

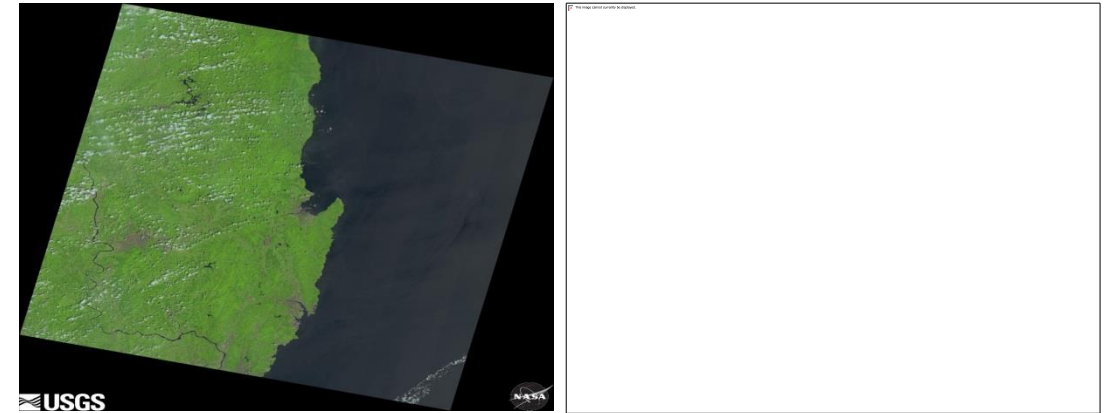
How do we best utilise existing programs or recommend new programs to validate satellite approaches for detecting ephemeral blooms in the sea?

GOCI in support for PFT detection – red tides

Contribution from Wonkook Kim, Department of Civil and
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Busan

GOCI-II for red tide detection

- Increased spatial resolution
 - 500 m to 250 m (nominal), 300~350m at around Korea
 - High resolution satellites such as Landsat, Sentinel-2 are supposed to be more suitable for coastal areas with complex shorelines
 - But, their overpass time (10-11am) is NOT optimal for red tide observation (RT typically peaks in the afternoon)



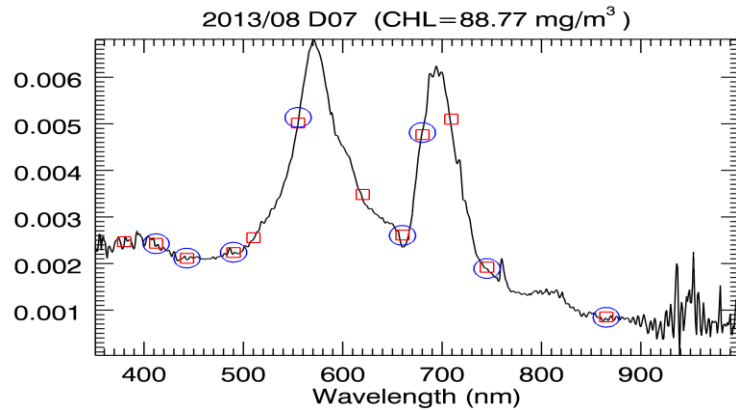
Landsat-8

- Temporal frequency
 - GOCI : 9:30am to 4:30pm (8 times/day)
 - GOCI-II : 8:30am to 5:30pm (10 times/day)
 - Still hourly, but with 2 more acquisitions per day
 - Field observation shows that red tide intensity is still strong even after 4:30pm -> GOCI-II's 5:30pm observation will help characterizing diurnal cycle of red tide!

GOCI-II for red tide detection

- More spectral bands

- New spectral bands at 510 nm, 620 nm will help characterizing phytoplankton absorption
- 709 nm will help estimating non-algal contribution & atmospheric correction
- 380 nm will help discriminating phytoplankton absorption in UV (diatom vs. red tide)



Rrs spectra for *C. Polykrikoides*
(Kim et. al, 2015)



○ GOCI Band
□ GOCI-II Band

GOCI Band	GOCI-II Band	Band center	Bandwidth	Nominal Radiance	Maximum Ocean radiance	Threshold Radiance	Maximum Cloud Radiance	NEdL	SNR @ Nominal radiance
-	1	380 nm	20 nm	93	139.5	143.1	634.4	0.093	998
1	2	412 nm	20 nm	100	150	152	601.6	0.095	1050
2	3	443 nm	20 nm	92.5	145.8	148	679.1	0.081	1145
3	4	490 nm	20 nm	72.2	115.5	116	682.1	0.059	1128
-	5	510 nm	20 nm	64.9	108.5	122	665.3	0.055	1180
4	6	555 nm	20 nm	55.3	85.2	87	649.7	0.049	1124
-	7	620 nm	20 nm	53.3	64.1	65.5	629.5	0.048	1102
5	8	660 nm	20 nm	32	58.3	61	589	0.03	1060
6	9	680 nm	10 nm	27.1	46.2	47	549.3	0.03	914
-	10	709 nm	10 nm	27.7	50.6	51.5	450	0.03	914
7	11	745 nm	20 nm	17.7	33	33	429.8	0.02	903
8	12	865 nm	40 nm	12	23.4	24	343.8	0.015	788
-	13	643.5 nm	483 nm	-	-	-	-	-	-

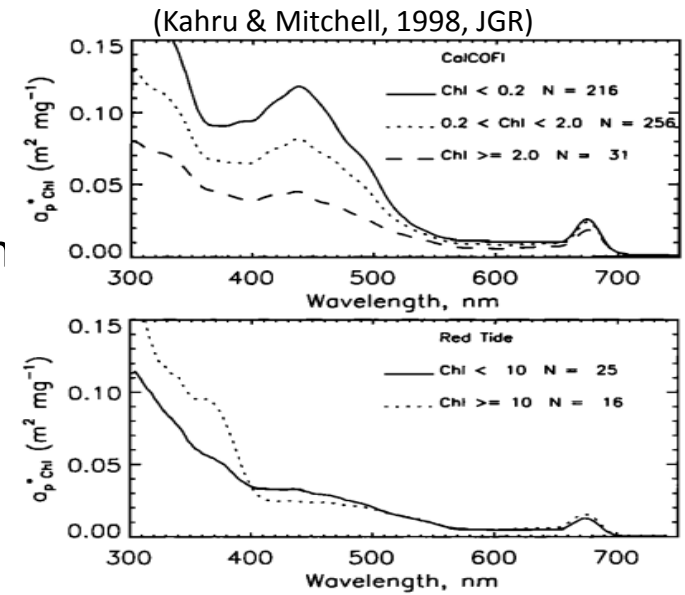


Figure 5. Average particulate absorption spectra normalized to chl *a* for three chl *a* ranges of the CalCOFI data (top) and two chl *a* ranges of the red tide data (bottom).

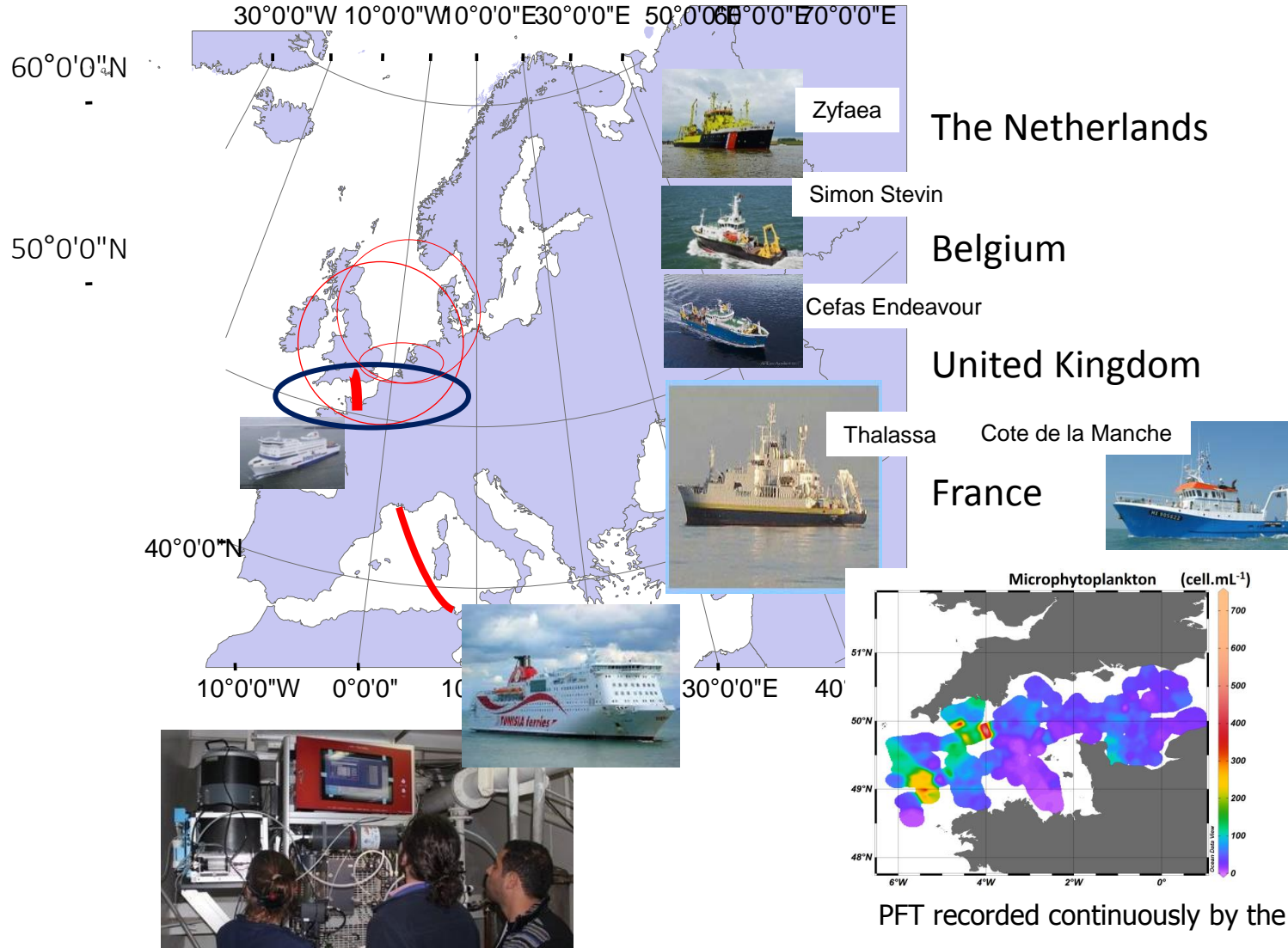
Examples of existing European networks and projects for phytoplankton time series data

Information collected by Astrid Bracher, Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research (AWI), Bremerhaven, Germany

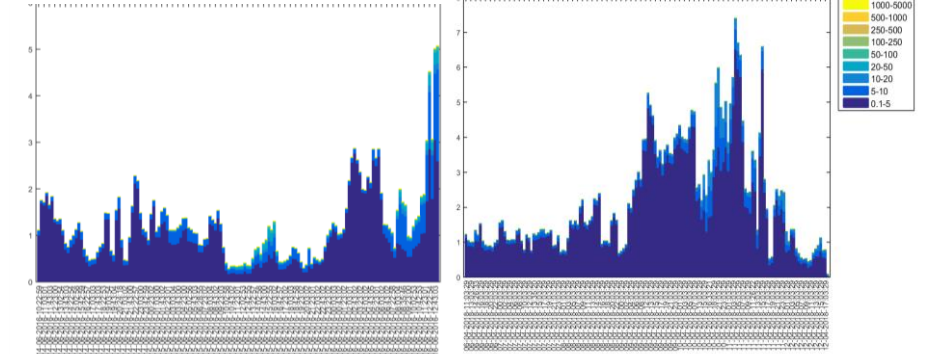
With help by: Alexandra Kraberg (AWI), David Antoine (LOV, UPerth),
Veronique Creach (CEFAS)

Standardization of flowcytometry measurements (FCM): data set for PFT validation

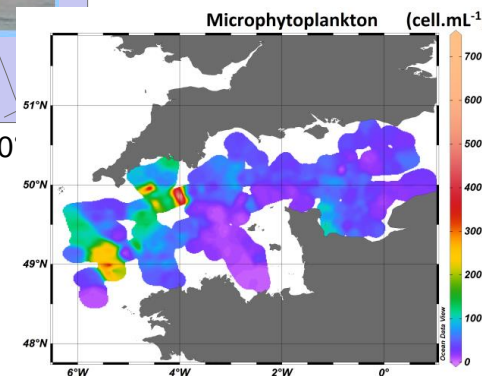
Last 10 years strong increase in platforms using automatic measurement (research vessel and ferry) of PFTs around the North Sea, Channel, Celtic Sea and Mediterranean sea



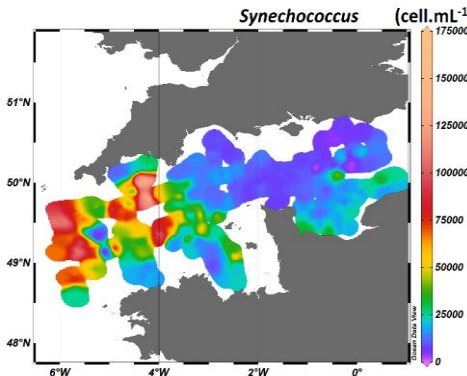
Particle number per ml over size



PFT recorded continuously by the automated FCM in the North Sea and Celtic Sea



PFT recorded continuously by the automated FCM in the Channel



Development of portal with standards, tools, and services, both for users and data centres

for pulse shape recording flow cytometer (ex: Cytosense):

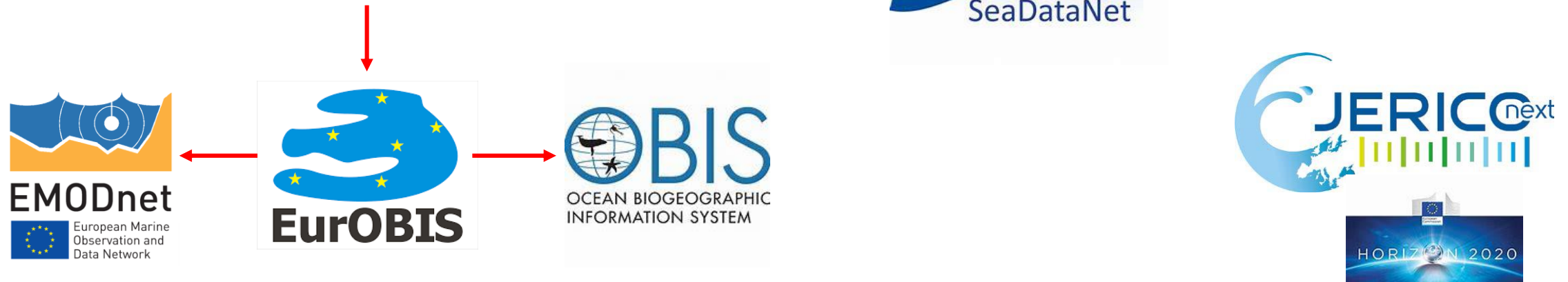
1. New FCM Standardized Common Vocabulary (F02): *12 identifiers*

2. New Parameter Usage Vocabulary (P01)

3. Data flow

Integrate these data for PFT validation?

Data providers: own database or DOI data



About the Atlas

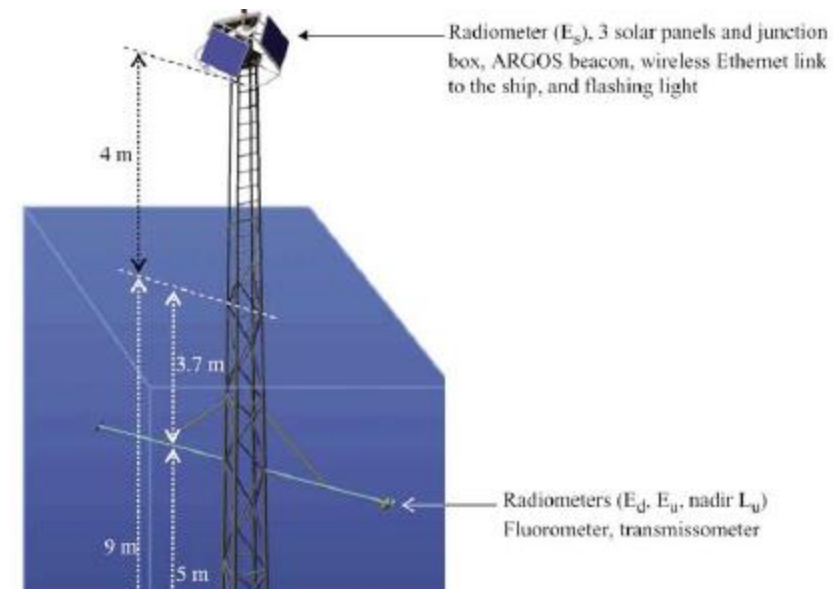
The EMODnet **Atlas of Marine Life** provides a combination of tools, models and spatial maps that allow to visualise marine biological data. The Atlas gives an overview of the marine birds, mammals, reptiles, fish, benthos, algae and plankton that occur in European marine waters. It is using species observation data to create biological data-products that showing changes in species, communities and functional traits over time.



The products within the Atlas are structured around the Essential Ocean Variables for Biodiversity (EOV). EOVS try to harmonize biological observations across the globe - the Atlas of Marine Life provides aggregated output of biological observations following these EOV categorizations. Currently you can find products on:

A combination of tools, models and spatial maps to visualize marine biological data (birds, mammals, benthos, macroalgae, zoo- and **phytoplankton in European marine waters**

- Products structured around **Essential Ocean Variables for Biodiversity** (EOV) and follows EOV's categorization
- Several European projects developed (EMODnet) and contribute



Other complete ship cruise data sets (more gappy) with AOP, IOP, HPLC, flowcytometry for PFT validation and publicly available: AMT (PML, ...), Polarstern (AWI, ...), Mediterranean (LOV, ...), Sometimes also microscopy sampling, particle counter, plankton recorder, flowcam data for evaluation, ...

Measurements			
HYPER- Rrs	2008	-	15 min
MULTI- Rrs	2003	2017	15 min
HYPER- a_p	2003	-	Monthly
HYPER- a_{cdom}	2011	2016	Monthly
HPLC	2001	-	Monthly
Flow Cytometry	2011	2012	Monthly

