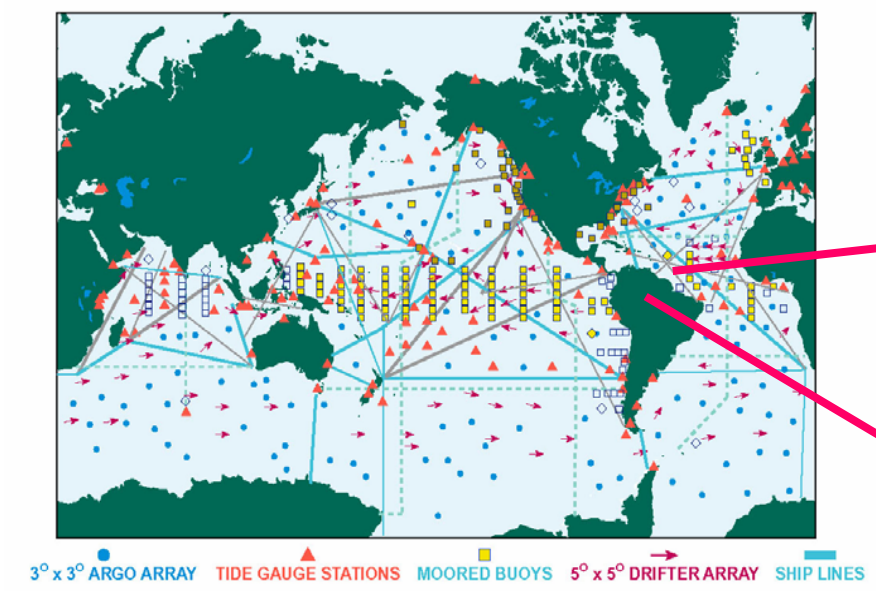
MERSEA
Marine Environment and Security for the European Area

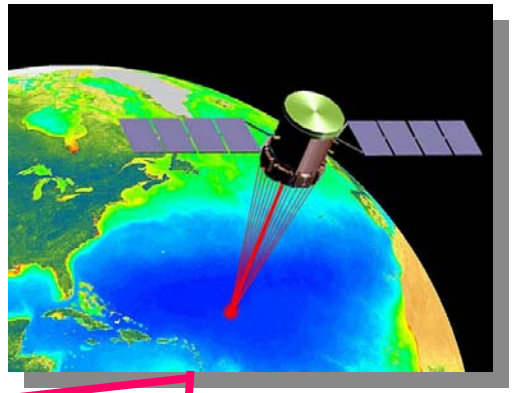
Development of a European system for operational monitoring and forecasting of the ocean physics, biogeochemistry, and ecosystems, on global and regional scales.

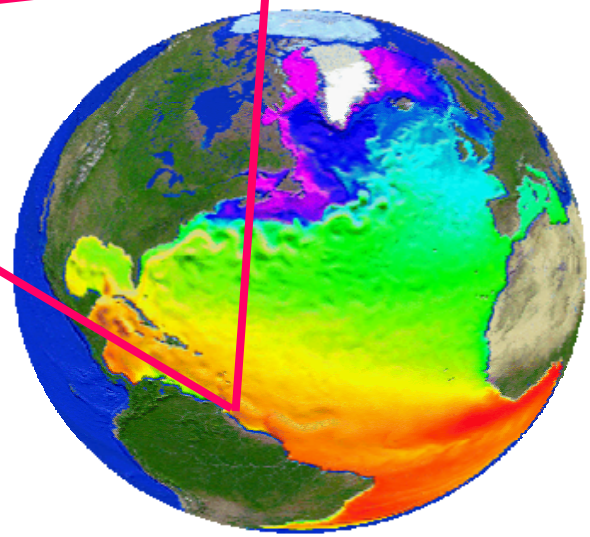
Ocean and Marine Applications for GMES

Ocean monitoring and forecasting

Combining *in-situ* and satellite data, with models to provide GMES Marine Core Services







Analysis, forecast and hindcast

Mersea : project, system, services

- The project : 2004 – 2008
  - Strong research and development component
    - Satellite and in situ data, ocean processes and modelling, seasonal forecasting, …
  - System design and information management
  - Implementation of upgrades, operation, and production
  - Services to users
    - Agencies (EEA, ICES), user applications (offshore industry, marine safety)
  - GMES integration,
    - planning for transition to fully operational systems

Some recent research results

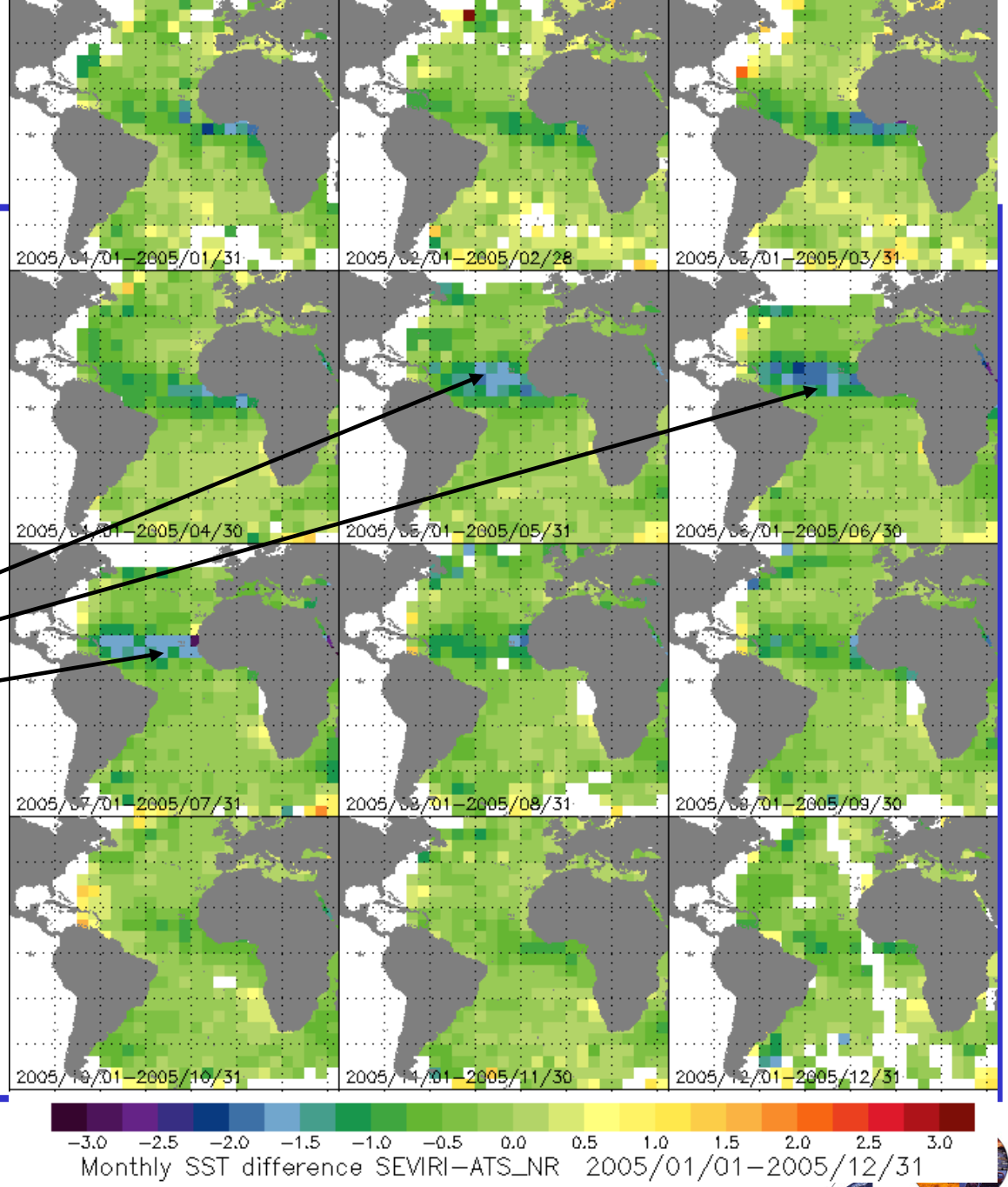
Sea Surface Temperature

Bias removal :

MSG / SEVIRI vs

AATSR

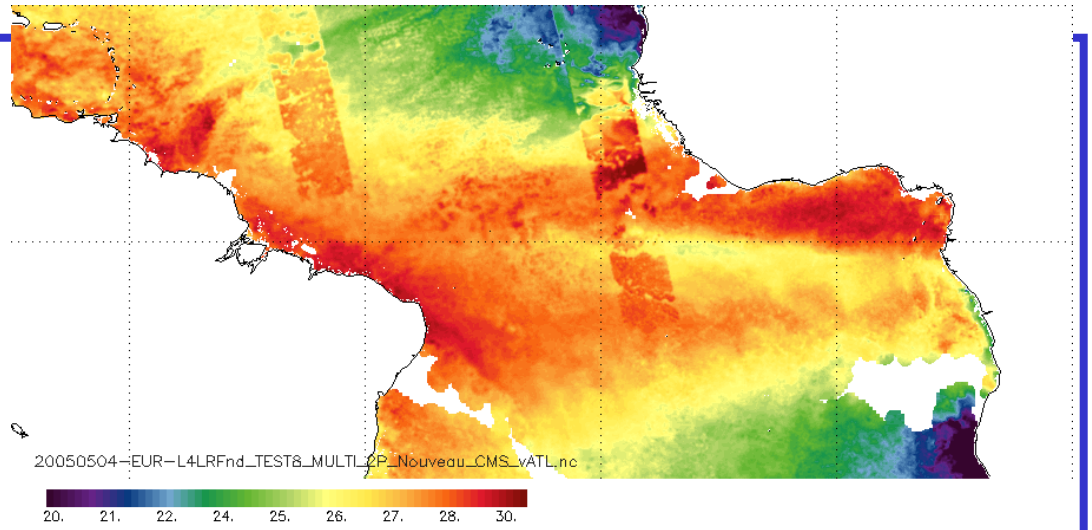
Saharan dust



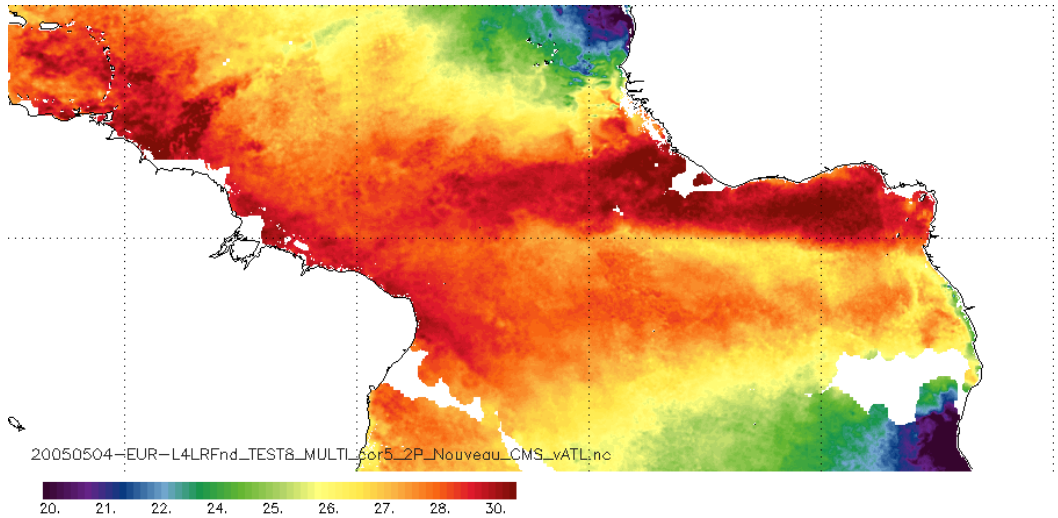
H. Roquet

SST : inter-sensor bias correction

Without correction

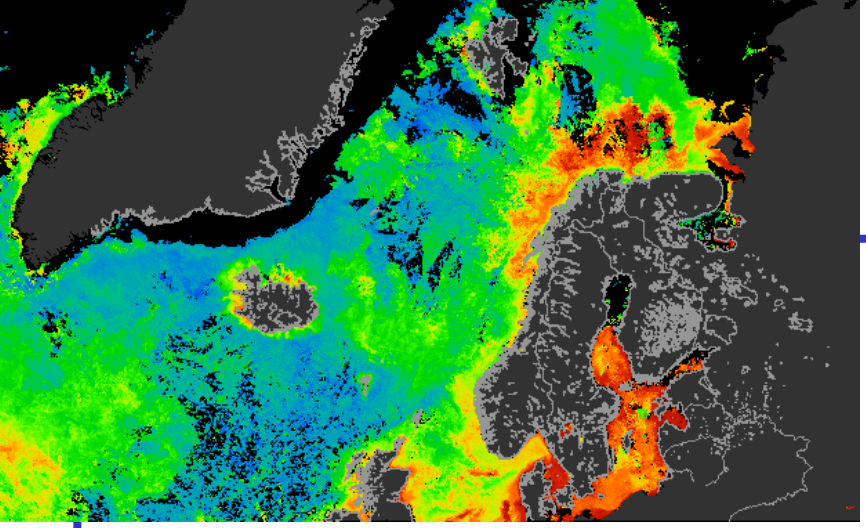


With correction



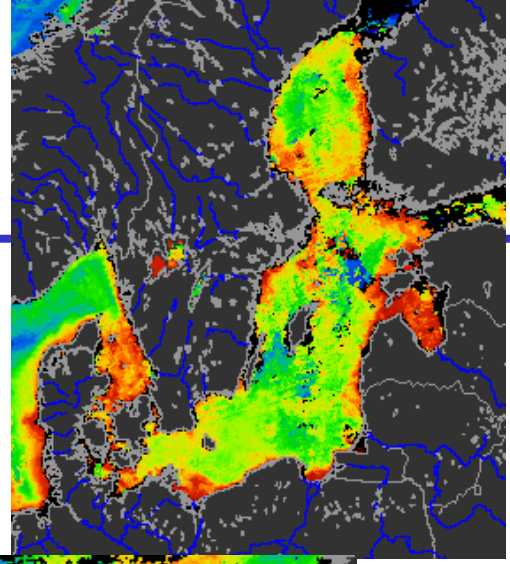
Re-analysis activities :
JRC MERSEA Ocean Colour Portal & Products

Product	Sensor	Region	Spatial Resolution	Temporal Resolution	Time Period
Chi-a + K_d + PP	SeaWiFS + MODIS-Aqua	Global	4/9km	Monthly/8-day	1997 – 2007
Chl-a + K_d + PP	SeaWiFS + MODIS-Aqua	Europe (+ Black Sea)	2km	Monthly/8-day	1997 – 2007
Chl-a + K_d + PP	SeaWiFS + MODIS-Aqua	NE Atlantic	2km	Monthly/8-day	1997 – 2007
Chl-a + K_d + PP	SeaWiFS + MODIS-Aqua	Arctic Ocean	2km	Monthly/8-day	1997 – 2007
Chl-a + K_d + PP	SeaWiFS + MODIS-Aqua	Baltic Sea + North Sea	2km	Monthly/8-day	1997 – 2007
Chl-a + K_d + PP	SeaWiFS + MODIS-Aqua	Mediterranean Sea	2km	Monthly/8-day	2002 - 2007

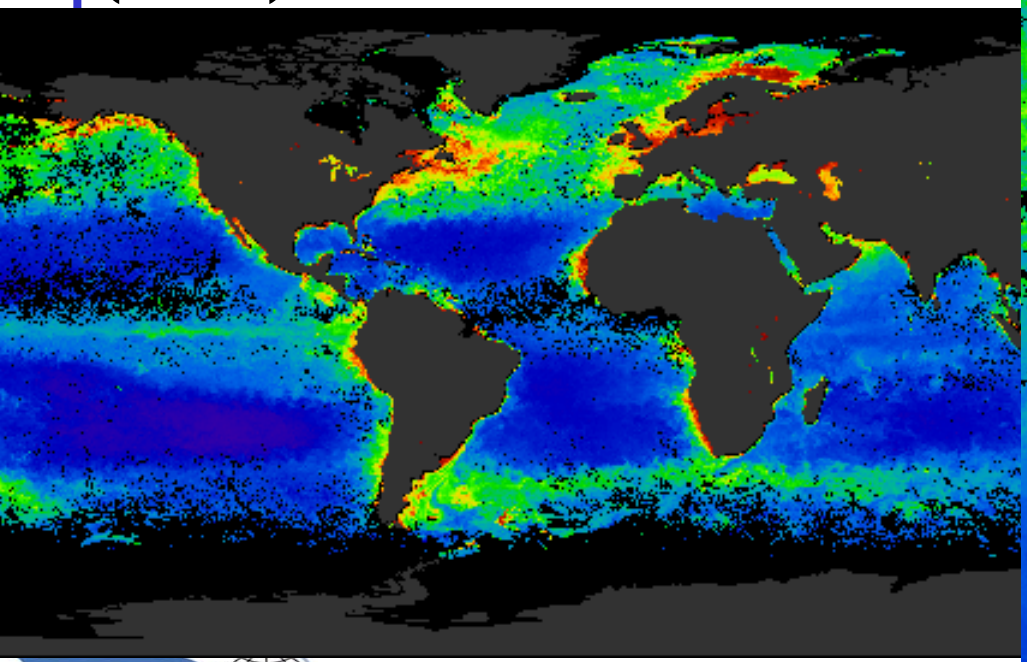


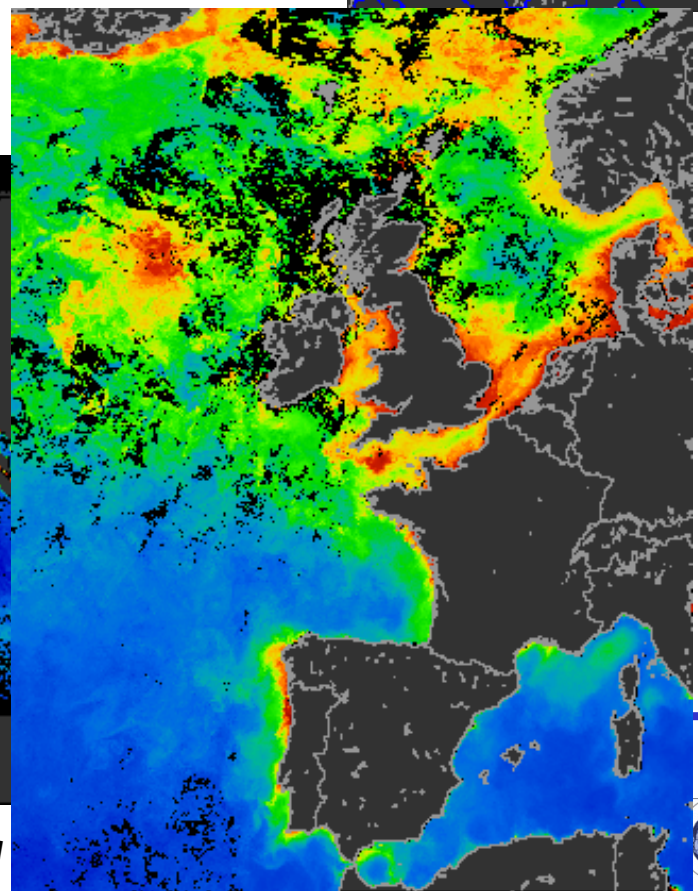
SeaWifs-

MODIS



Chla : 9 yrs analysis / (JRC)



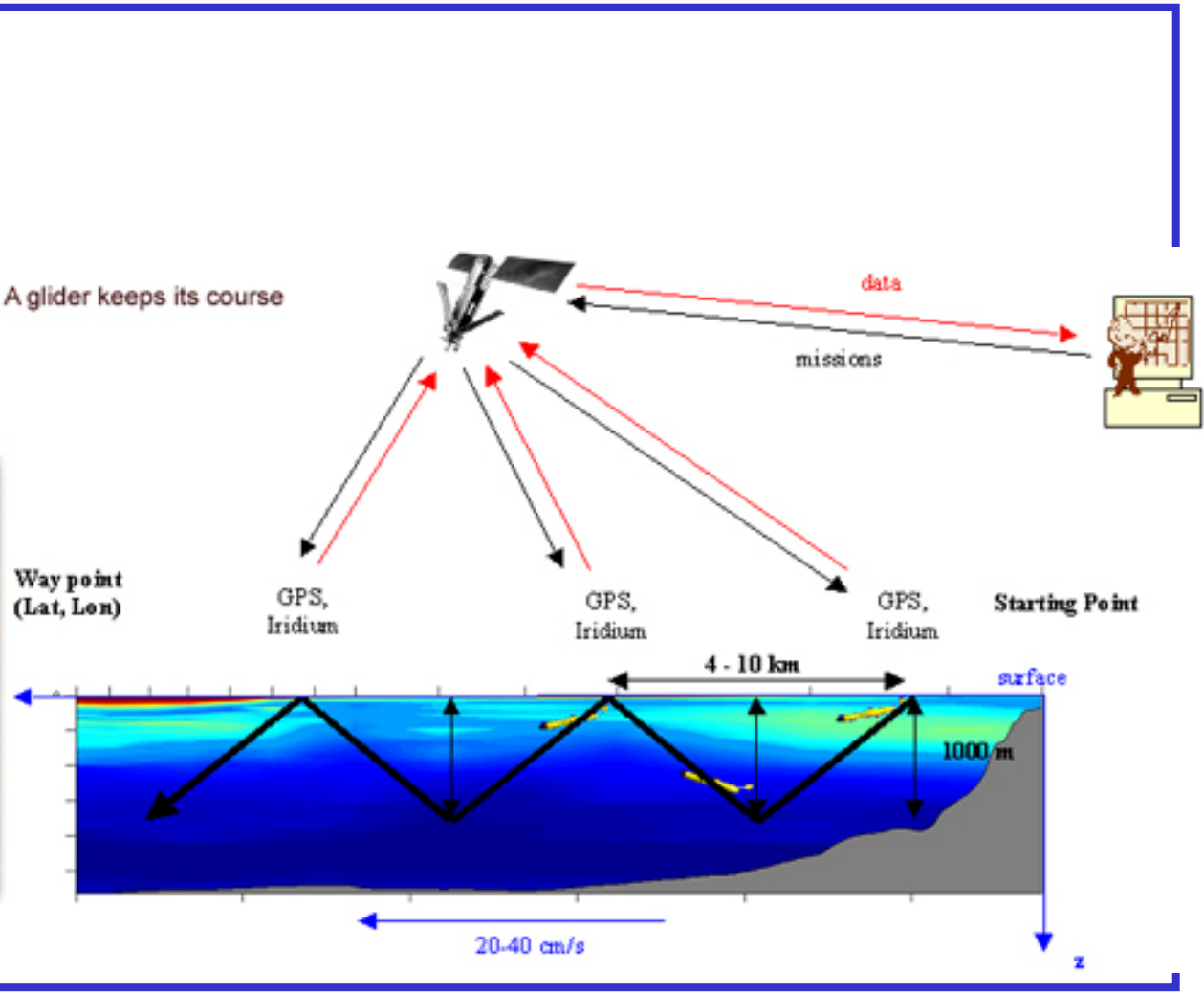


In situ observations

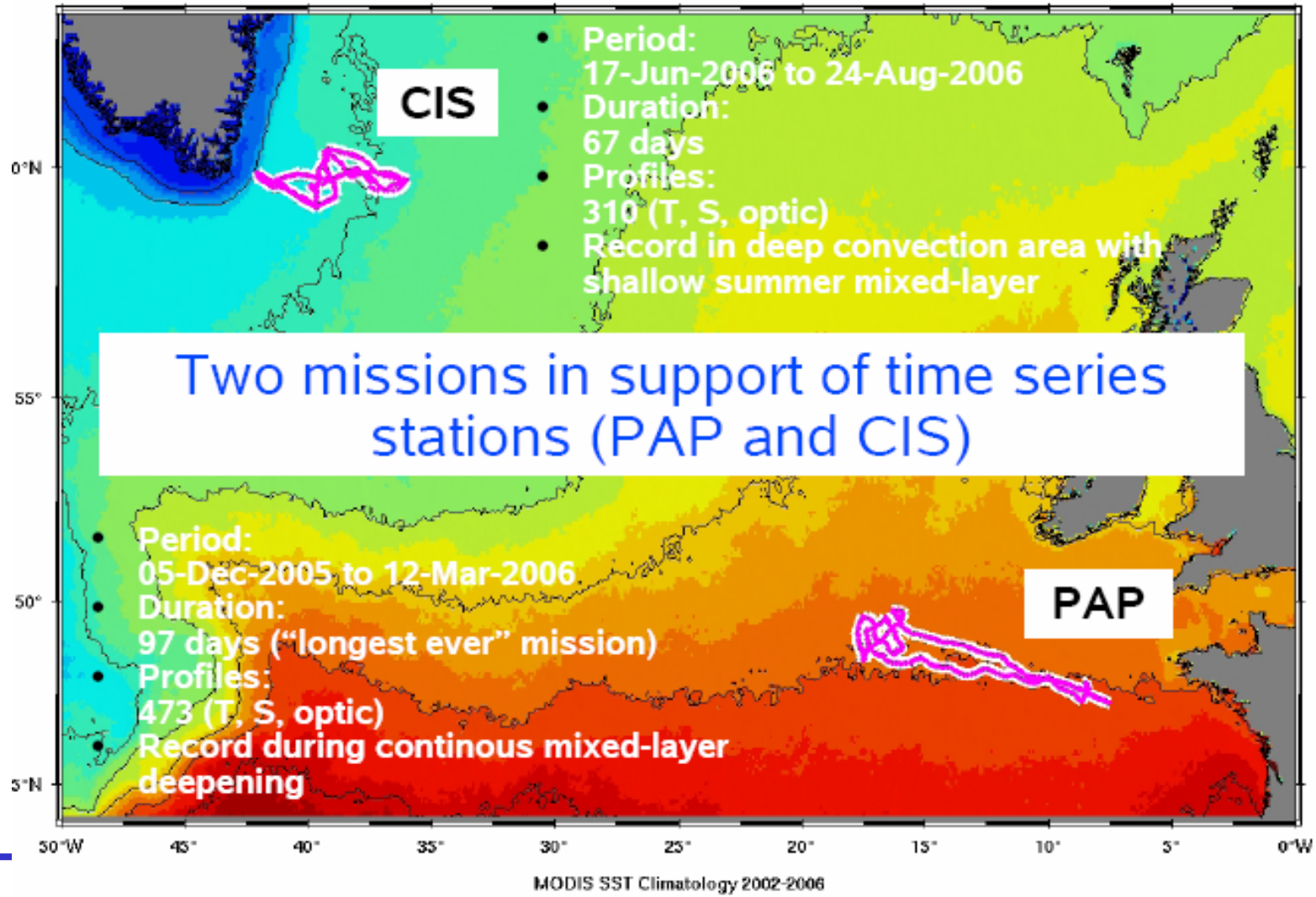
In situ observations

- ARGO floats deployed and working (North Atlantic)
  - OVIDE cruise (Spain to Greenland)
  - (international target of 3000 floats reached !)
- Time series stations:
  - difficult to maintain continuously
- Second successful open ocean glider mission
- Regional networks
- Quality control, distribution, elaborated products

Gliders : innovative observing system



The MERSEA SPRAY missions

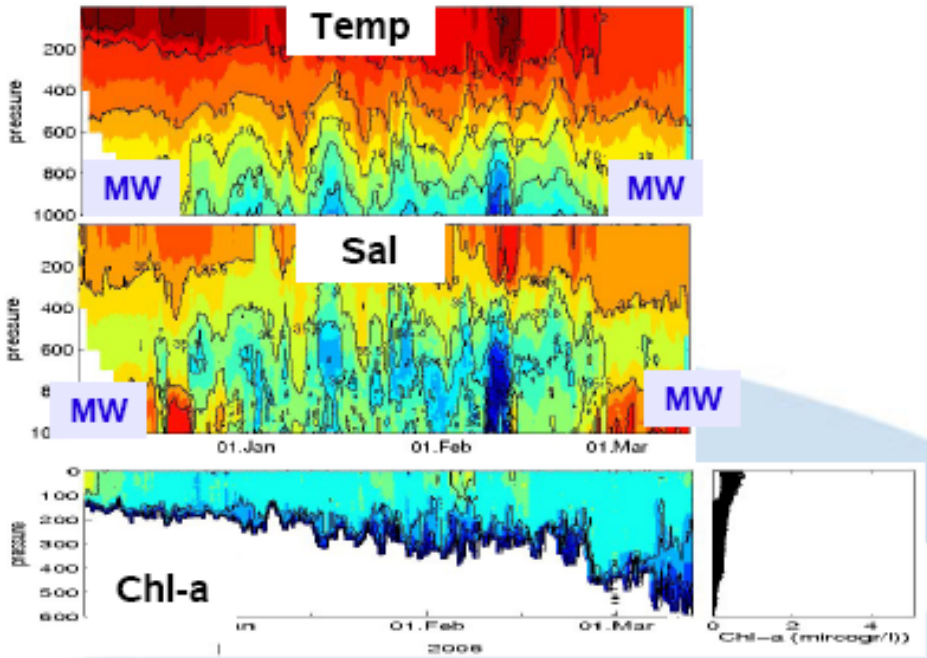


MERSEA

GMES

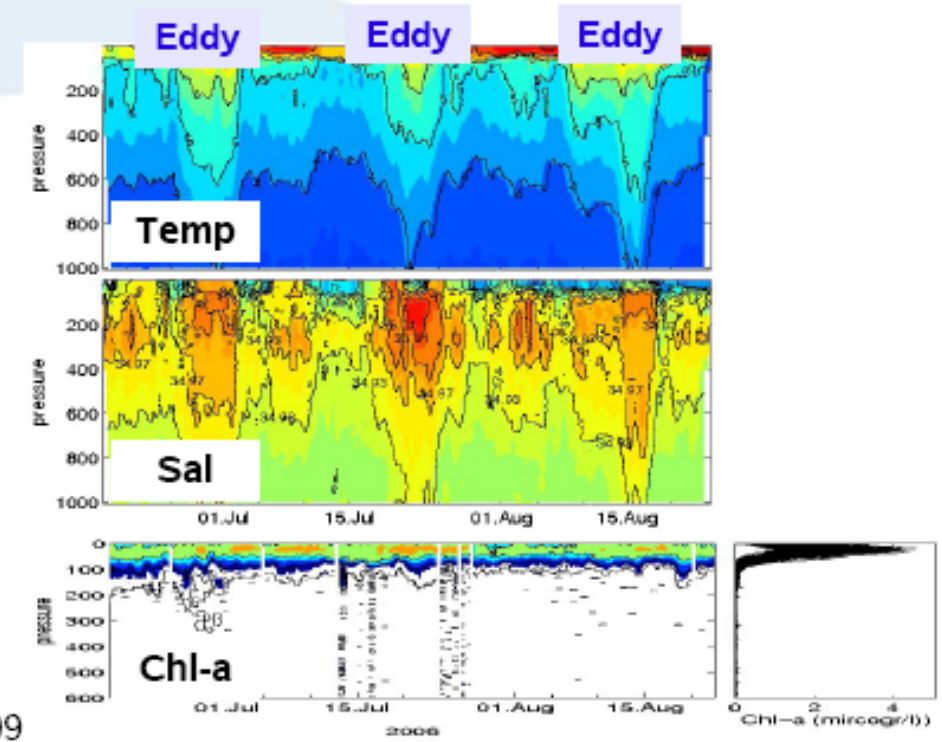
The PAP mission

- Mediterranean Water (MW) at continental shelf break
- Continues Mixed layer deepening along track/time
- Chlorophyll content low **but** very deep reaching



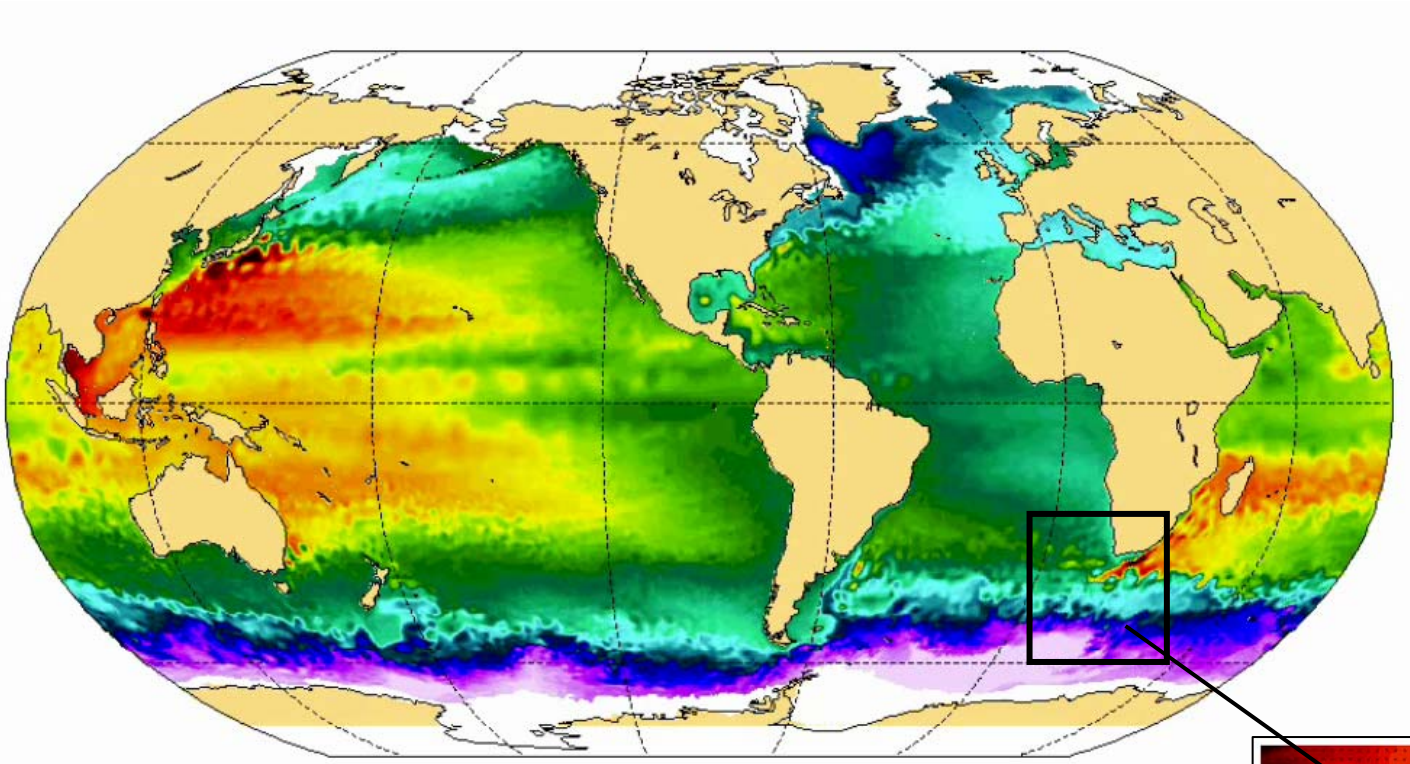
The CIS mission

- Three surveys in warm and saline *'Irminger Sea eddy'*
- Chlorophyll only in upper 100m **but** subsurface maximum (20m depth)

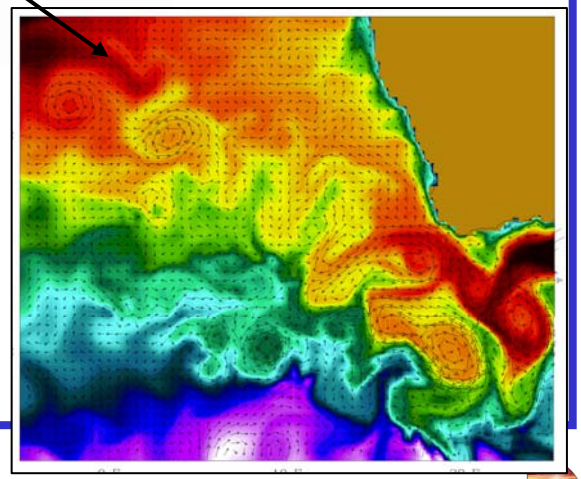


Ocean modelling

Global ¼° NEMO-LIM simulation 1958-2000



Resolution	Equator	45°N	60°N
1/4°	27 km	19 km	13 .5 km



These models are resolving:

- Eddies and fronts
- Boundary currents
- Waves
- Coastal upwelling
- sea-ice cover, thickness

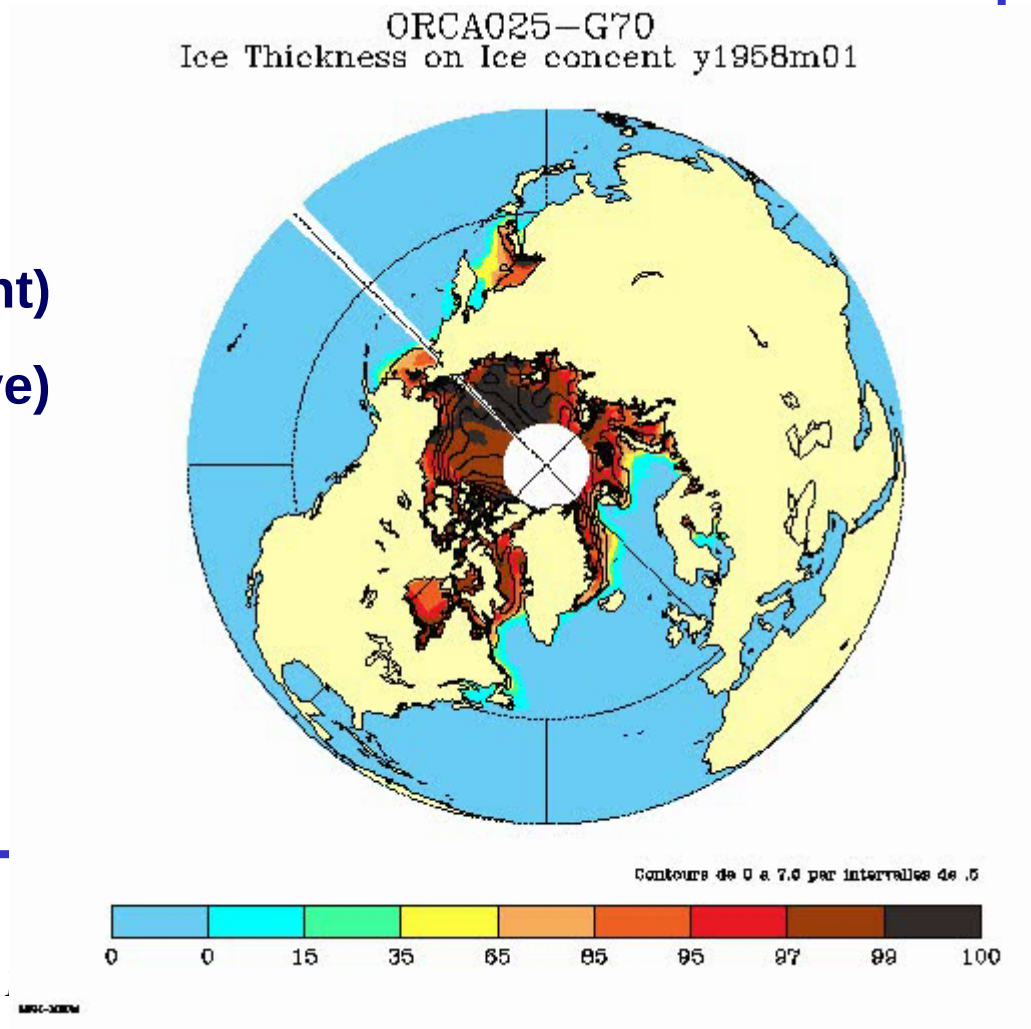
Sea Ice : Remote sensing and modelling

- Sea Ice:
  - Prepare and implement ice products (concentration and drift) for assimilation in MERSEA models and validation of model results
  - Improve operational sea ice products in OSI-SAF
  - Interaction with other projects delivering sea ice data during the International Polar Year 2007 - 2008 when intensified observations of Arctic sea ice will take place
- Remote sensing data portal update

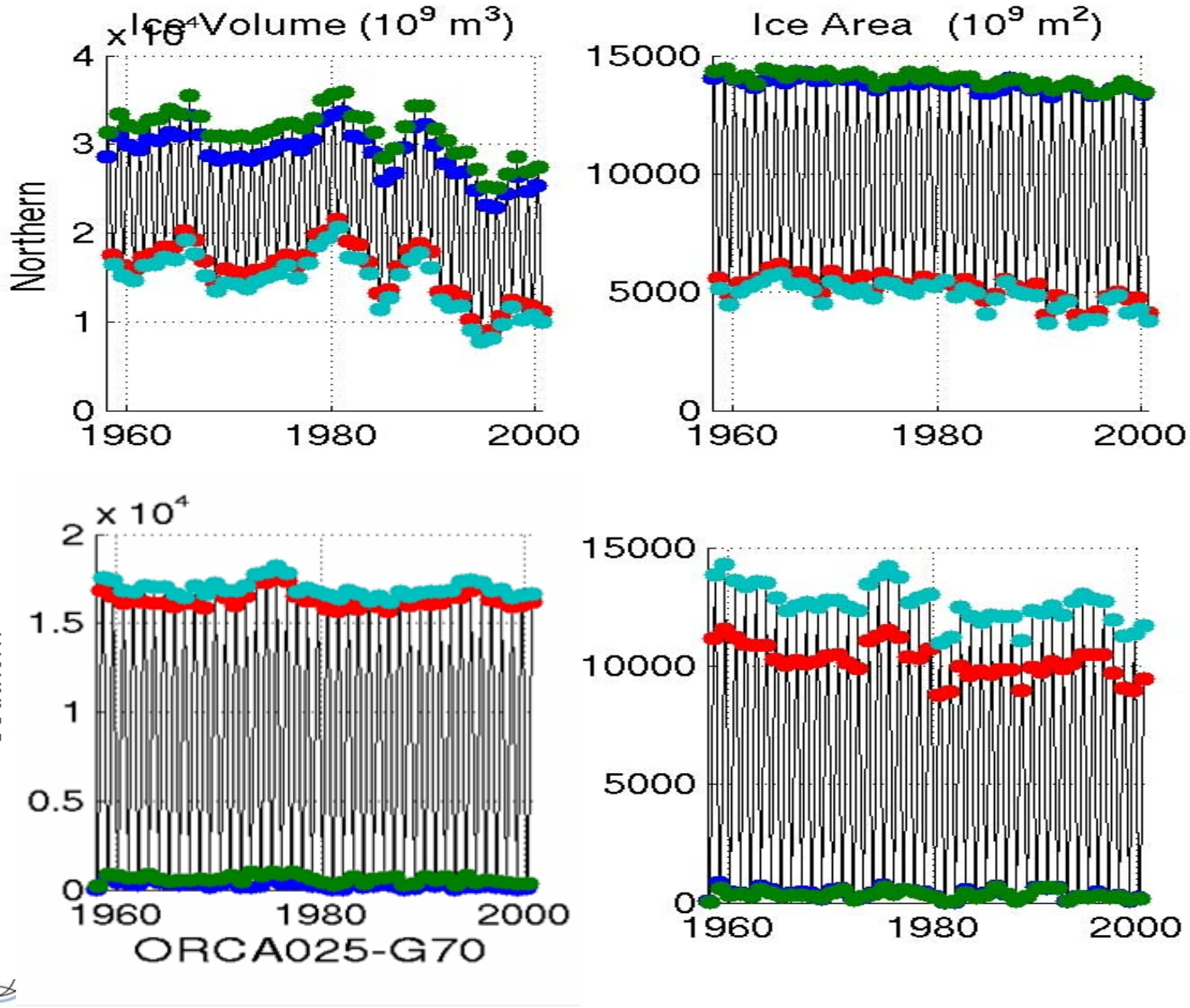
Sea-ice modelling (LIM)

Atmospheric forcing:

- **1958-1984: climatological (perpetual year)**
- **1984-2000: ERA-40 (turbulent) + satellite (radiative)**



Assessment: sea-ice modelling



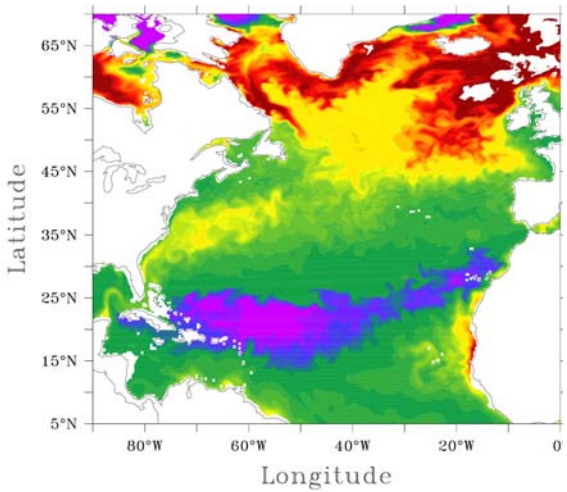
Different approaches to ecosystem modelling

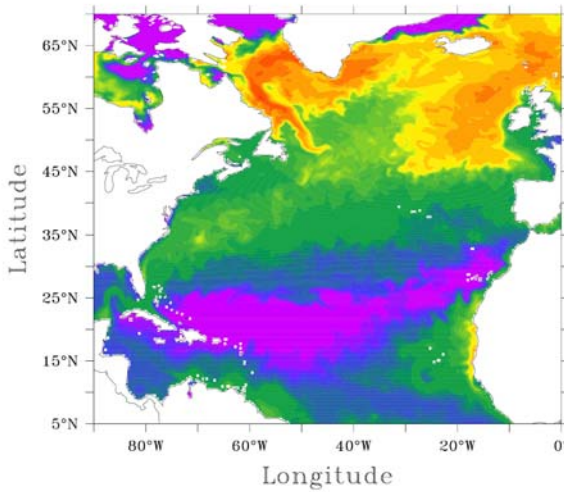
- Global
  - *Development* of new model formulations
    - Class sizes model : transition from 1-D studies to full 3-D implementation and testing
  - Tuning of “simple” models in the North Atlantic
  - Implementation of more “complex” models (*existing formulations, no specific tuning, no new development*))
- Regional
  - NW shelves and Mediterranean
    - More variables are included

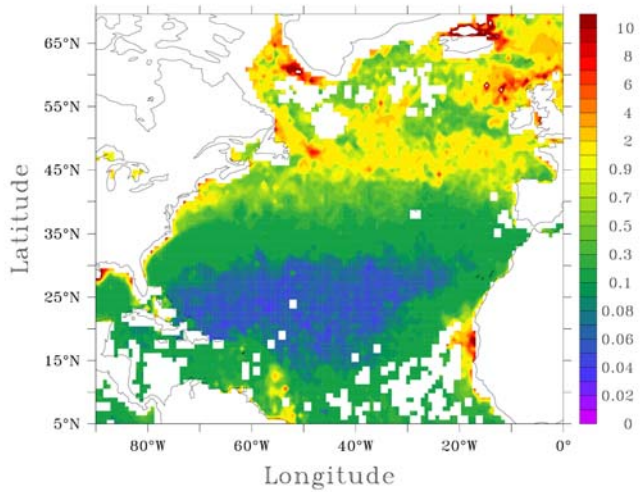
Monthly averaged Surface Chlorophyll

May 1998

(mg/m3)





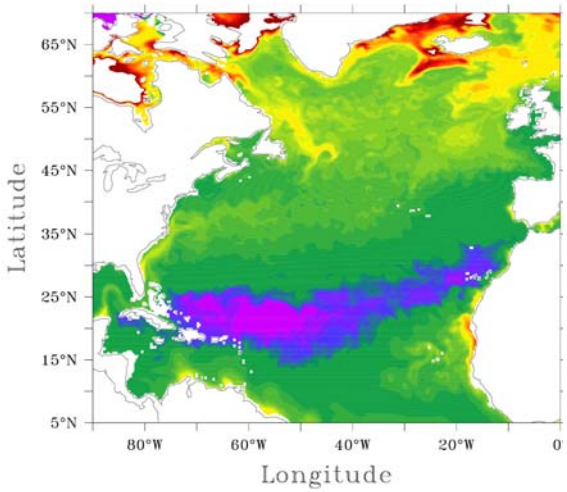


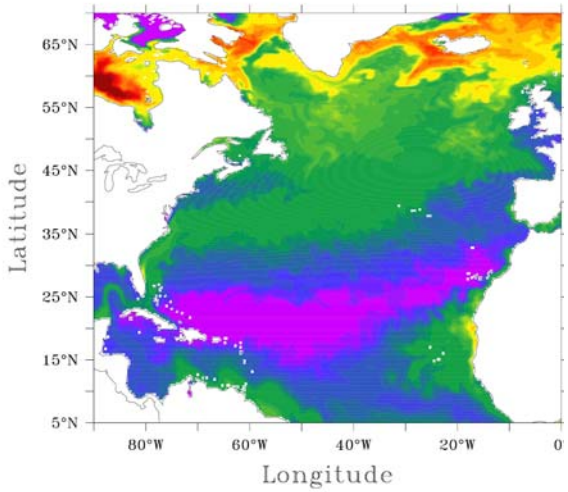
Initial LOBSTER

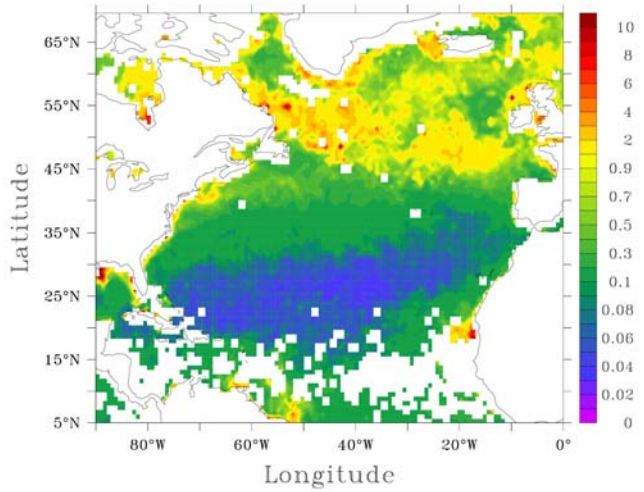
New LOBSTER

SeaWifs

June 1998

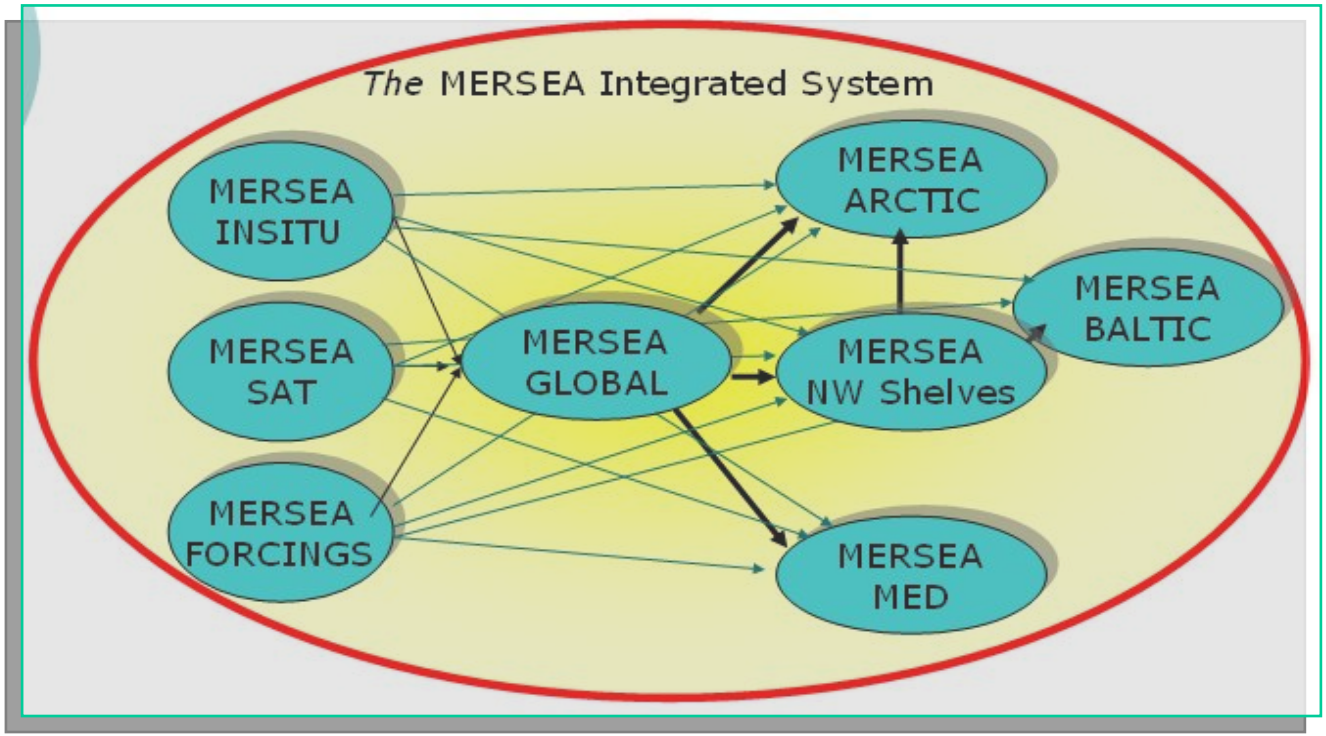






MERSEA System in operation

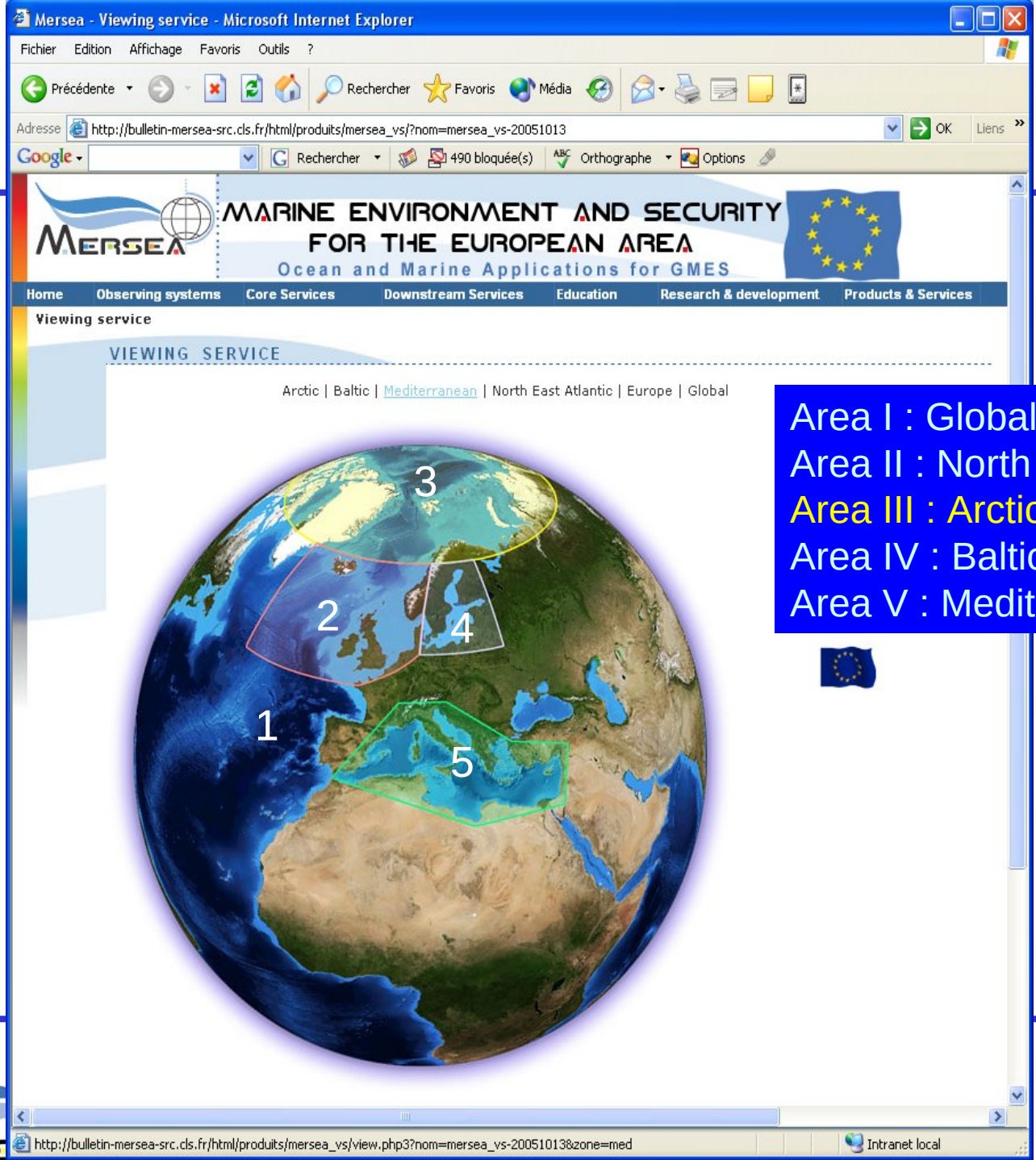
A « system of systems »



3 Thematic Assembly Centres for data

5 Monitoring and Forecasting Centres

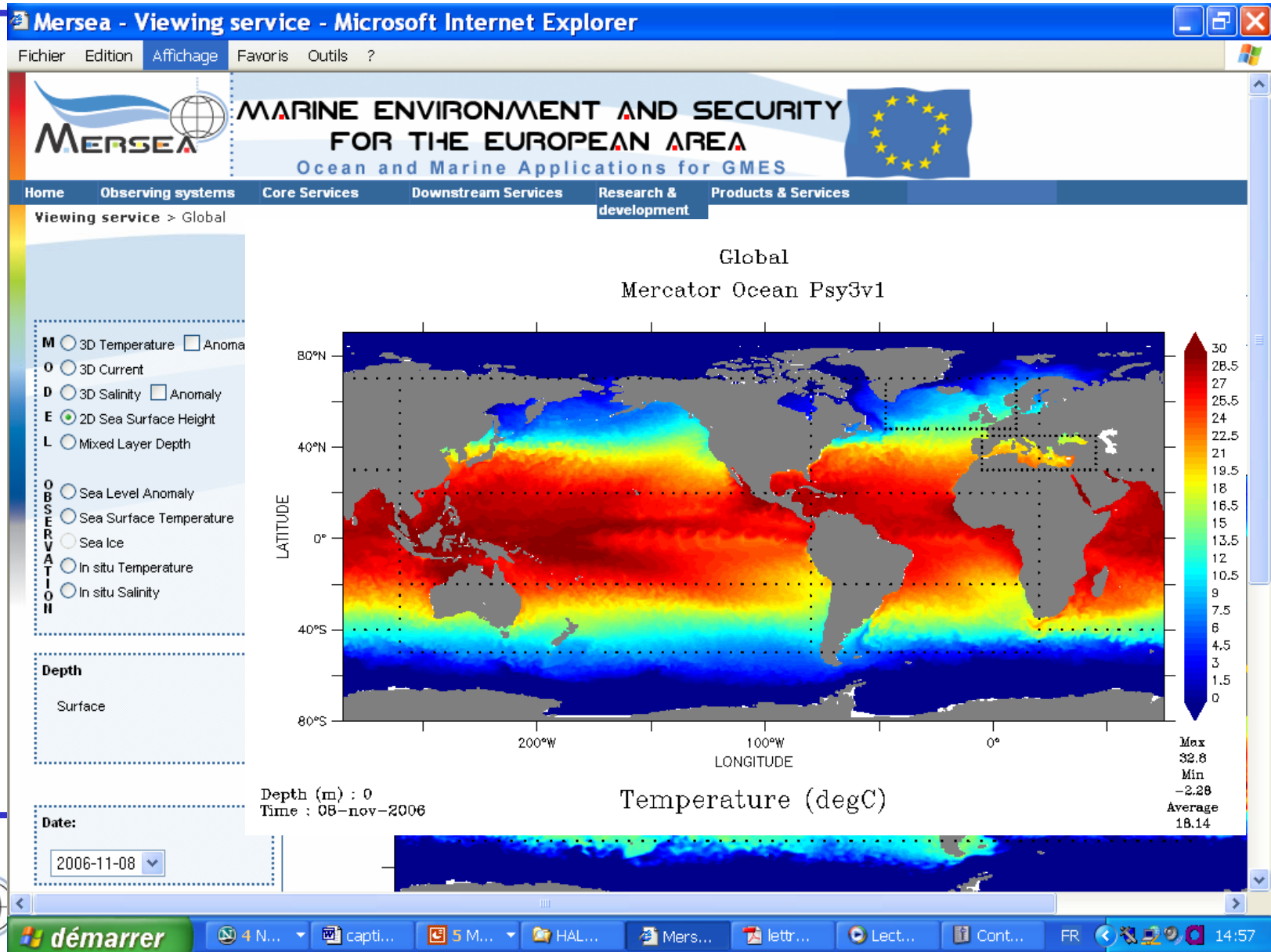
Information management and communication

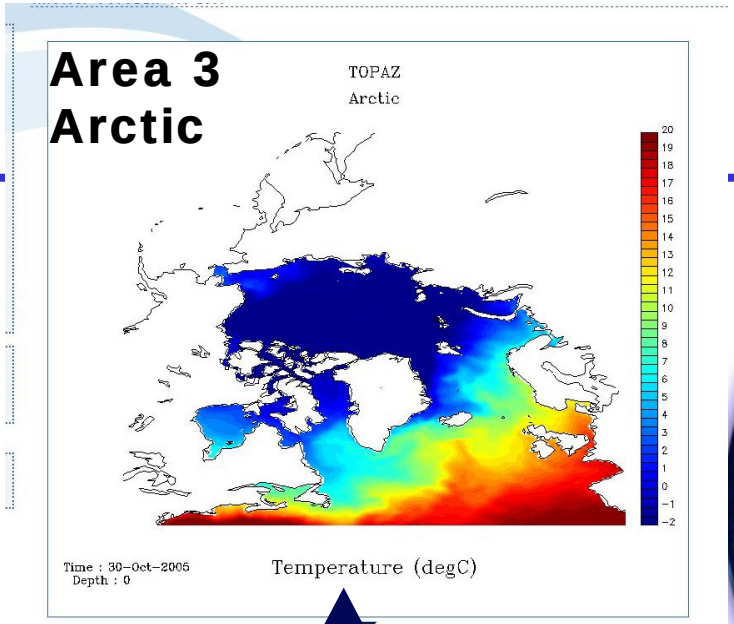


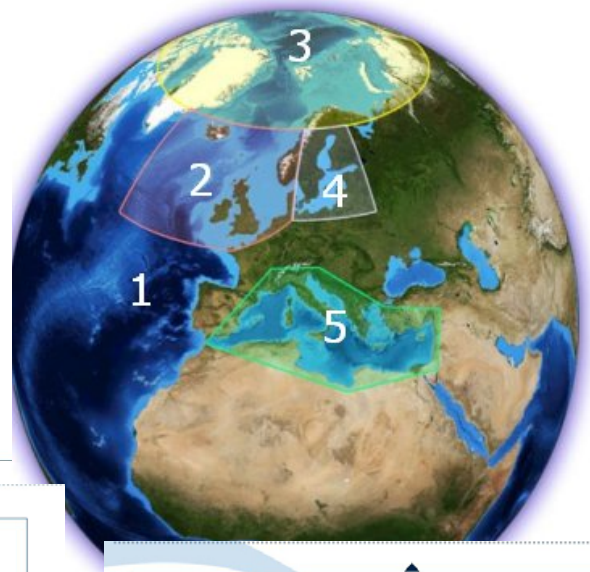
Area I : Global Ocean
Area II : North East Atlantic
Area III : Arctic
Area IV : Baltic Sea
Area V : Mediterranean Sea

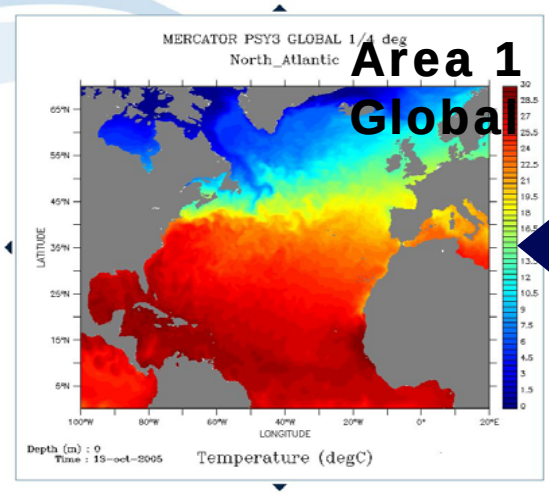
GMES

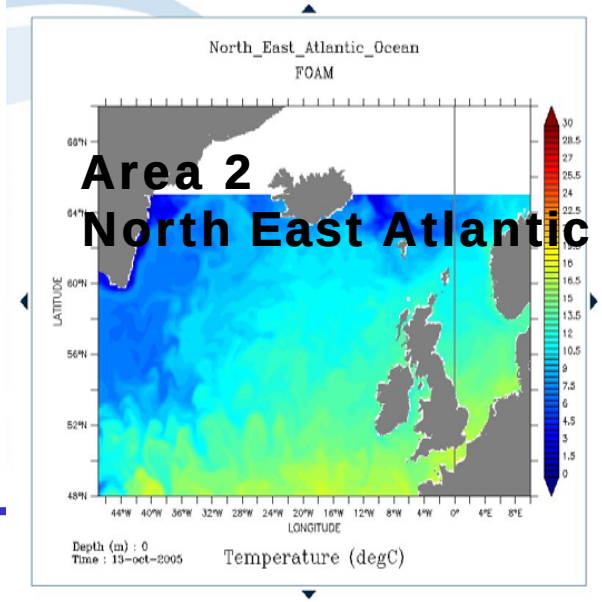
viewing … Sea Surface Height (Global Ocean, model forecast)

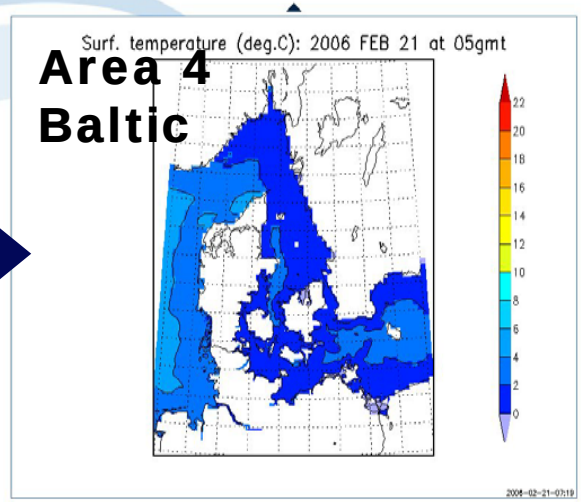



Area 3
Arctic
TOPAZ
Arctic
Time : 30-Oct-2005
Depth : 0
Temperature (degC)

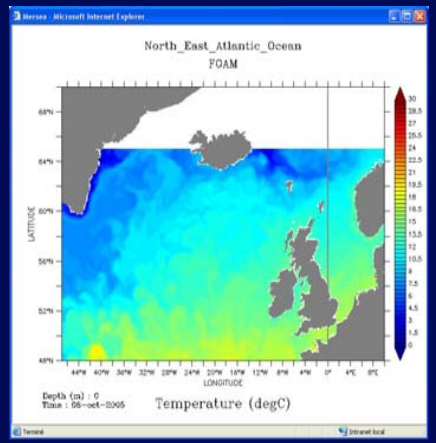

1
2
3
4
5

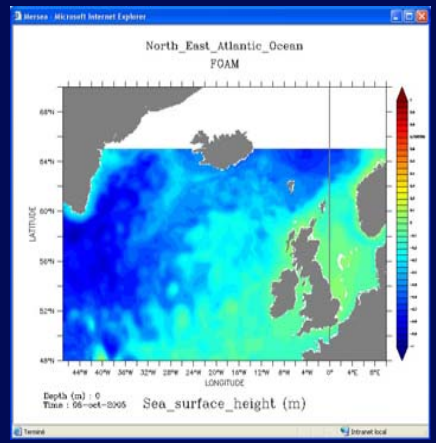

Area 1
Global
MERCATOR PSY3 GLOBAL 1/4 deg
North_Atlantic
LONGITUDE
LATITUDE
Depth (m) : 0
Time : 15-oct-2005
Temperature (degC)

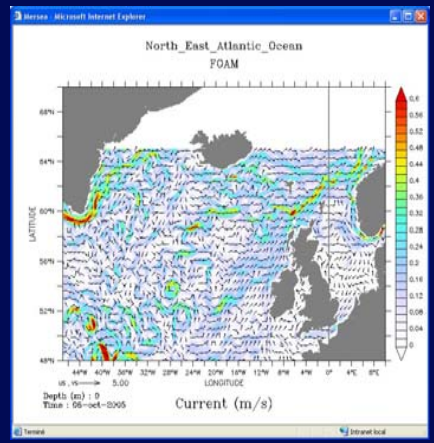

Area 2
North East Atlantic
North_East_Atlantic_Ocean
FOAM
LONGITUDE
LATITUDE
Depth (m) : 0
Time : 15-oct-2005
Temperature (degC)

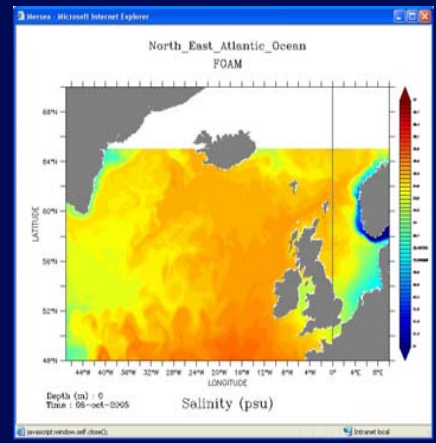

Area 4
Baltic
Surf. temperature (deg.C): 2006 FEB 21 at 05gmt

viewing … North East Atlantic
(different fields, model & observations)

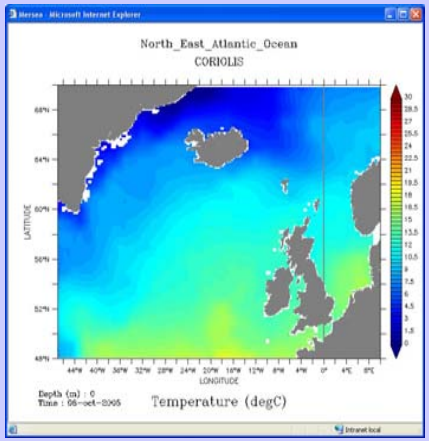


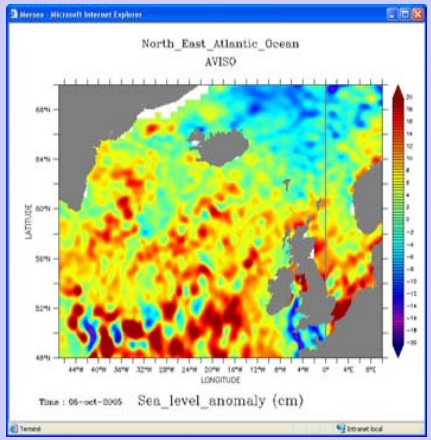


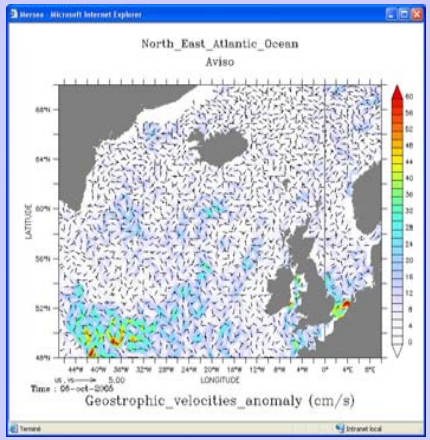


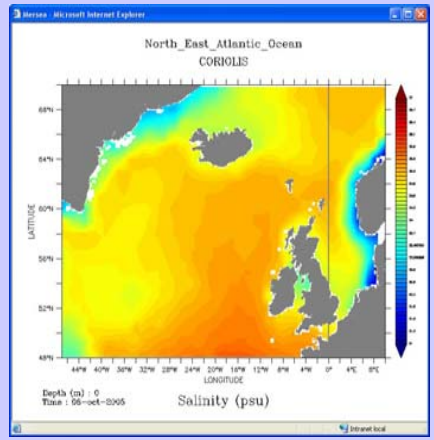


Model









Observations

Services to stakeholders

Environmental monitoring and reporting

Environmental monitoring and reporting

- International conventions :
  - OSPAR (Atlantic); HELCOM (Baltic), UNEP/MAP (Mediterranean)
- EEA (European Environmental Agency)
  - EMMA : European Marine Monitoring and Assessment
  - European Marine Strategy (+ Maritime Policy)
- ICES : working groups and annual reports

⇒Towards convergence and GMES input in the process;

⇒ Indicator development

Towards Marine Core Services

GMES MCS overarching Objectives

- Produce a regular and systematic reference information on the state of the oceans / seas of known quality and accuracy for the global and regional European Seas
- Information to be delivered:
  - 2008 : physical ocean state variables as a starting point
  - The number of environmental variables produced will increase over the period 2008-2013
- The products include observational and model data, real time and re-analysis (mapping)
  - Ocean indicators, bulletins, synthesis, statistics

Serving intermediate users

Area of benefit	Products	To intermediate user	Final user
Climate	Comprehensive and synthetic observations. Reanalysis	Research; climate research centres	Ocean and climate research; validation of scenarios. Policy making on climate change
Marine Environment	Indicators	EEA, OSPAR, HELCOM, national agencies; DG ENV	Policy makers, general public
Ecosystems	Boundary and initial conditions, data products	Coastal monitoring and forecasting system	National environmental or marine agencies; WFD reporting; Coastal management.
Seasonal forecasting	Initial conditions on ocean; reanalysis	ECMWF, NMS	Agriculture, insurance, energy, transport; public safety preparedness; research
Marine safety	High resolution ocean current forecasts	NMS	Search and rescue, oil spills and drifting objects; wave forecasts
Fisheries, ecosystems	Physical conditions; re-analysis of past conditions	Marine and fisheries institutes	ICES, DG FISH, National agencies; research
Maritime, offshore industry	High resolution ocean current forecasts and re-analysis	Value adding service companies	Operation support, ship routing, design criteria, risk assessment; EMSA
Research	Validated data sets	Scientific community	Improved systems; education; policy making

Core Service:
transforming data into ocean products

- **Operational Production** of Ocean Core Data
  - T,S, UV, SSH, sea - ice, Chl-a, ….
- Dissemination of Products
  - Standard and easy access to users (information management)
  - Nowcast, forecast and re-analysis
- Assessment and expertise
  - Quality and human expertise
- Development and maintenance of tools, research
  - Model, assimilation, data handling
- Adhere to standards : service level agreements

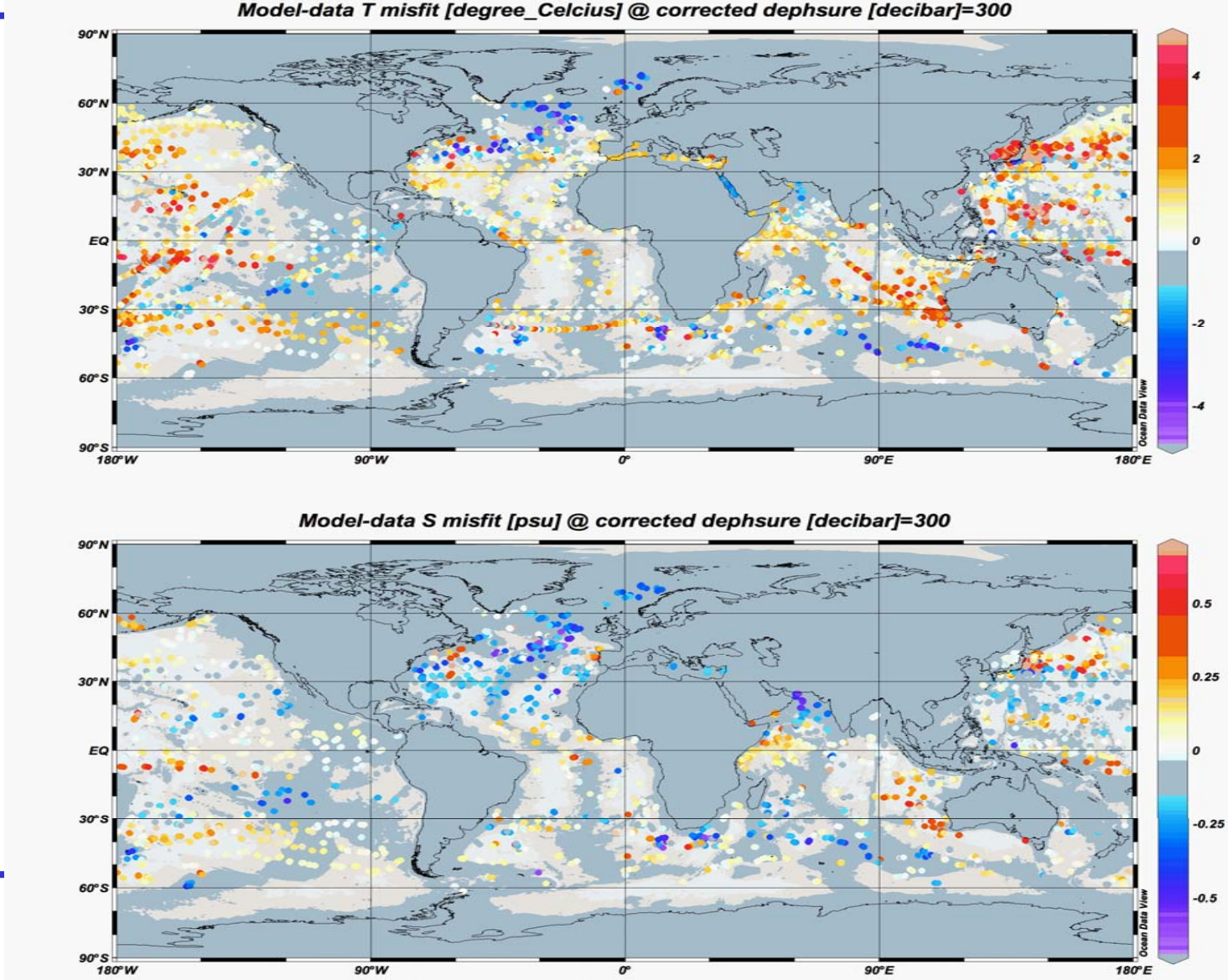
Upcoming Target Operational Period
TOP 2

April through Septembre 2007

TOP 2 Objectives

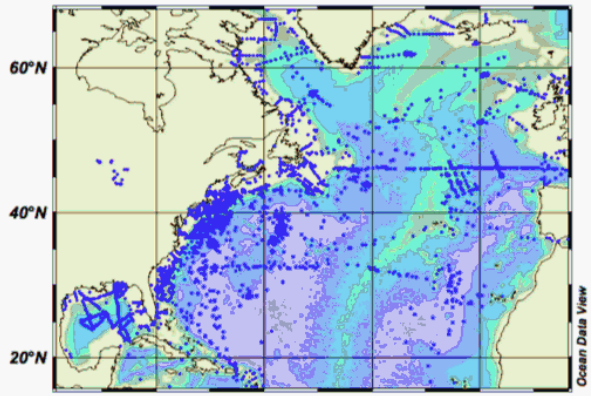
- Implement several upgrades of the system (V2) :
  - data sets, in situ observing system
  - Information management and services (catalogues, inventories, viewing, downloading)
  - Modelling : increased resolution (time and space), nesting, ecosystems, multivariate assimilation
- Assessement and validation
  - Common approach (GODAE) with metrics
- Links with users, demonstrations
  - Workshops
- Communication, visibility
  - Web site, training

Assessment:
Model-data (ARGO + XBT) misfit at 300 m



T/S model-data (XBTs) misfits

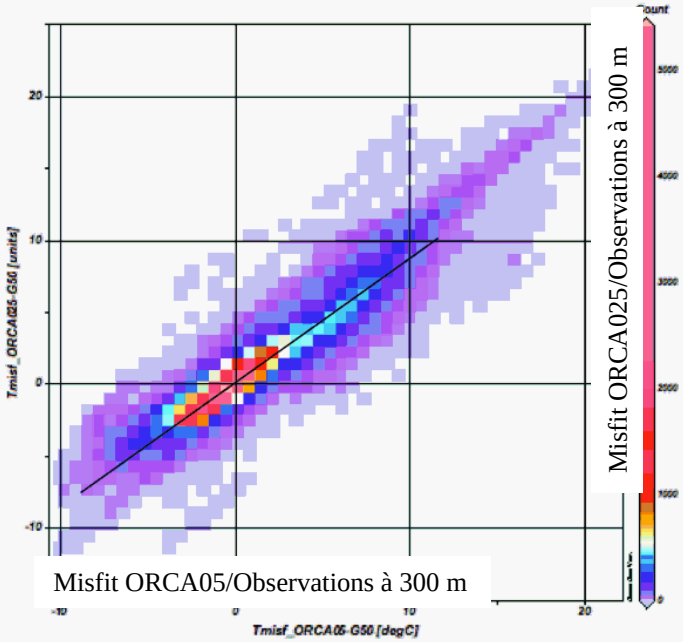
(1 month in 1965)



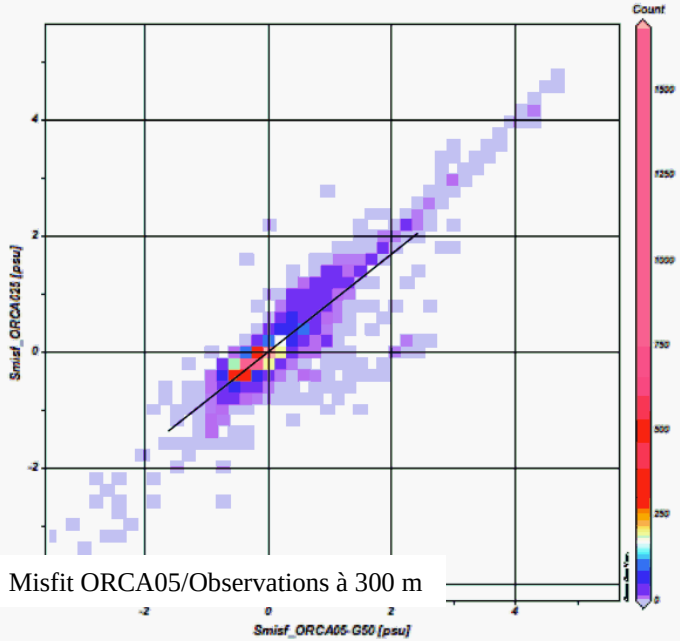
Température

Salinité

Misfit ORCA025/Observations à 300 m



Misfit ORCA025/Observations à 300 m



Misfit ORCA05/Observations à 300 m

Misfit ORCA05/Observations à 300 m

Conclusions

- Advances on all fronts
- Initial system operating
  - Data streams (remote sensing and in situ)
  - Information management
  - Monitoring and forecasting
- TOP2 : upgrades of all systems
  - User products
  - Integration within GMES
- Good prospects for implementation of Marine Core Services (2008 - ….)


THAT CONCLUDES MY TWO-HOUR PRESENTATION. ANY QUESTIONS?
DID YOU INTEND THE PRESENTATION TO BE INCOMPREHENSIBLE. OR DO YOU HAVE SOME SORT OF RARE "POWERPOINT" DISABILITY?
ARE THERE ANY QUESTIONS ABOUT THE CONTENT?
THERE WAS CONTENT?
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