Satellite remote sensing of the Baltic ecosystem

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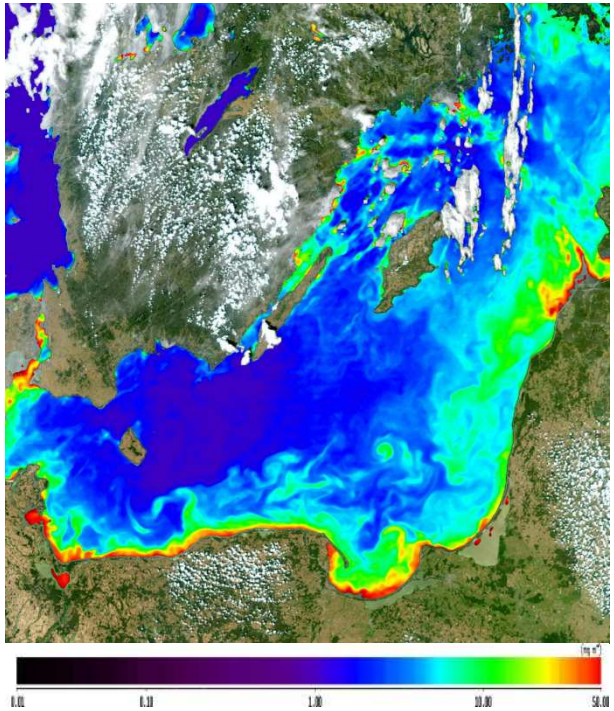
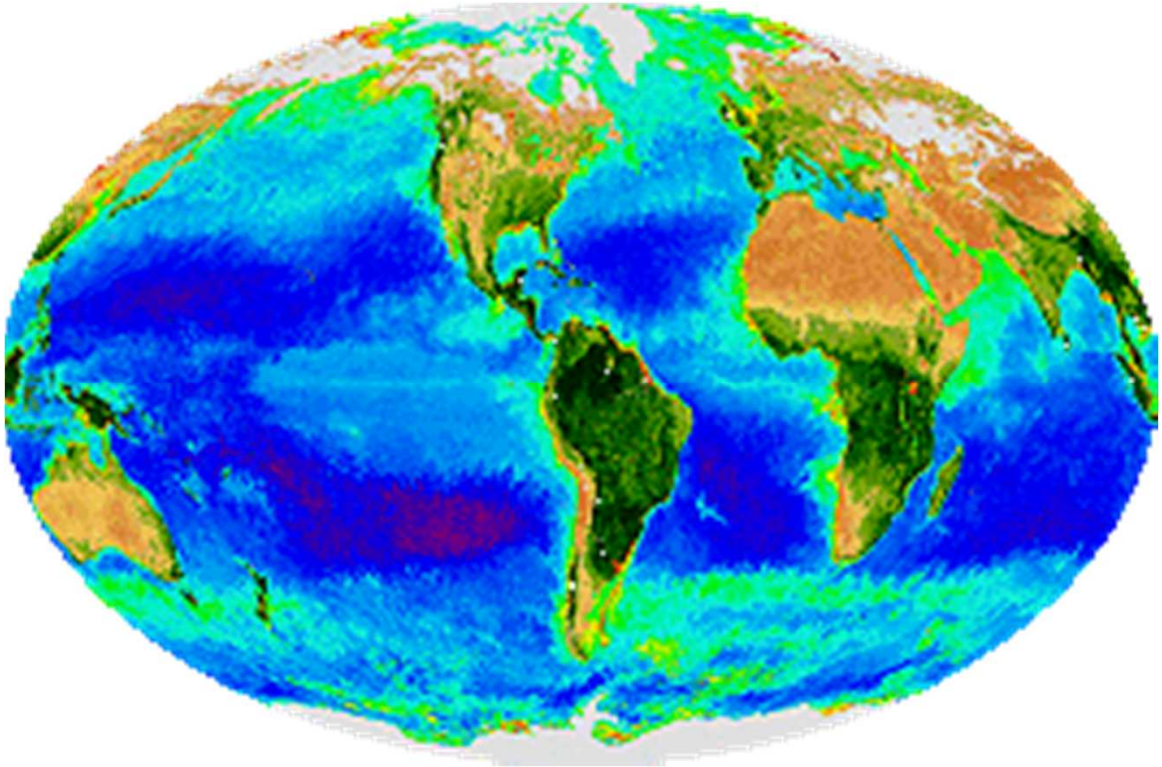
Observing and measuring ocean colour from space



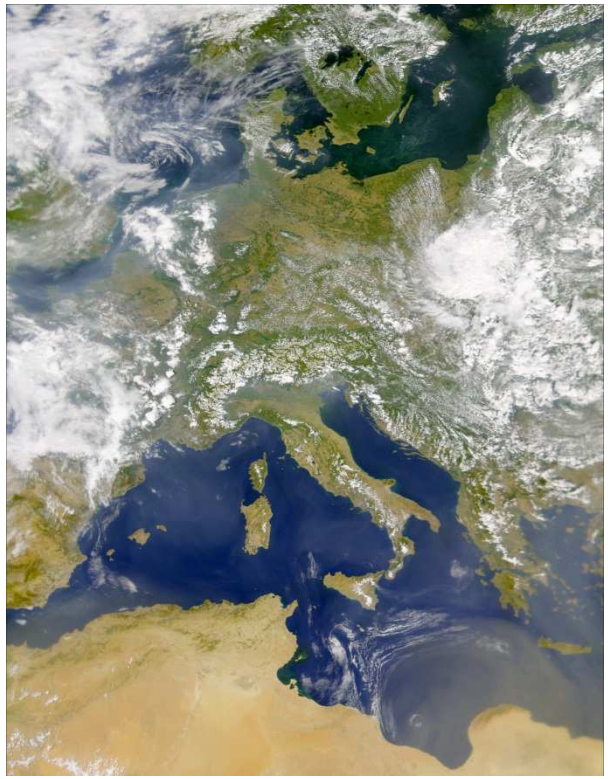
Satellite true color image

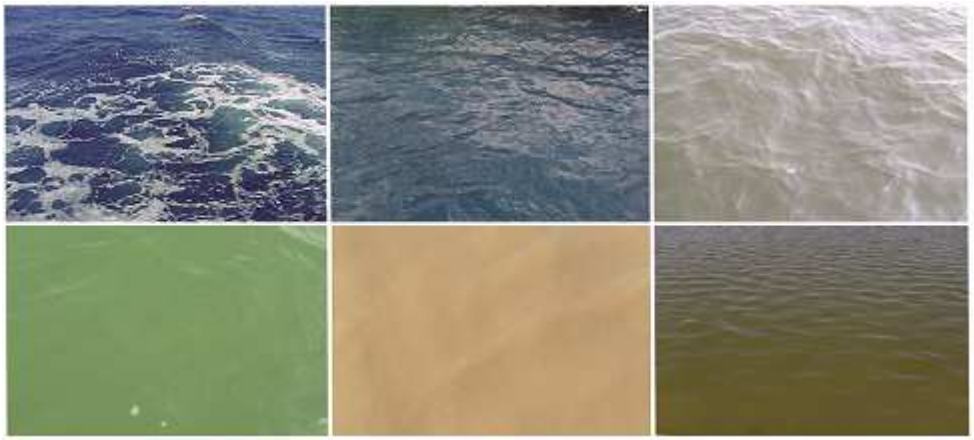
Chlorophyll a spatial variability

Measuring ocean colour from space



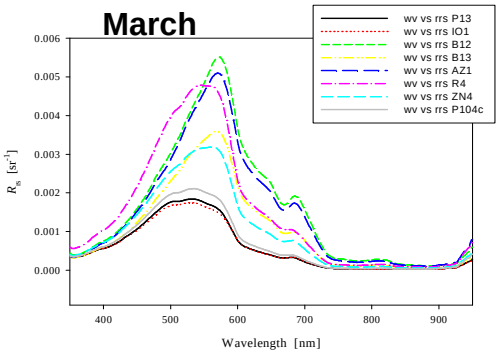
Measuring ocean colour from space

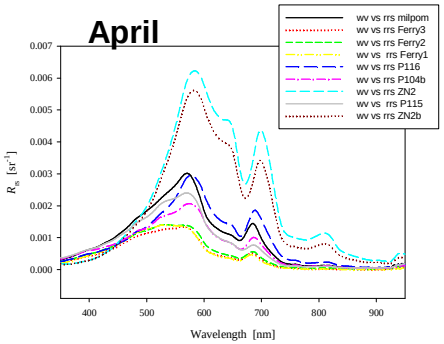


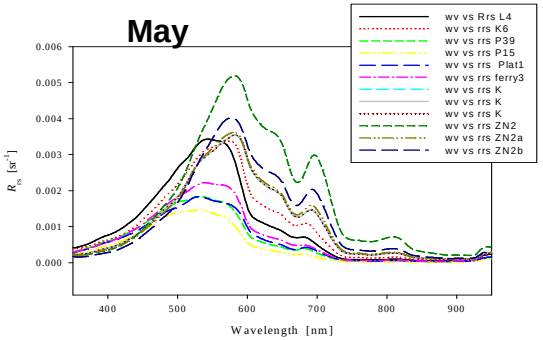


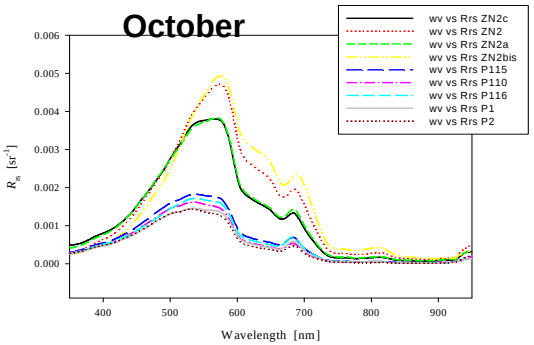
Ocean colour –spectral characteristics of the upwelling radiance

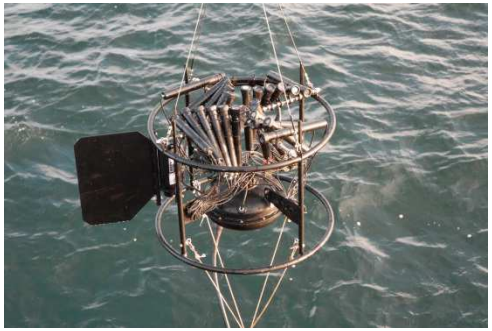
Radiometry



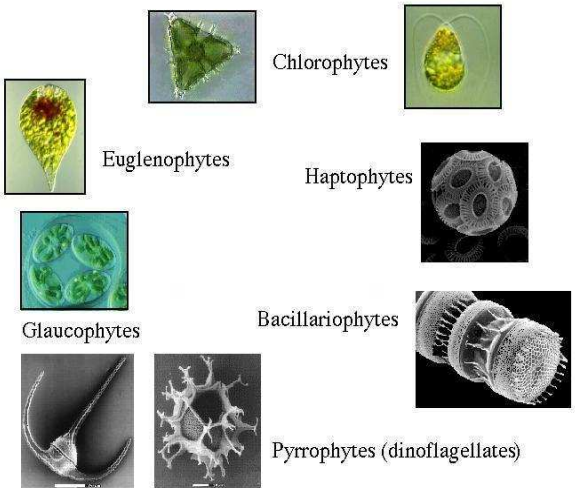


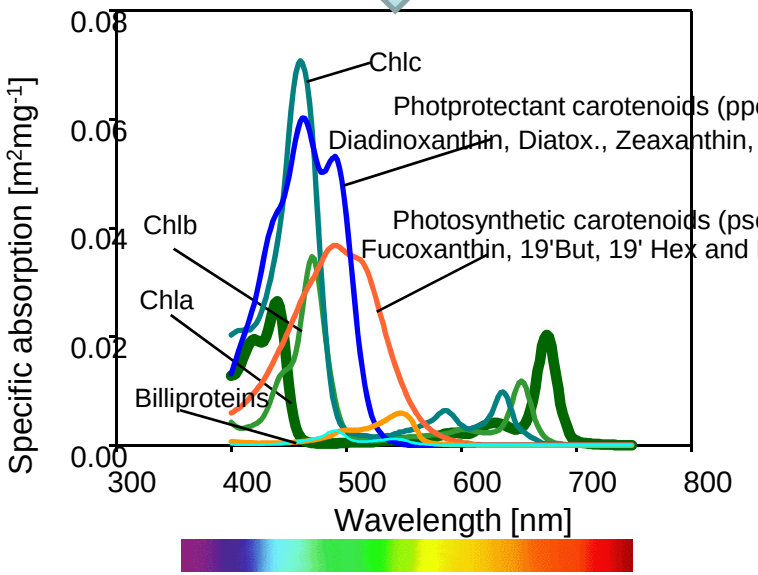


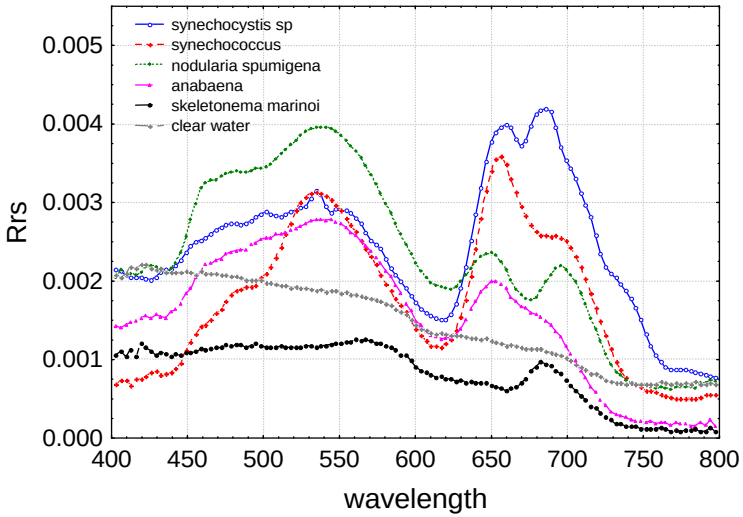




Ocean colour

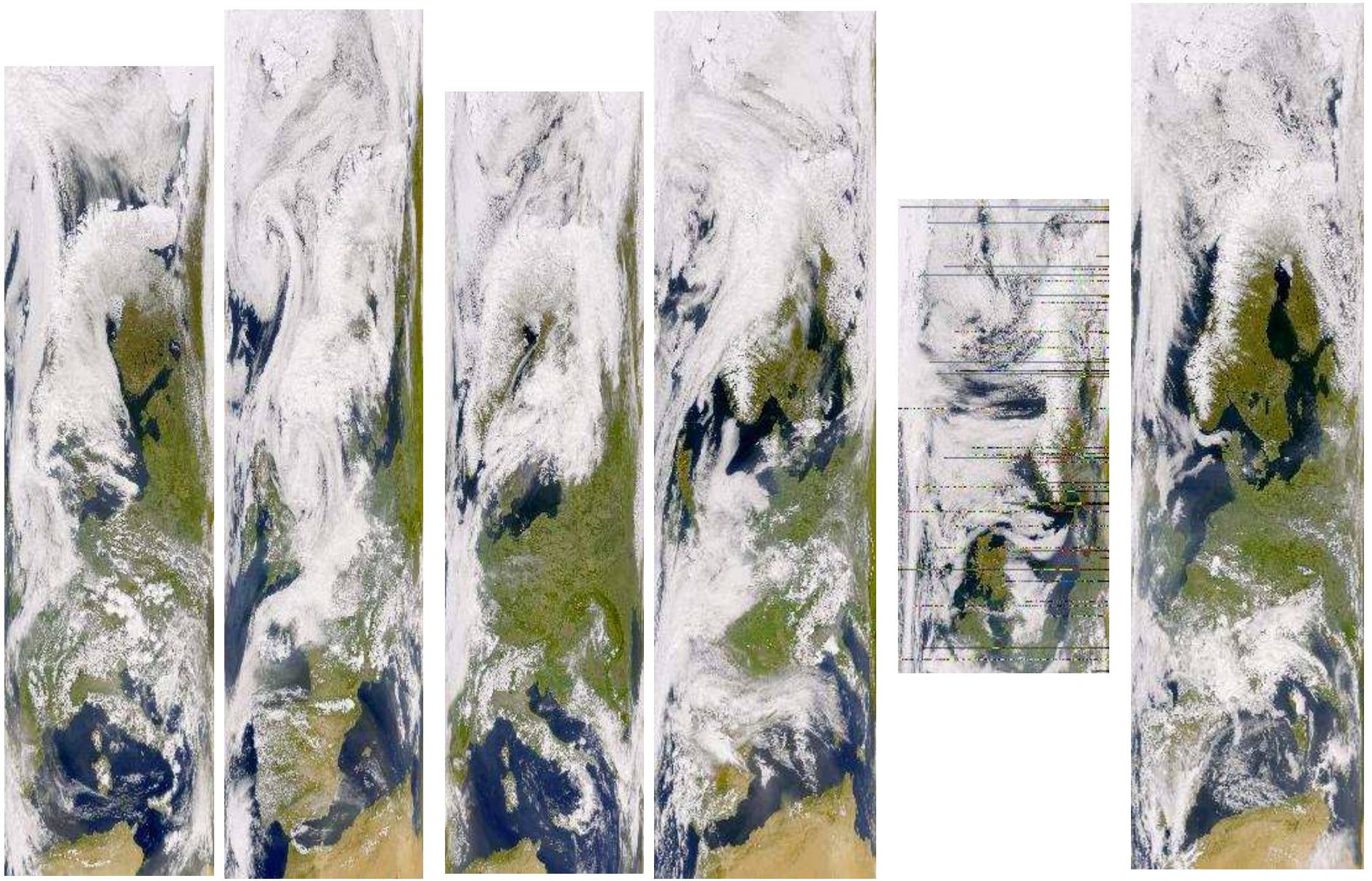






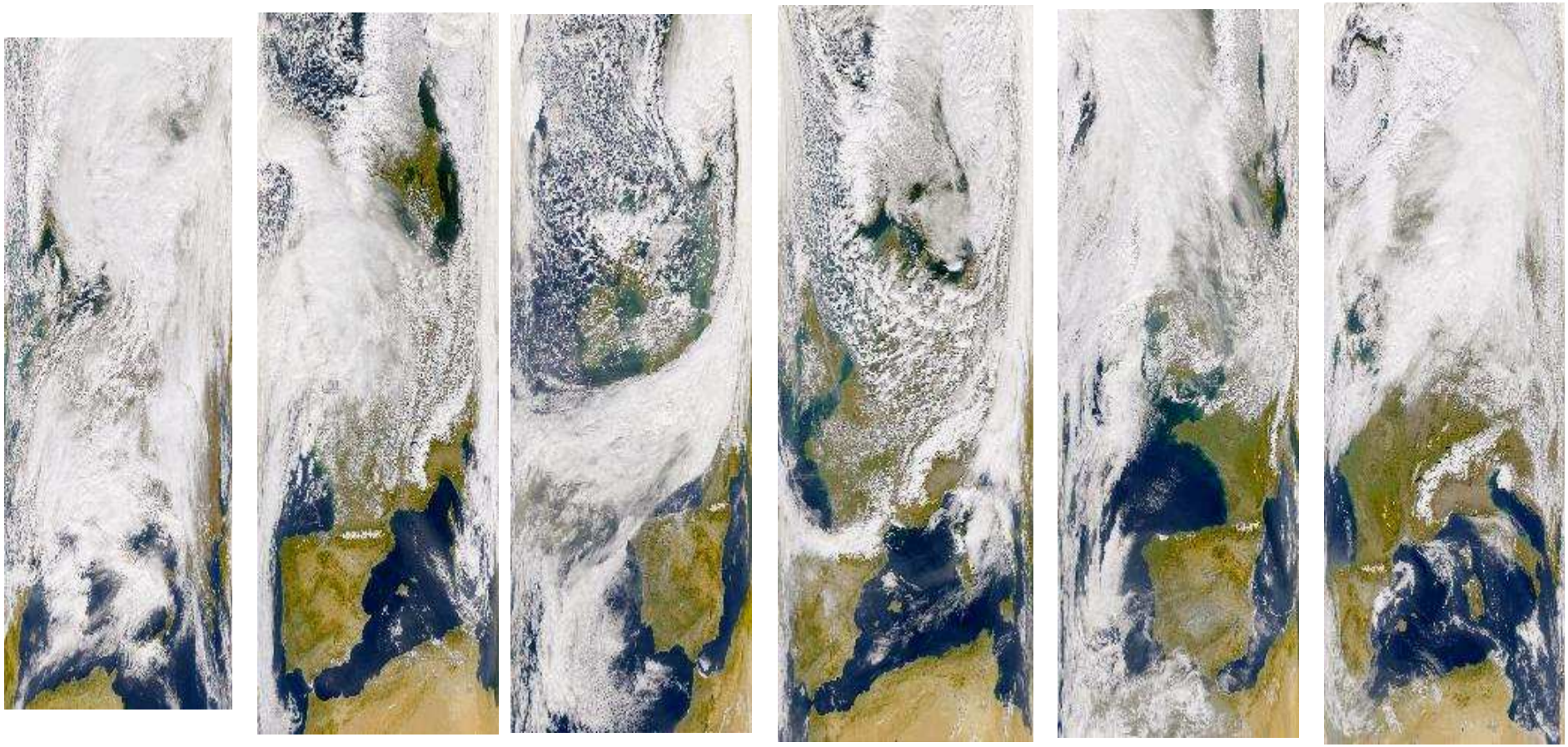
Bidigare et al.(1990)

Baltic, one week in May

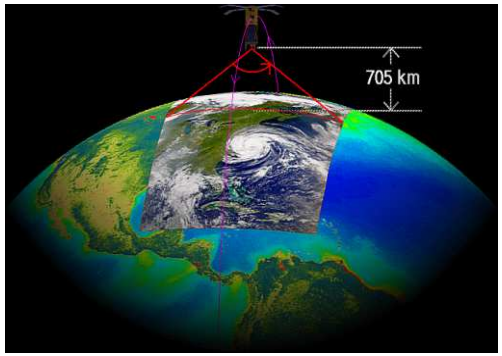


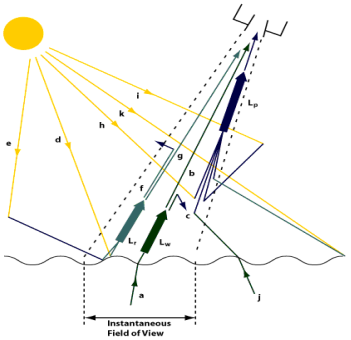
‘One’ week in March

Baltic Sea – difficult target for ocean color remote sensing

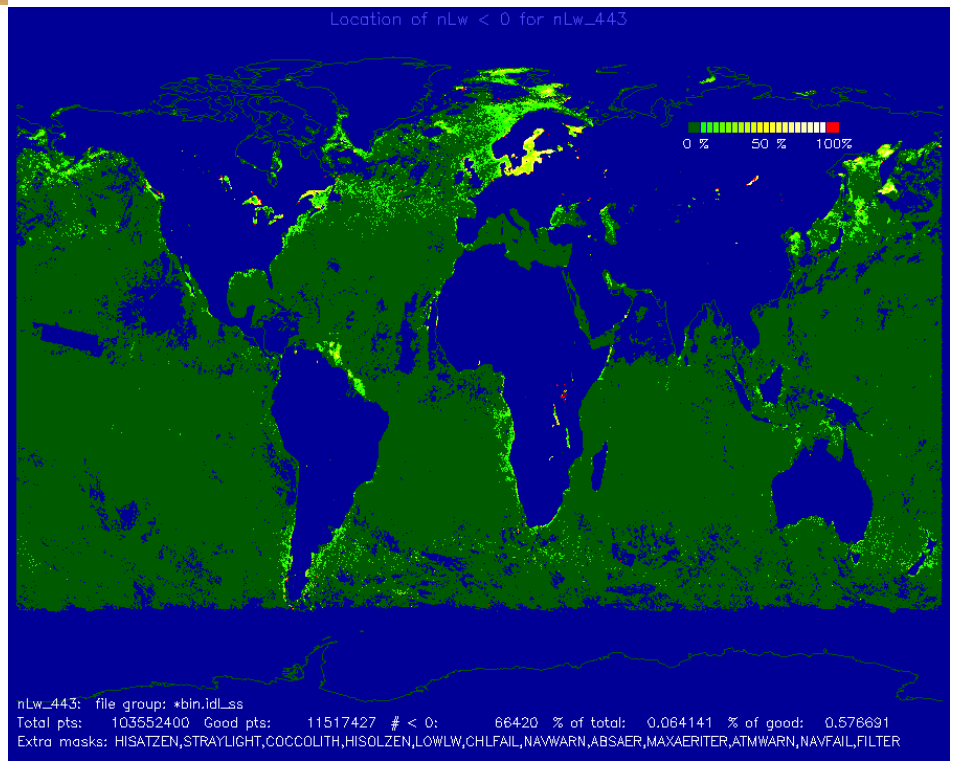


Baltic Sea – difficult target for ocean color remote sensing





Problems with atmospheric correction
e.g. % of nLw(443nm) <0
after last reprocessing



INNOVATIVE ECONOMY
NATIONAL COHESION STRATEGY

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

Project *POIG.01010222011*

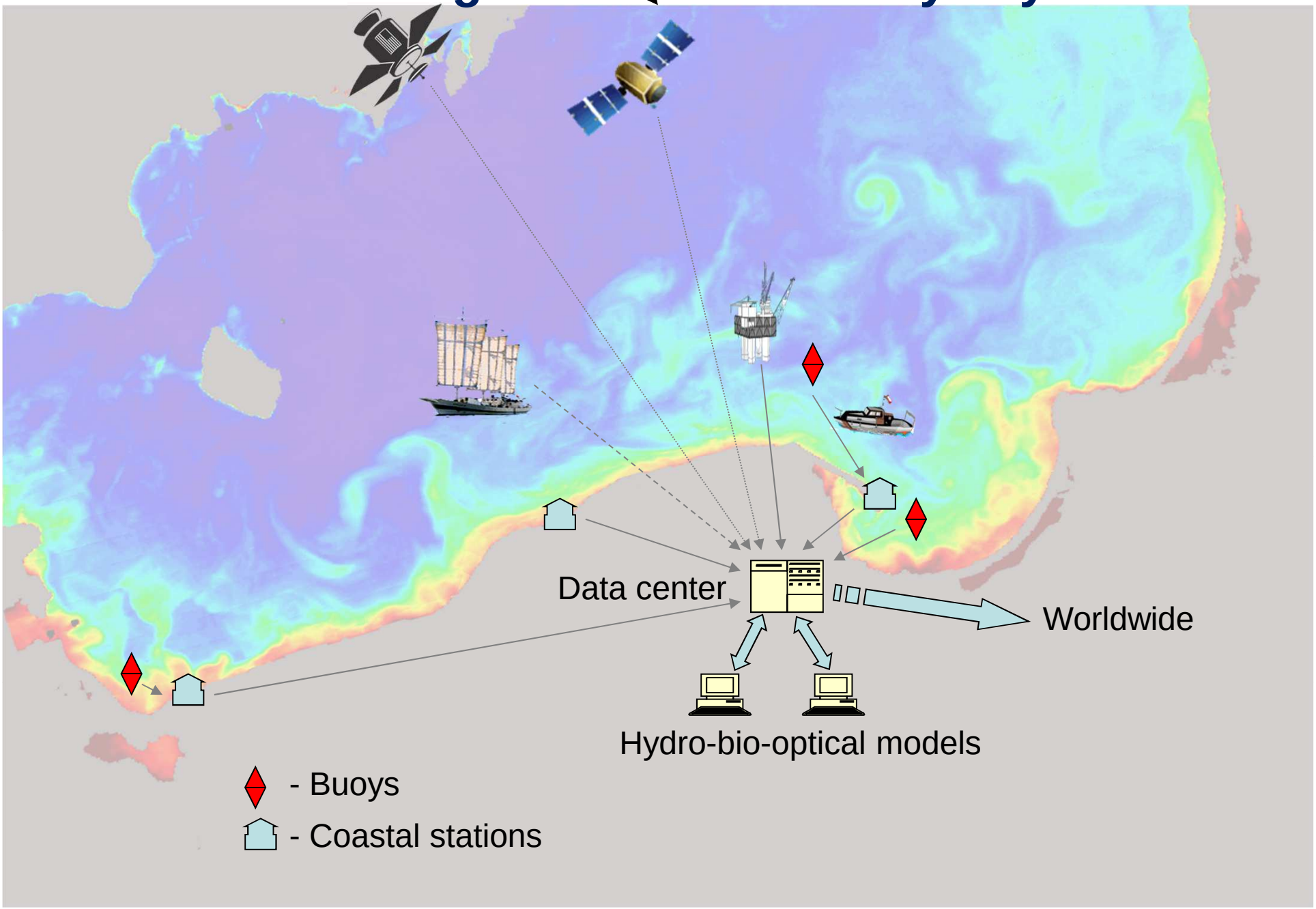
SatBaltic: – A BALTIC ENVIRONMENTAL SATELLITE REMOTE SENSING SYSTEM

UNIWERSYTET GDAŃSKI

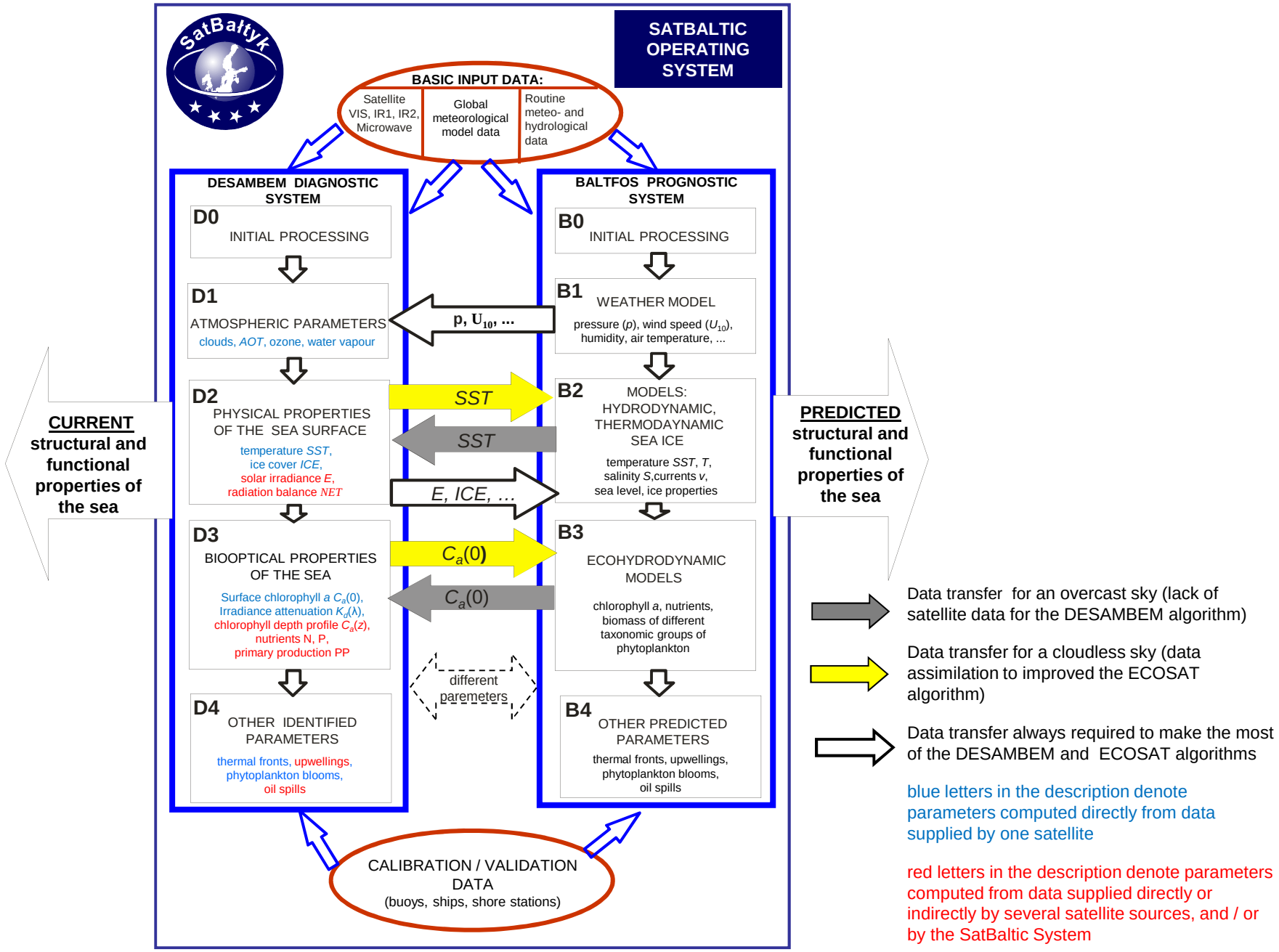
The aim of project:

Establish monitoring system for the Baltic Sea, based on the satellite remote sensing data and eco-hydrodynamical models

Schematic diagram of the SatBałtyk systemu



Block diagram of the SatBaltic Operating System



Data transfer for an overcast sky (lack of satellite data for the DESAMBEM algorithm)

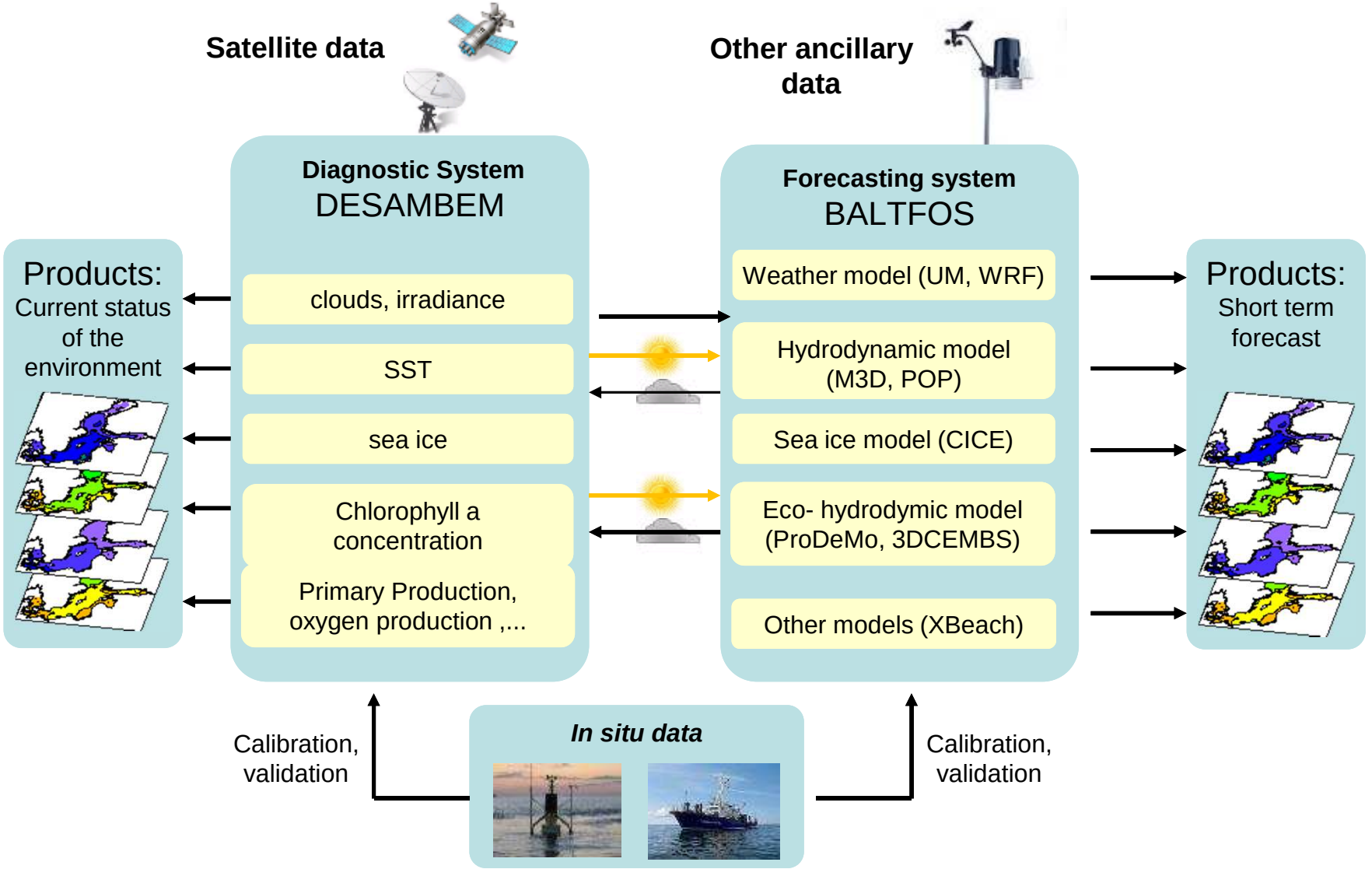
Data transfer for a cloudless sky (data assimilation to improved the ECOSAT algorithm)

Data transfer always required to make the most of the DESAMBEM and ECOSAT algorithms

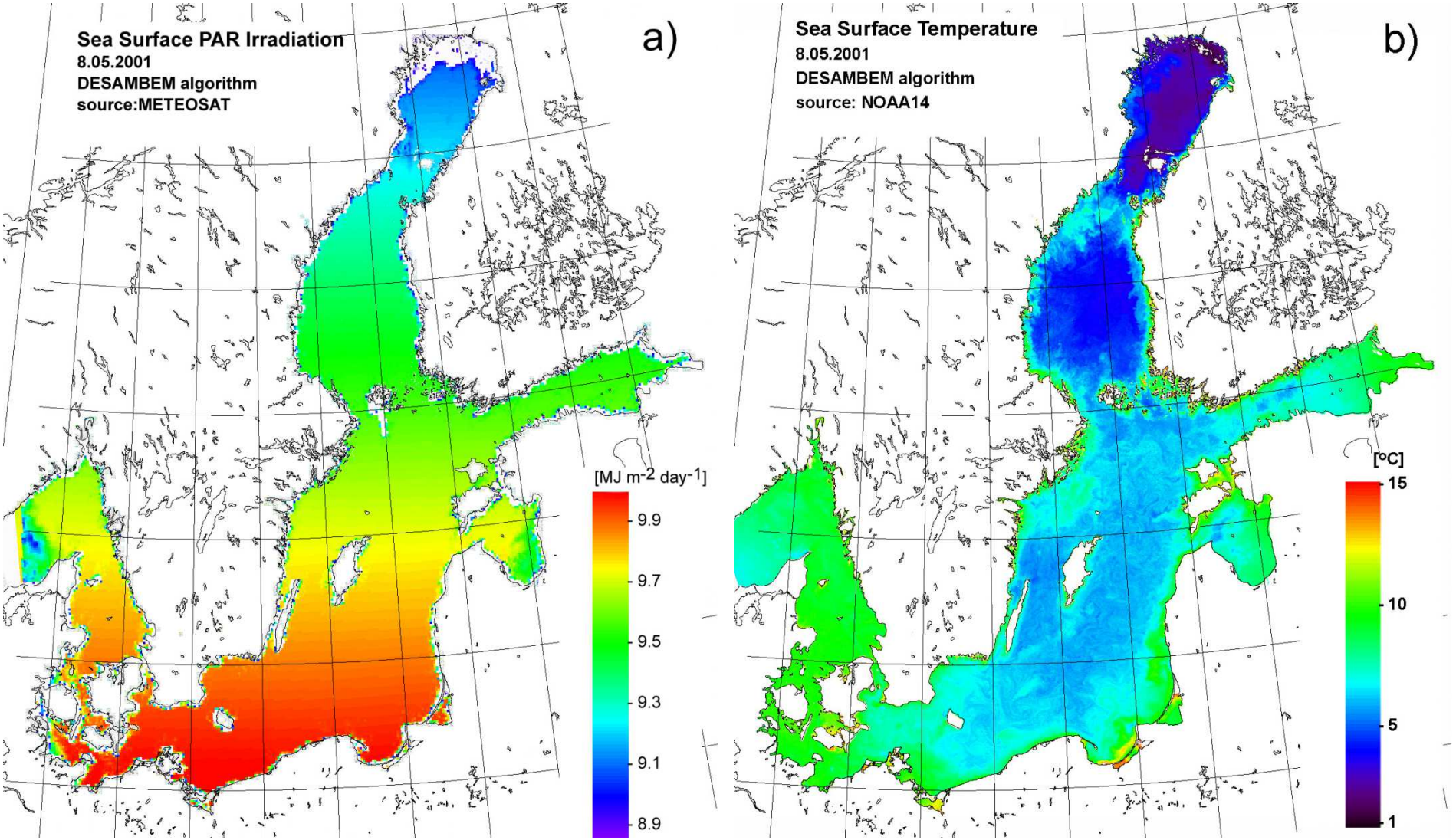
blue letters in the description denote parameters computed directly from data supplied by one satellite

red letters in the description denote parameters computed from data supplied directly or indirectly by several satellite sources, and / or by the SatBaltic System

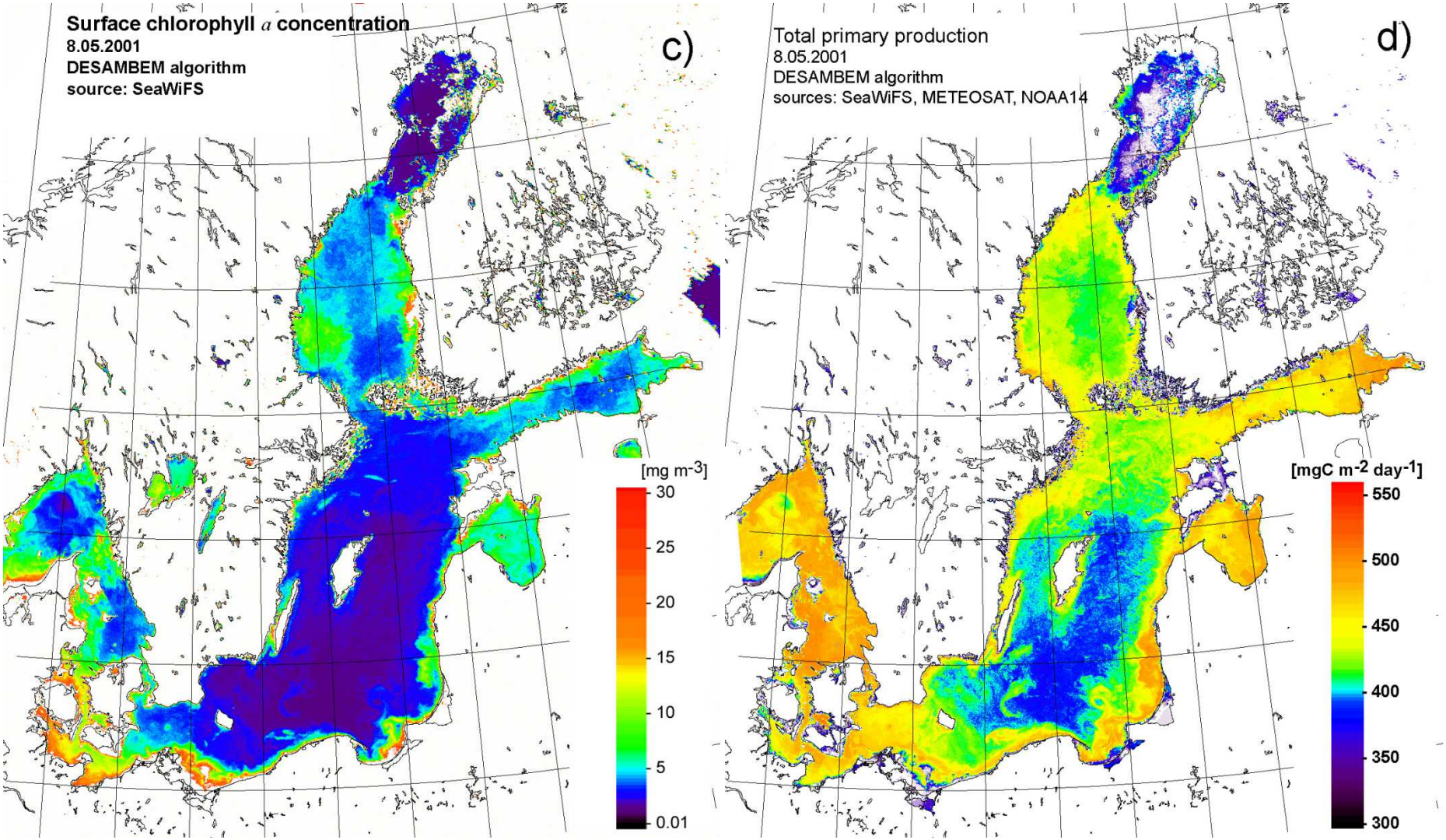
SatBałtyk - data streams



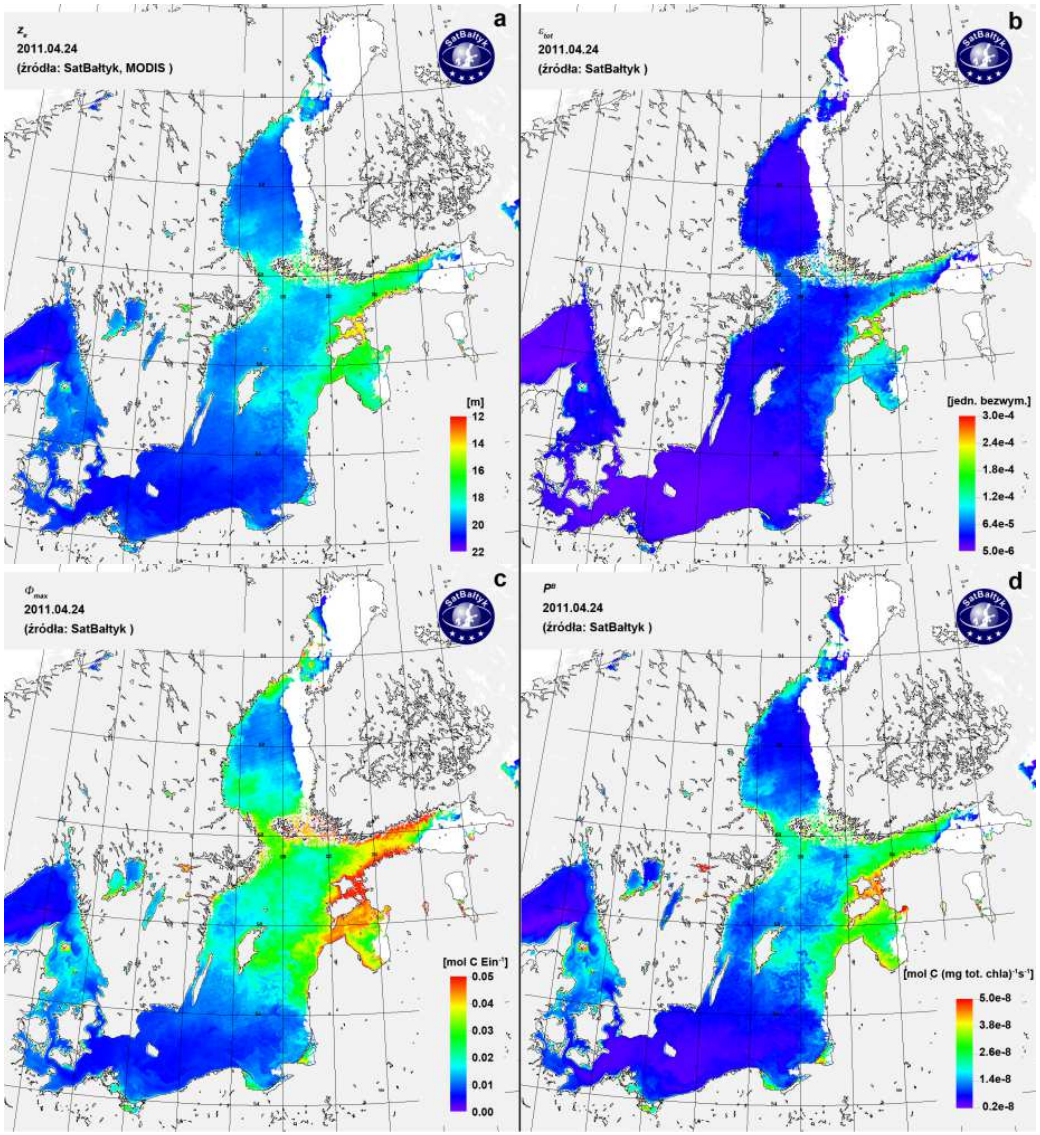
PAR and SST


Sea Surface PAR Irradiation
8.05.2001
DESAMBEM algorithm
source:METEOSAT
a)
[MJ m-2 day-1]
9.9
9.7
9.5
9.3
9.1
8.9
Sea Surface Temperature
8.05.2001
DESAMBEM algorithm
source: NOAA14
b)
[ºC]
15
10
5
1

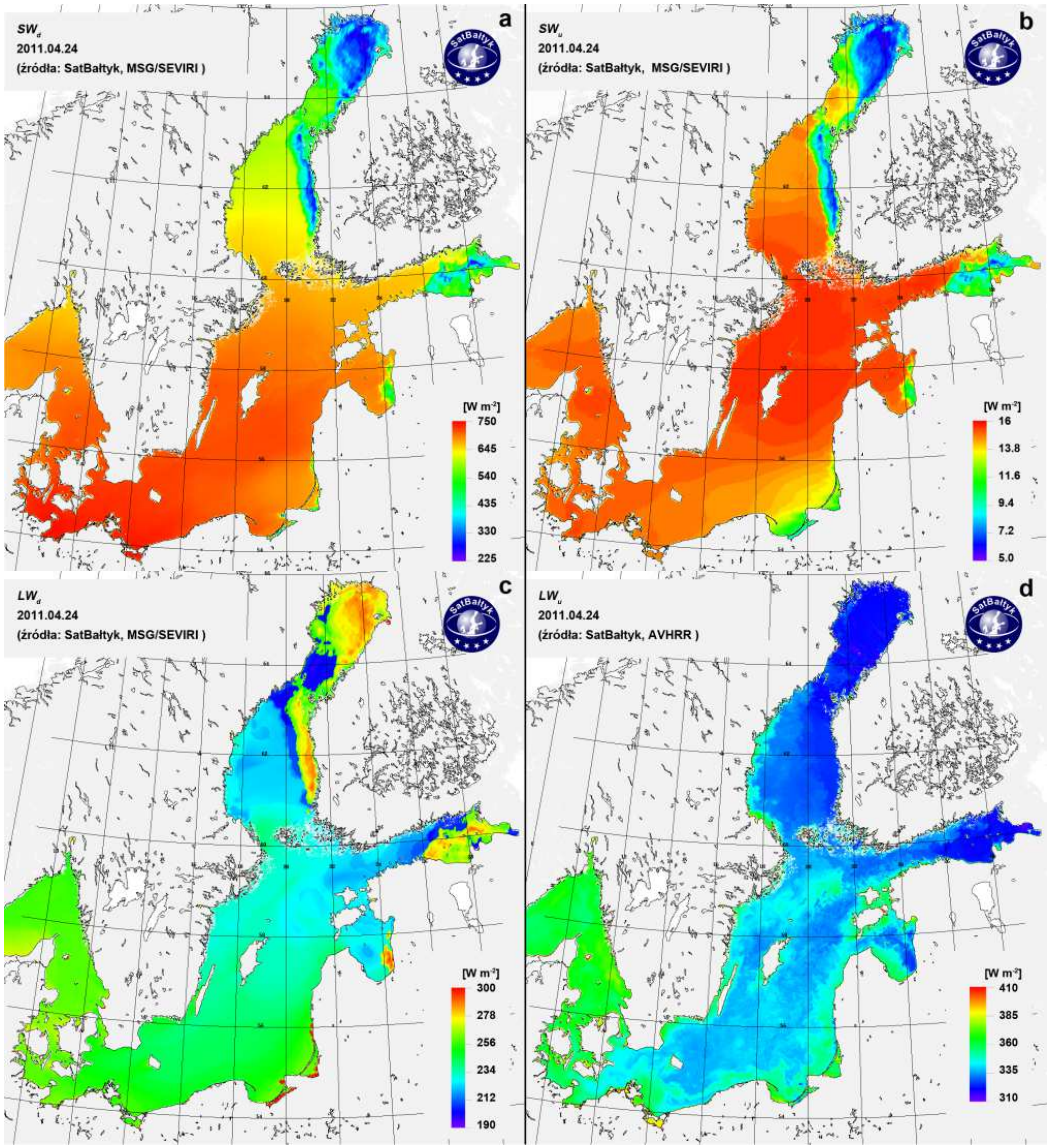
Chl*a and PP*


Surface chlorophyll a concentration
8.05.2001
DESAMBEM algorithm
source: SeaWiFS
c)
[mg m-3]
30
25
20
15
10
5
0.01
Total primary production
8.05.2001
DESAMBEM algorithm
sources: SeaWiFS, METEOSAT, NOAA14
d)
[mgC m-2 day-1]
550
500
450
400
350
300

Some optical conditions of photosynthesis of organic matter and condition of marine plant communities

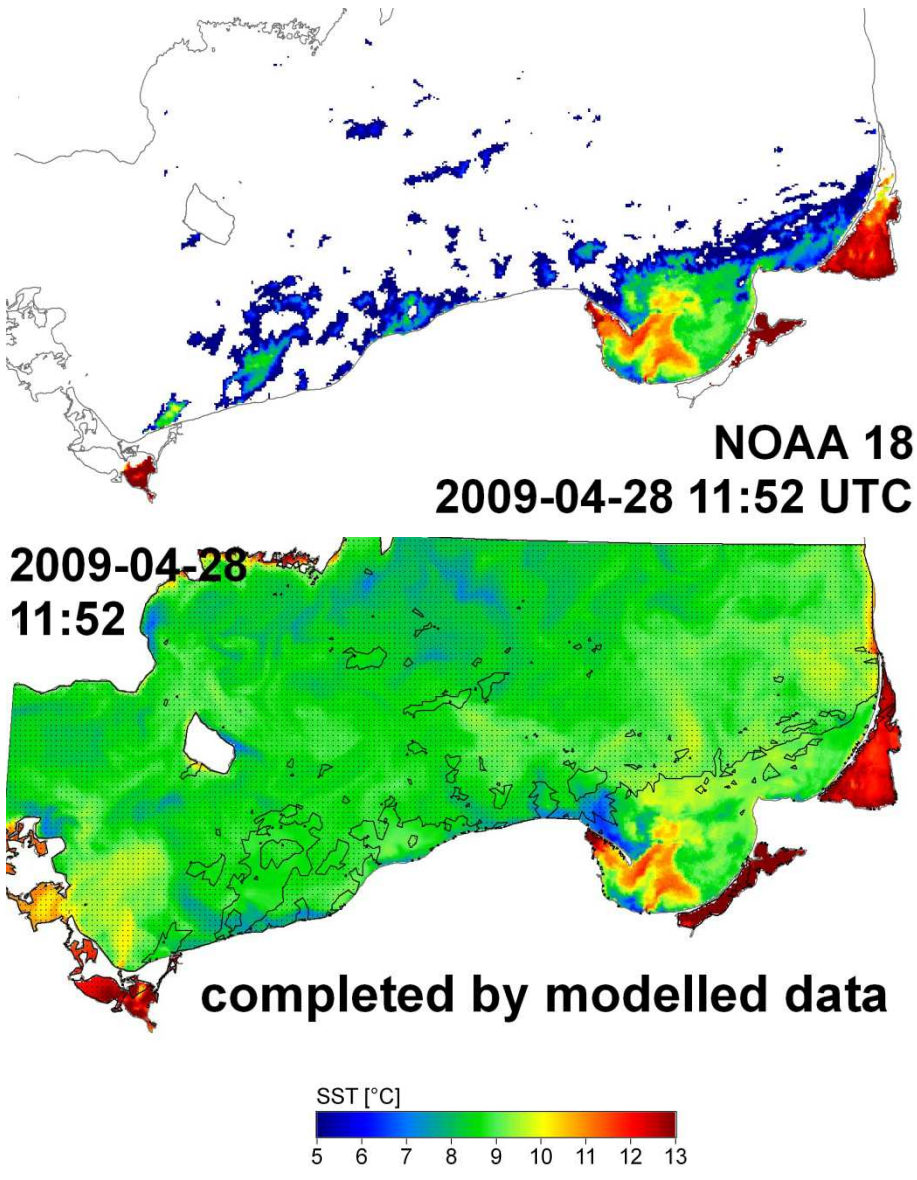


The radiation balance of the sea surface

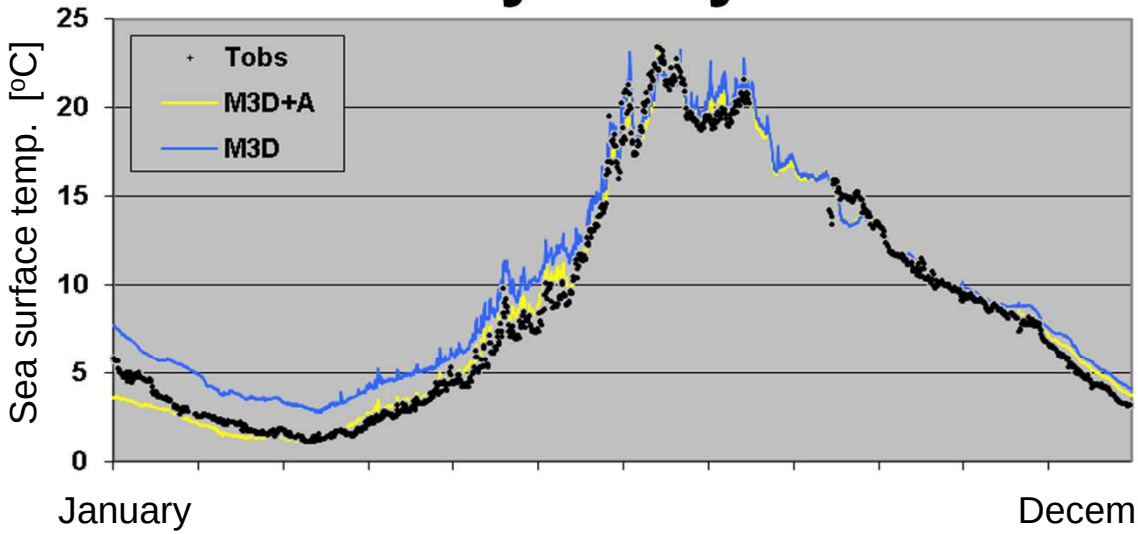


Merged Sea Surface Temperature Map

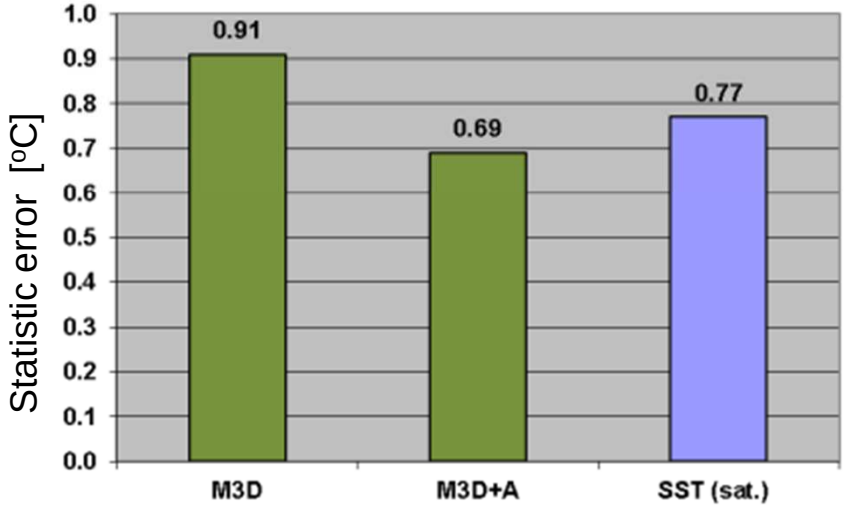
Sea surface temperature determined on the basis of remotely sensed data and the M3D hydrodynamic model (grid resolution 0.5 NM) when a large part of the sky over the sea is overcast



Assimilation of the satellite data in the hydrodynamic model



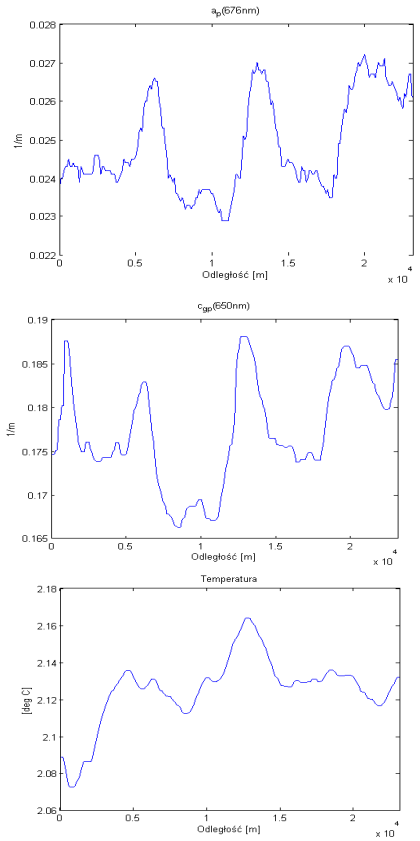
Comparison of sea surface temperatures observed in the southern part of the Baltic Sea and modeled with assimilation of satellite SST maps (M3D + A) and without assimilation (M3D)

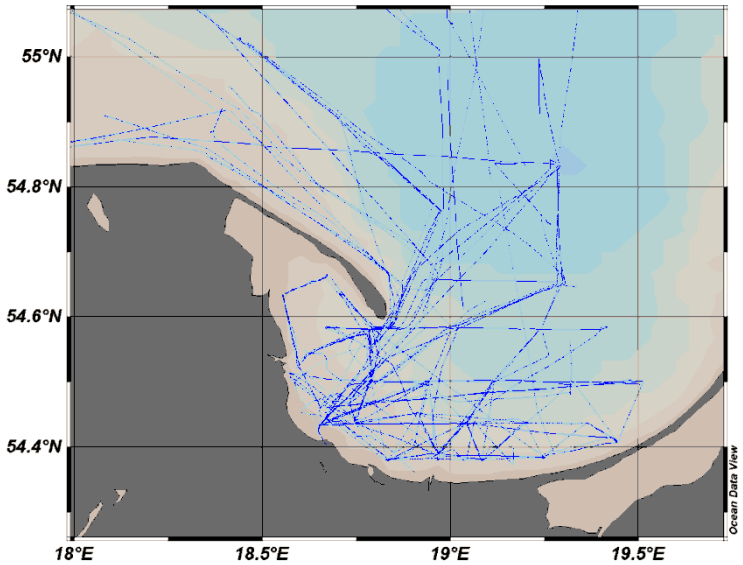


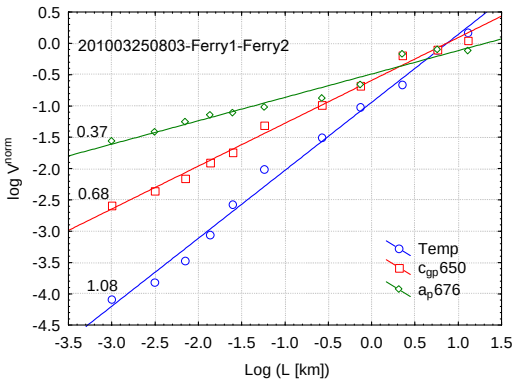
System components, calibration and validation

System components, calibration and validation

Sub pixel variability of IOPs and AOPs





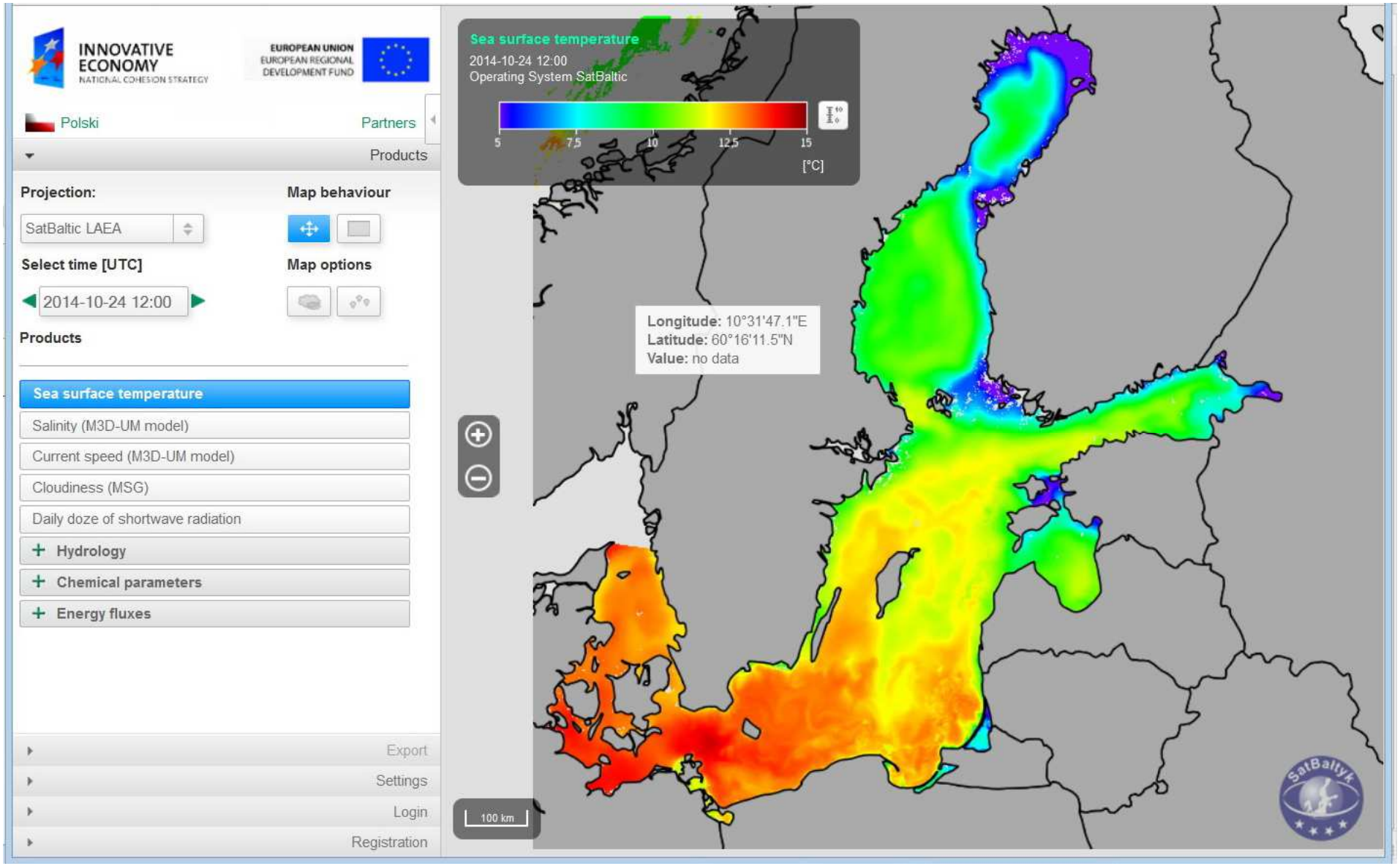


Validation

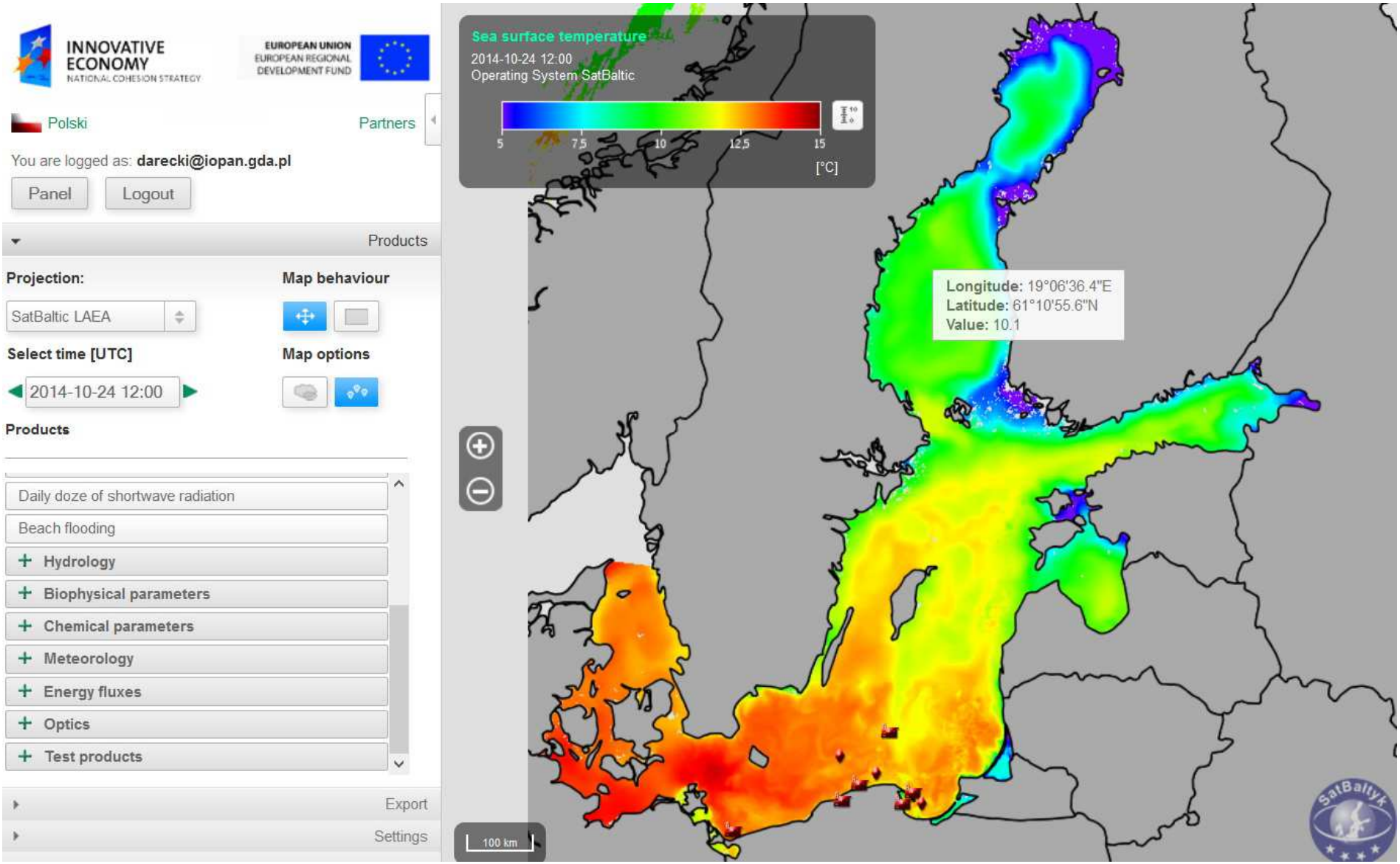
	Arithmetic statistics		Logarithmic statistics		
	Systematic error	Statistical error	Systematic error	Standard error factor	Statistical error
Quantity	Relative $<\varepsilon>$	Relative σ_ε	$<\varepsilon>_g$ [%]	x	σ_- [%]
Chl a (C_a)	9.9 [%]	±56.6 [%]	-3.2	1.68	-40.5
Dose PAR	2.44 [%]	±23.3 [%]	0.24	1.22	-18.3
Daily O_2	2.00 [%]	±60.6 [%]	-14.6	1.72	-41.7
	Absolute $<\varepsilon'>$	Absolute σ_ε'			
SST	Δt = 0.37 [°C]	σ = ±1.05 [°C]			
Net radiation: LW SW	1 [Wm^{-2}] 14 [Wm^{-2}]	±29.7 [Wm^{-2}] ±38.7 [Wm^{-2}]			

Errors in the remotely sensed estimation of selected quantities with SatBaltic System at its present stage.

SatBaltyk product portal



SatBaltyk product portal

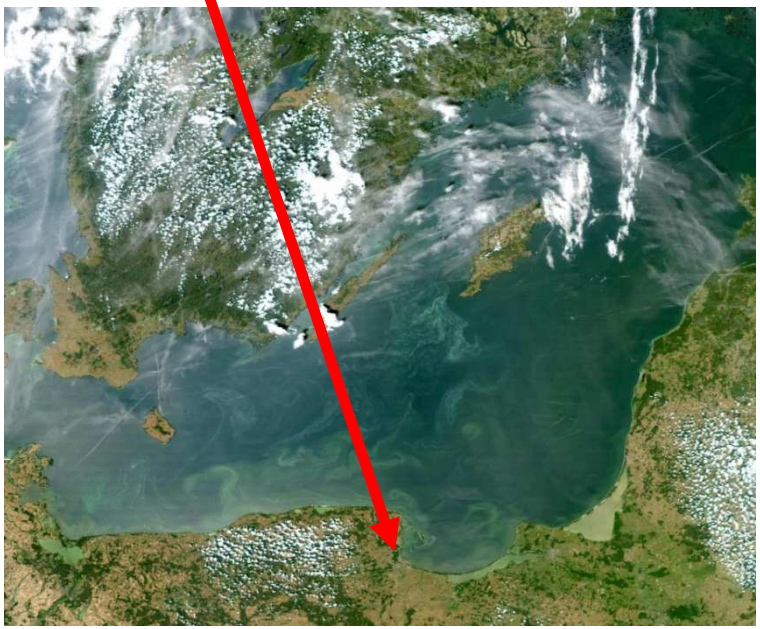


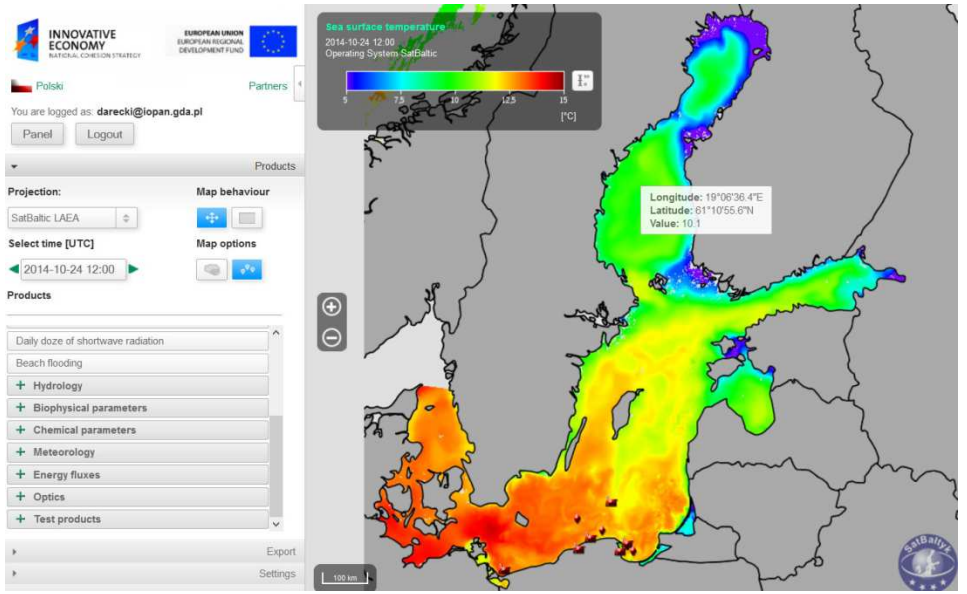
Some products (*at the moment*)

- Sea surface temperature and related products
  - surface currents
  - upwelling events
  - the range and immediate spread of riverine waters
- water transparency
- radiant energy balance between the sea surface and the upper layers of the atmosphere
- intensity of UV radiation over the sea and in coastal areas
- distributions of PAR irradiance useful for photosynthesis
- concentration of chlorophyll *a*
- concentration of other pigments
- efficiency of photosynthesis
- primary production of organic matter
- release of oxygen in the sea
- distribution of phytoplankton blooms

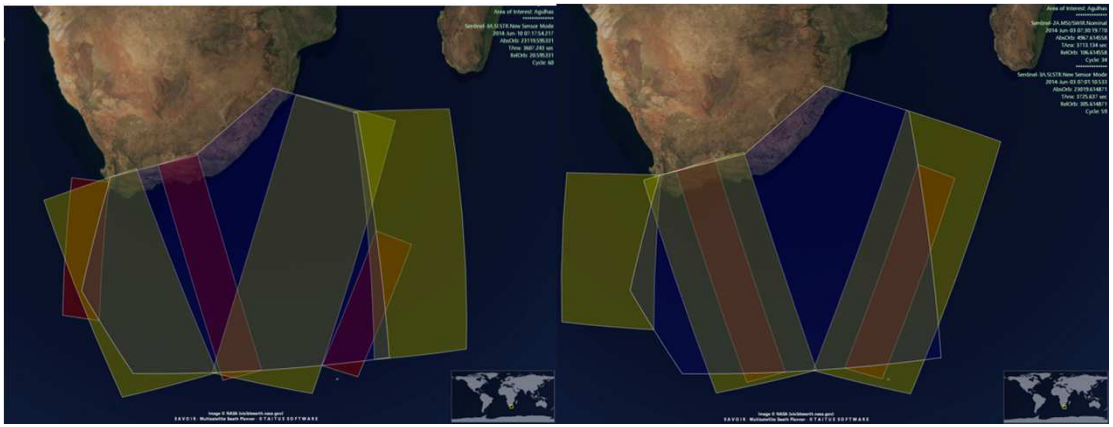
SatBaltyk – final phase

- Conference:
  Current status and trends and modern methods of the monitoring of the Baltic Sea
- SatBaltyk will be officially launched for public
- October 2015
- Sopot





ESA SEOM – SY4Sci Synergy
Study : Ocean Virtual Laboratory



Sentinel3A (SLSTR) and Sentinel2A (MSI)
: daily acquisitions for two different dates


Thank you !
http://www.satbaltyk.eu