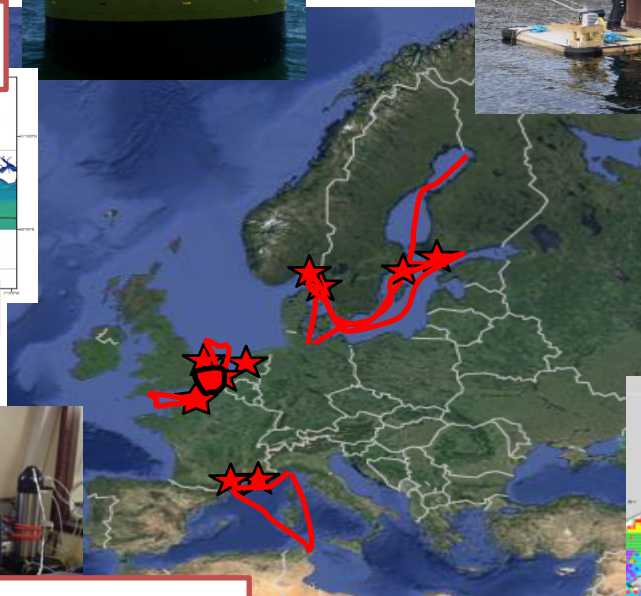
**ETOILE cruise “Côtes de la  
Manche” R/V**

**Fluoroprobe  
CytoSense**



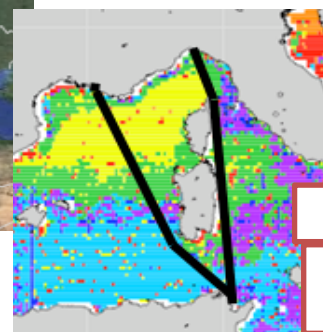
**PhytoPAM,  
CytoSense,  
AOA, FRRF**

**CNRS-LOG cruise  
PHYCO “Côtes de la  
Manche” R/V**



**SMHI Tangesund  
observatory**

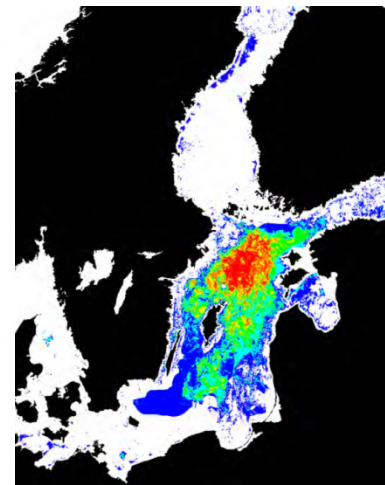
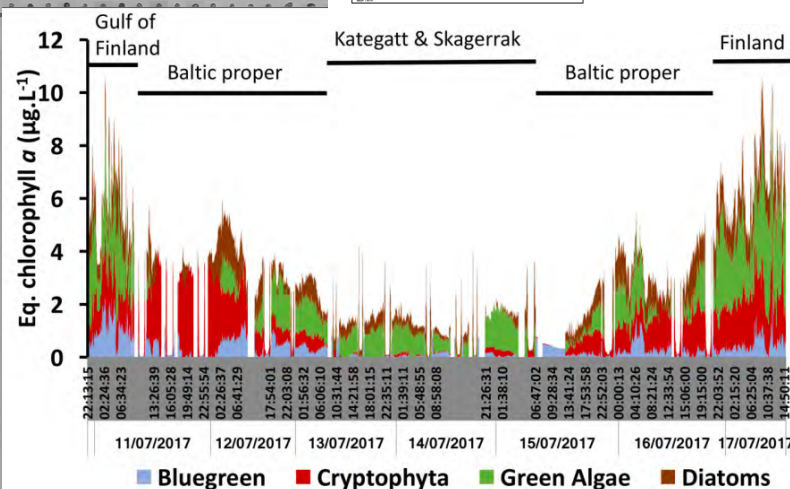
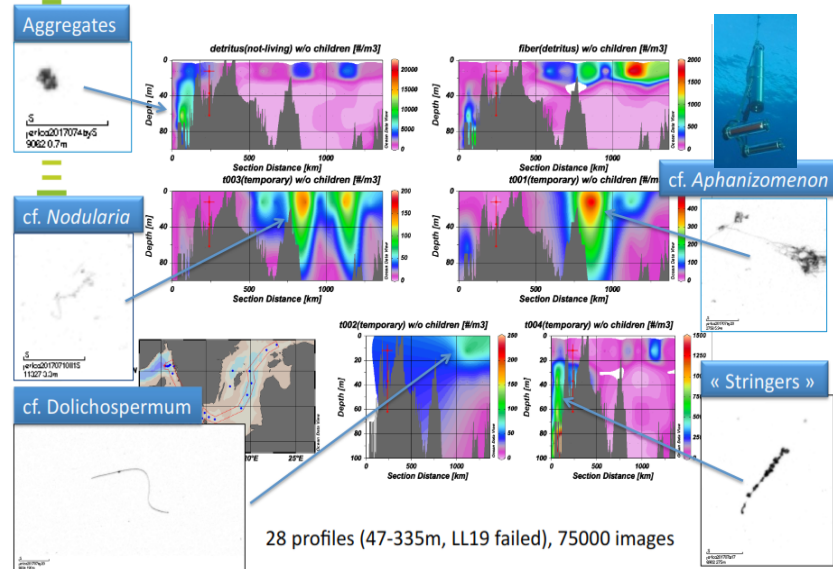
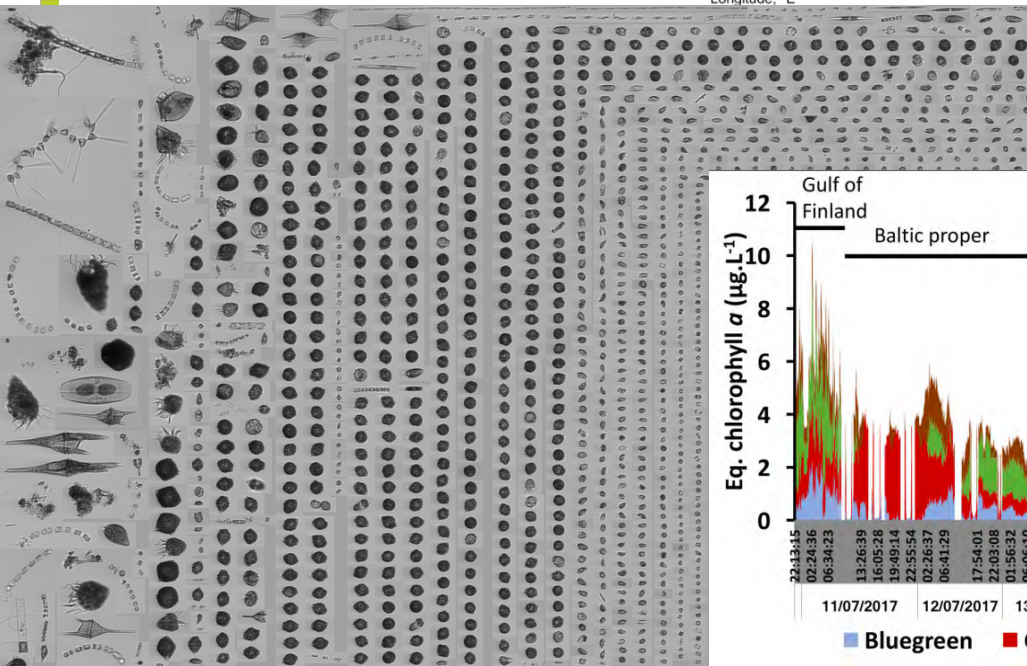
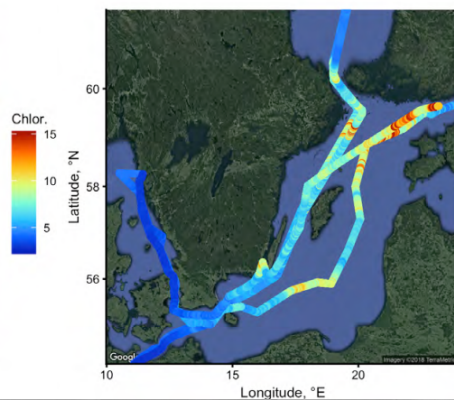
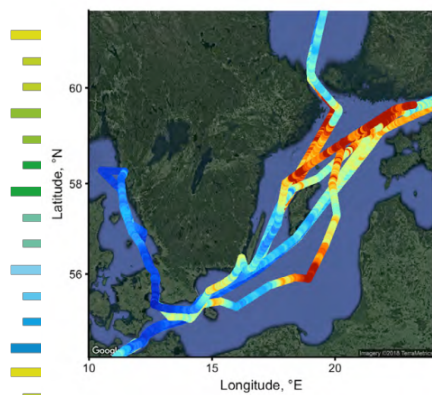
**Some field implementation  
(May 2016-August 2017)**

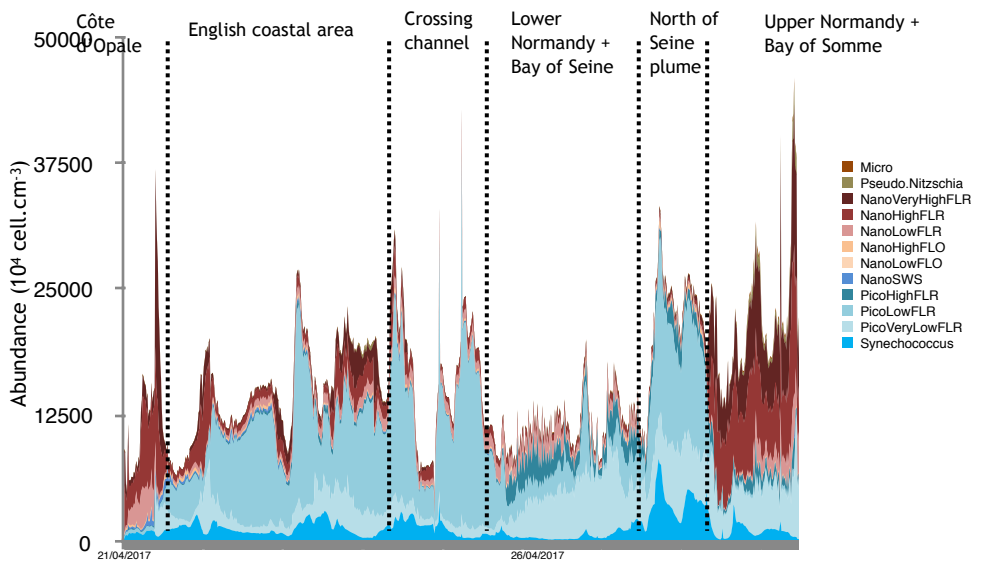
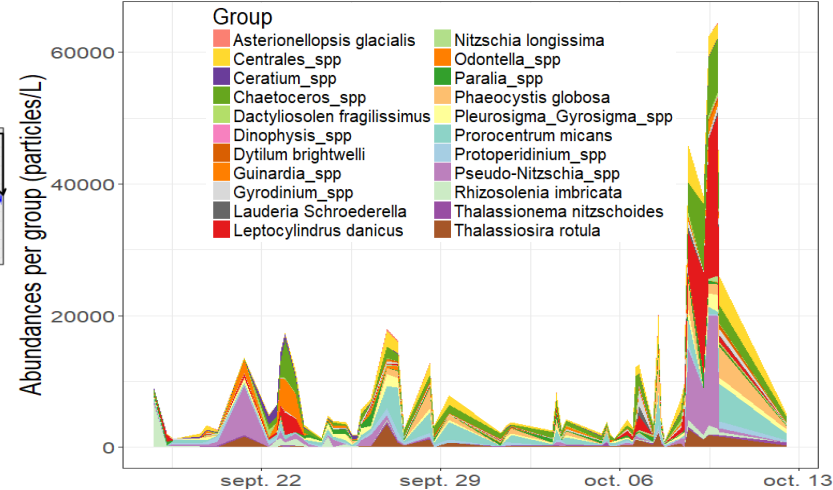
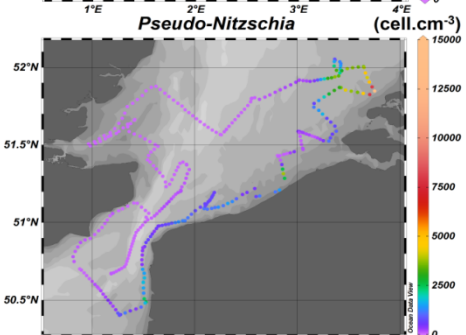
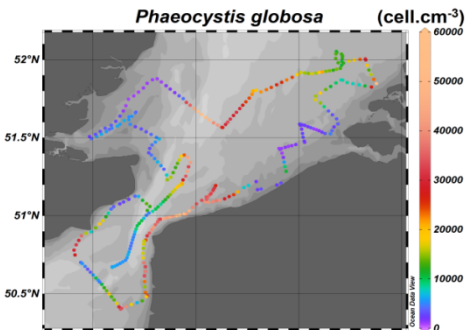
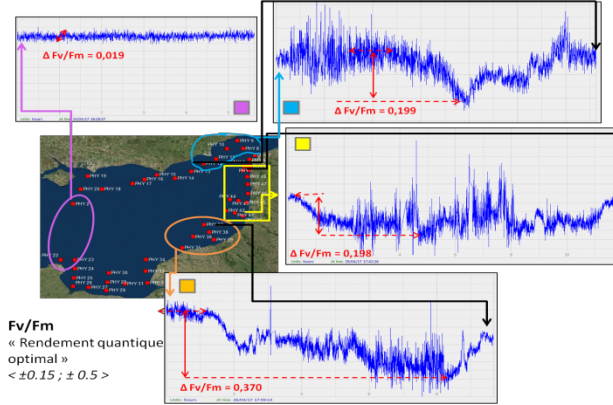
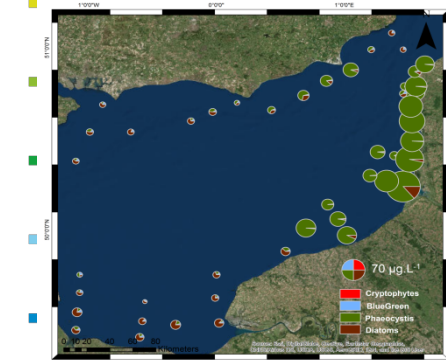
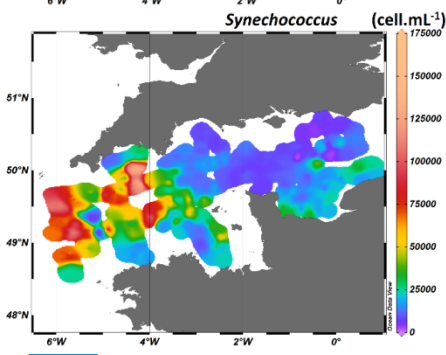
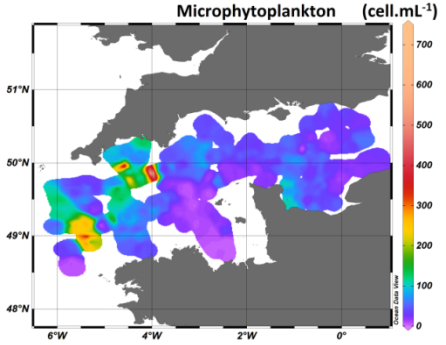


**FB + CytoSense**

**“Le Carthage” Ferry  
line CNRS-MIO**








- Define the most suitable and relevant combination of methods for studying and monitoring phytoplankton dynamics at high frequency
- Ways of implementing them in combined platforms.
- Take into account the difference response of this sensors according to optical properties, nutrient status and phytoplankton communities.
- Contribute to the improvement of the discrimination of each technique and the best synergy amongst techniques
- Contribute to the improvement of analytical software tools for automated analysis or potical profiles as well as images.
- Obtain better description of the different types of data that can/will be compiled in European databases (and to define levels of data qualification)
- Improve our understanding of phytplankton dynamics in relation to changes in ecological state and functioning of coastal waters, early



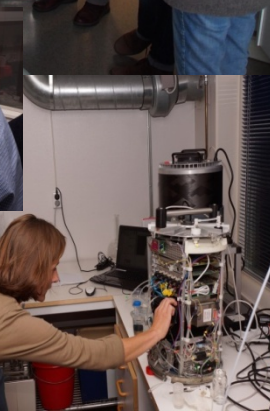
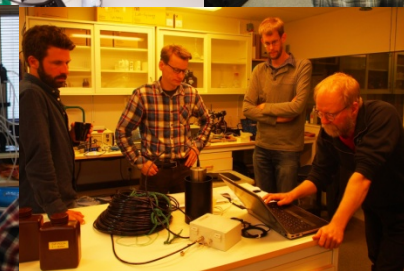
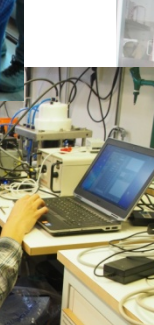
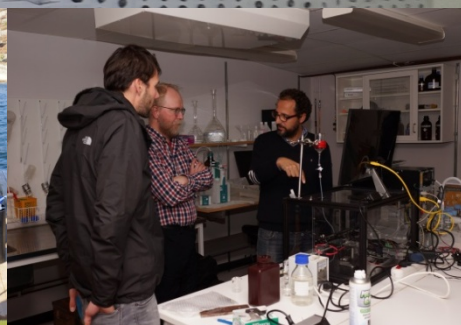
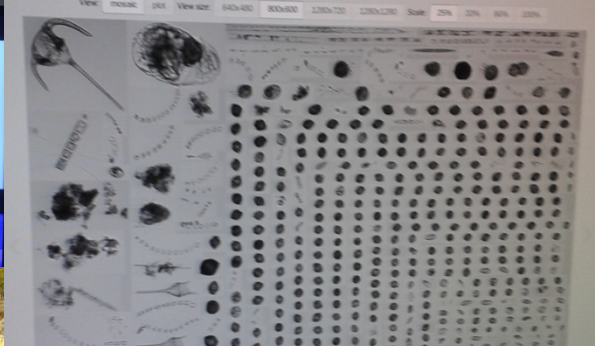
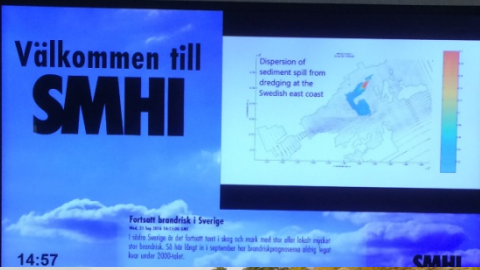
# JERICO-RI monitoring marine life

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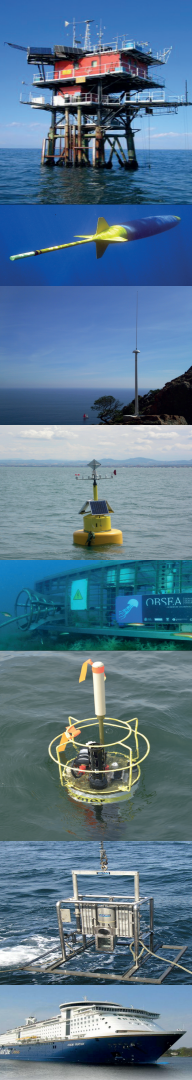
- 
- **Non intrusive methods** that will be more keen to be deployed for increasing number of studies of benthic marine life
  - **Automated techniques for higher frequency monitoring** of plankton communities resolving fine spatial and temporal scales
  - Providing **early warning** about changes in marine plankton and benthos communities, invasive/noxious species/groups occurrence and dynamics
  - Provide the whole scientific community with data from automated or semi-automated sensors for further fundamental and applied research, including **biogeochemical models and remote sensing products**
  - Propose **integrated** hydrological, biogeochemical and biological studies in targeted areas





**WP3.1 – JRAP#1 - JERICO-Next**  
**Practical Workshop on Automated Phytoplankton Sensors**  
**Göteborg, SE, September 26-30, 2016**





# Thanks for your attention!



## Danke für Ihre Aufmerksamkeit!

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