



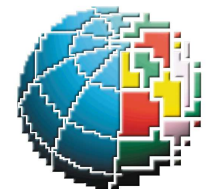
Marine Core Service products in support of the Marine Strategy Framework Directive

Nadia Pinardi

University of Bologna

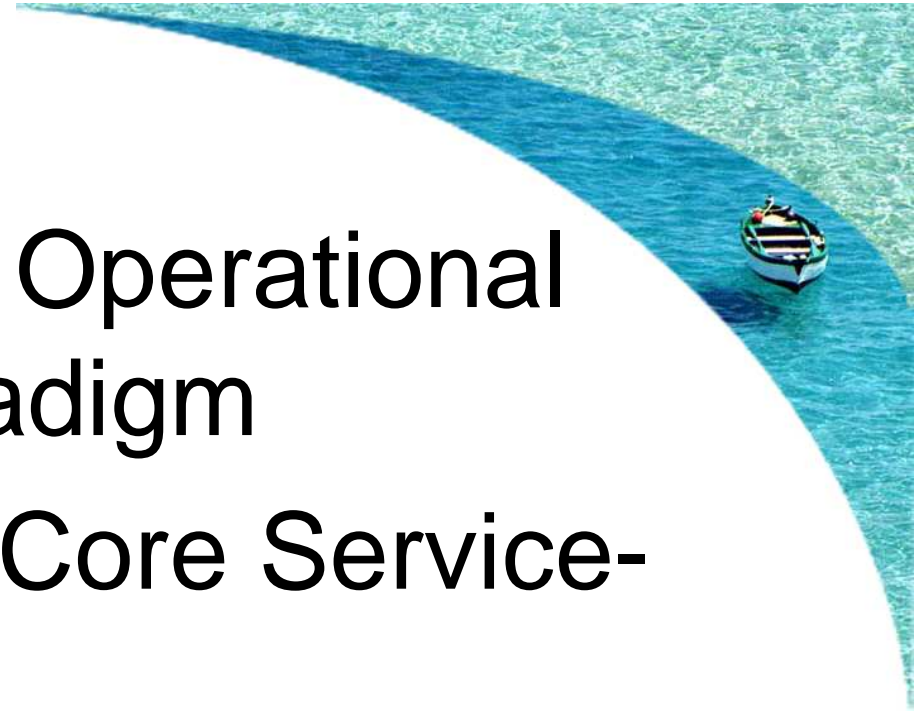
MyOcean Board

Co-Chair of Mediterranean Operational
Oceanography Network



Outline

- The MFSD and the Operational Oceanography paradigm
- The GMES Marine Core Service-*MyOcean* products
- Examples of applications that use MyOcean products to fulfil MFSD requirements
- Final considerations

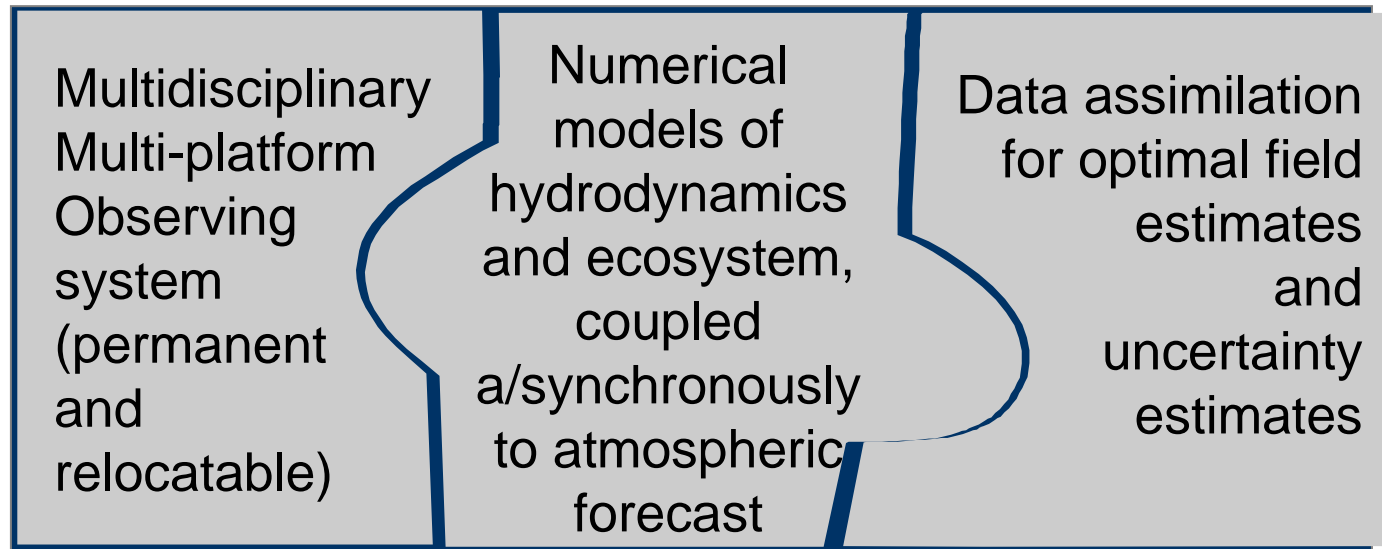
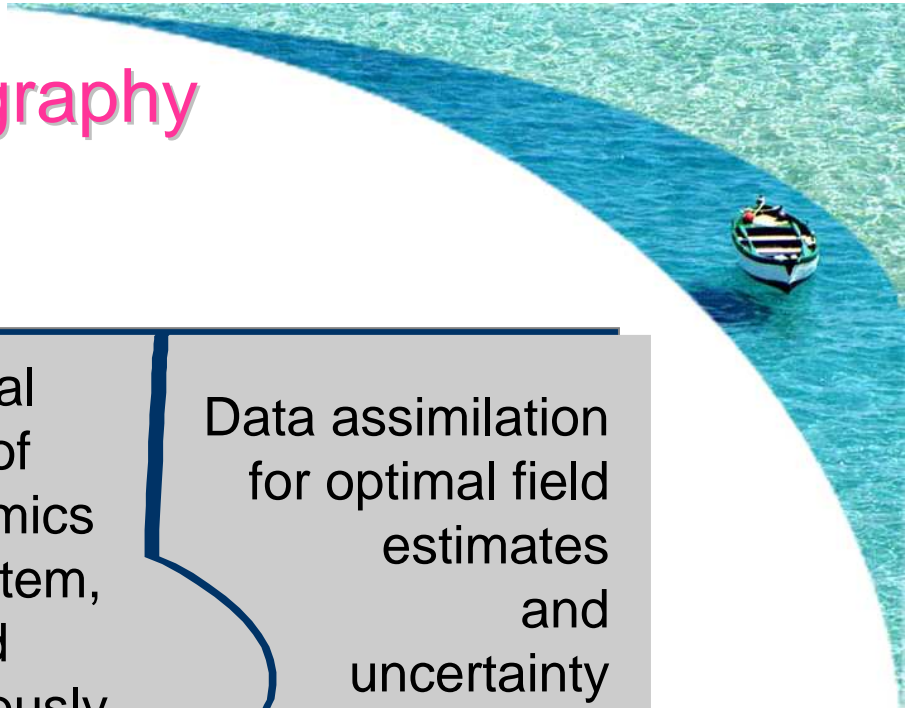


Marine Strategy Framework Directive

- The Directive establishes a framework *within which Member States shall take the necessary measures to achieve or maintain* good environmental status in the marine environment by the year **2020** at the latest.
- For that purpose, Marine Strategies shall be developed and implemented in order to:
 - (a) *protect and preserve the marine environment, ...*
 - (b) *prevent and reduce inputs in the marine environment, with a view to phasing out pollution ...*
- **GMES initiative provides the framework that partially supports a Pan-European monitoring and forecasting system to provide the basic data sets required by the MFSD**



The Operational Oceanography paradigm

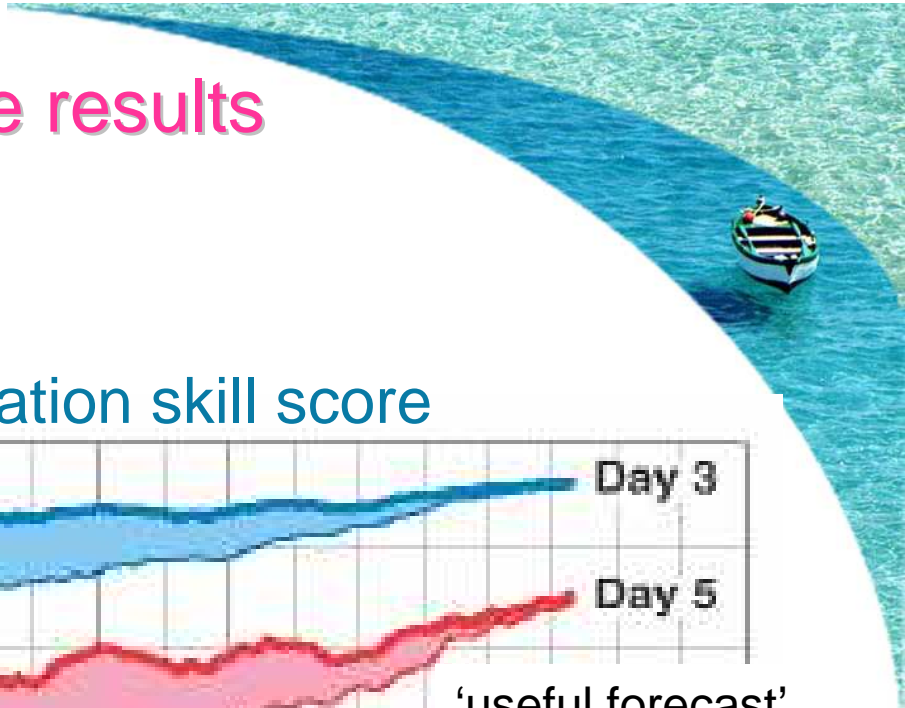


Continuous production of nowcasts/forecasts of relevant environmental state variables

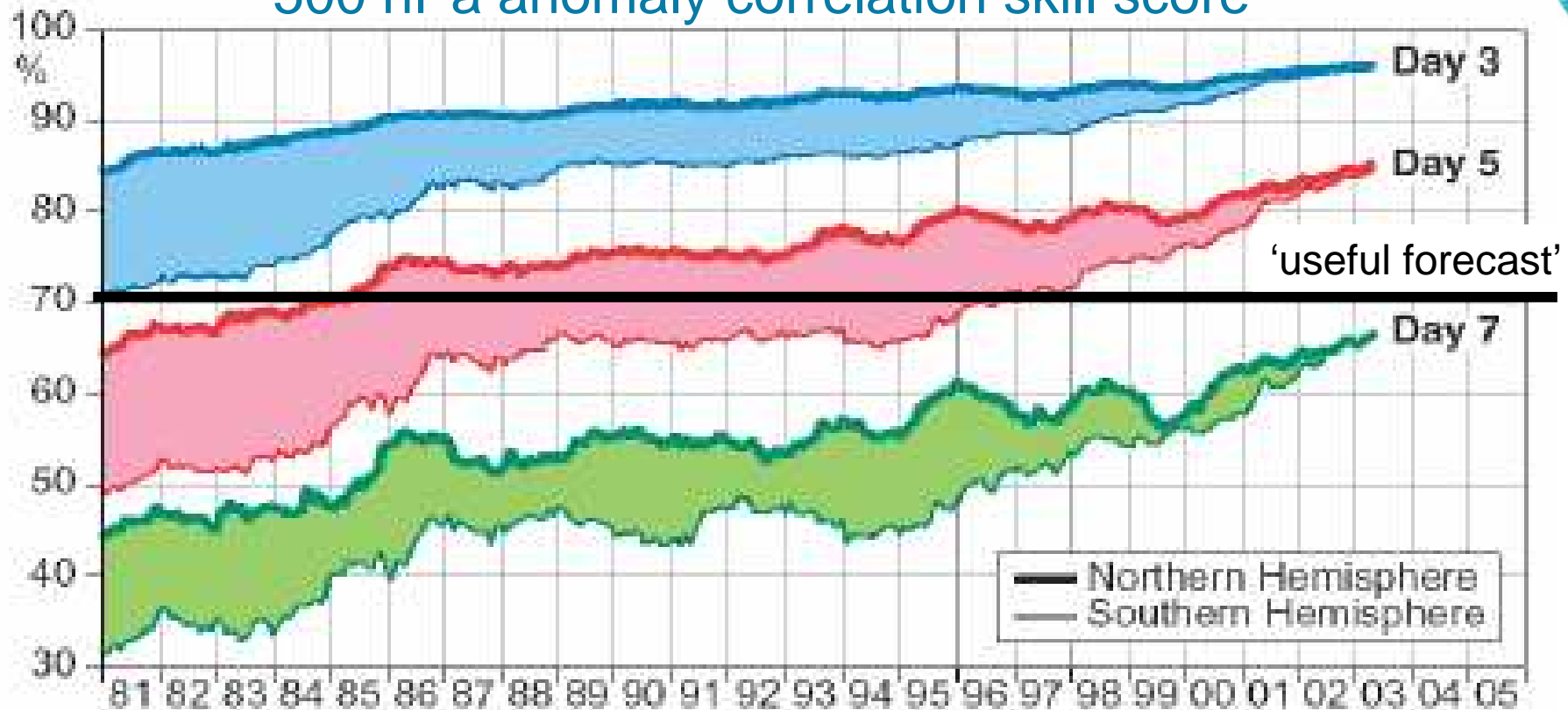
Real time products with internationally agreed standards



Operational Meteorology: the results after 25 years

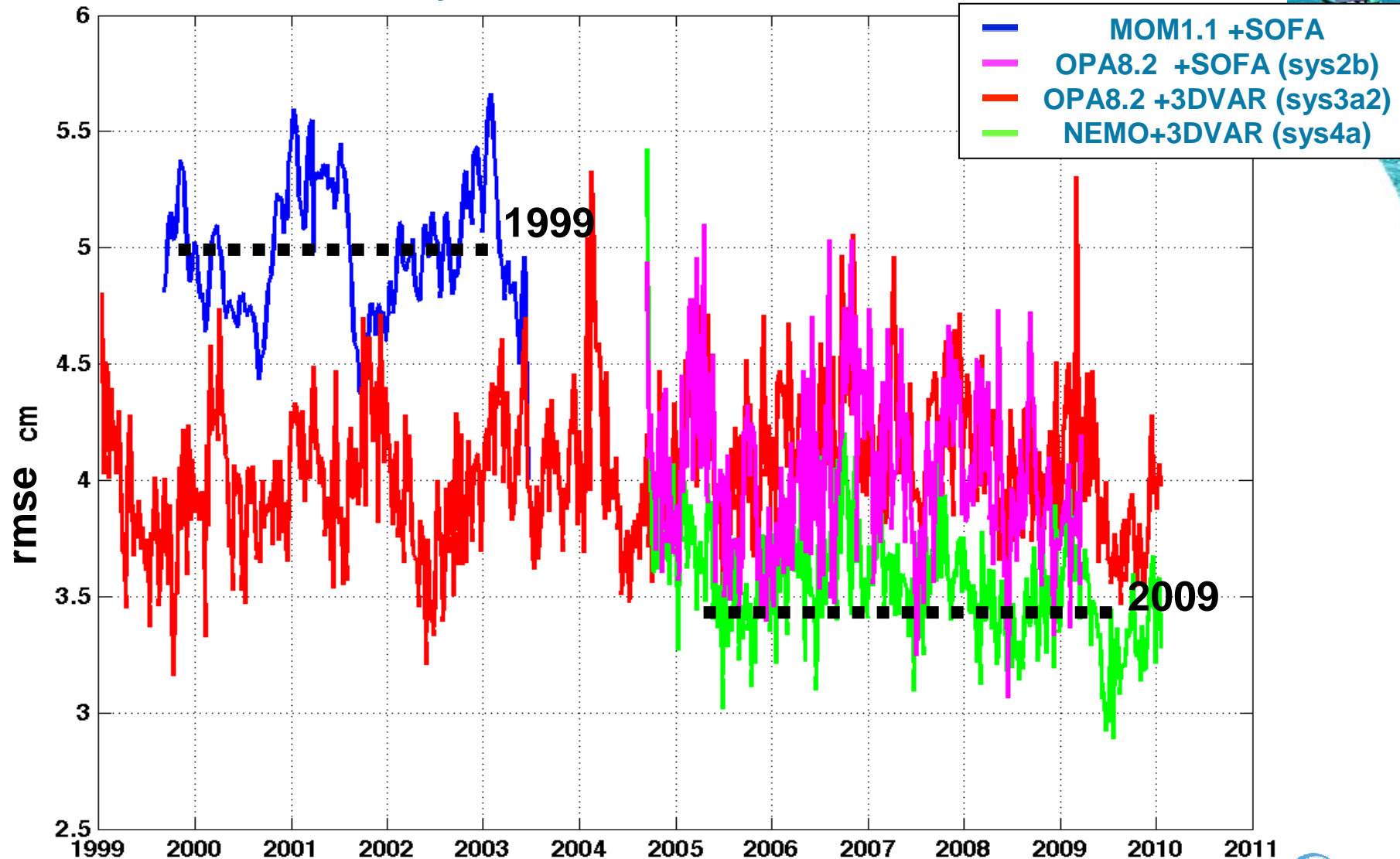


500 hPa anomaly correlation skill score

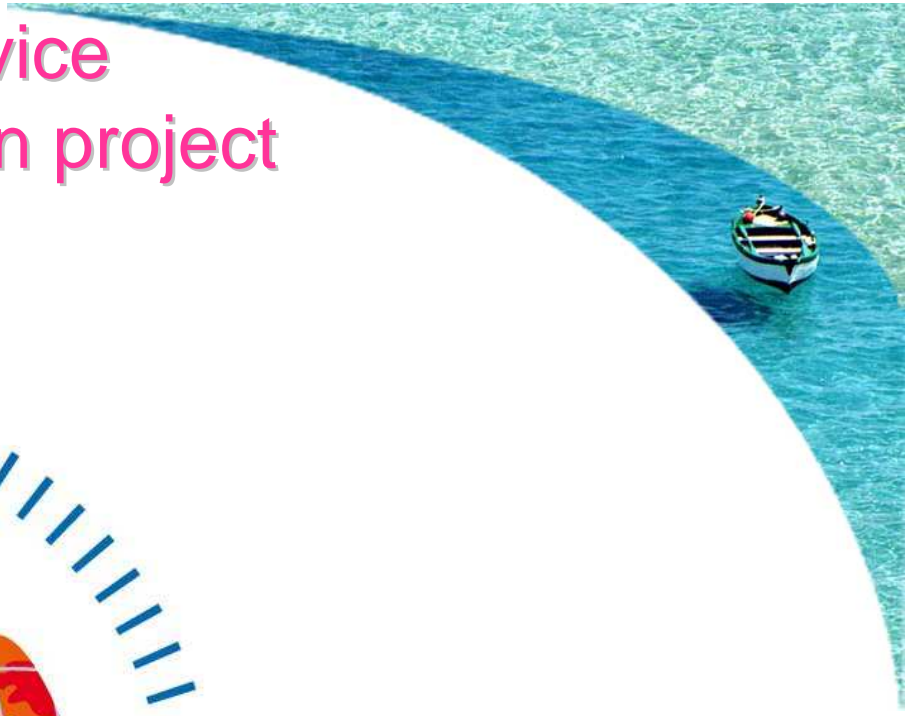


Operational oceanography: 10 years of quality increase

Sea level anomaly in the Mediterranean Sea



The GMES Marine Core Service implementation: the MyOcean project (2009-2012)



The Marine Core Service products

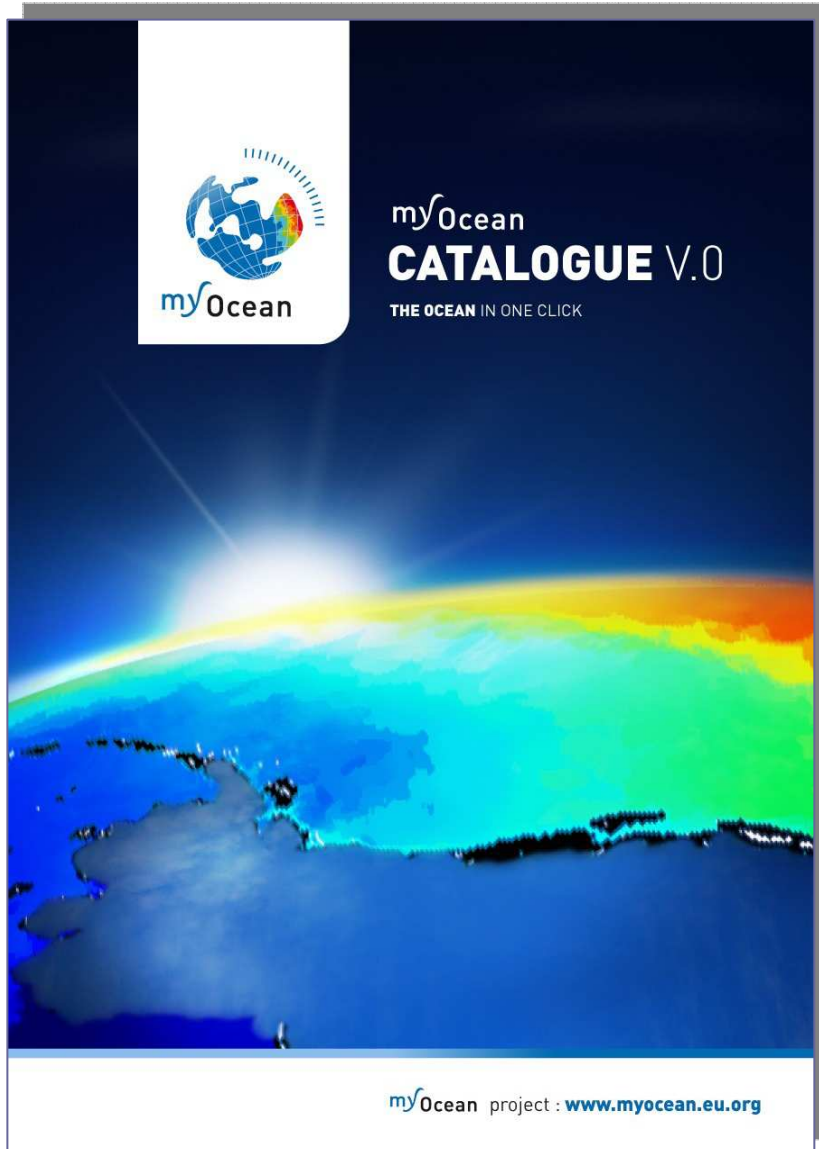
Geophysical State Variable	Marine core products derived from observations	Marine core products derived from models
Sea level, sea surface height	✓	✓
Temperature	✓	✓
Salinity	✓	✓
Currents	✓	✓
Surface winds	✓	✓
Surface waves	✓	✓
Sea ice (extent, concentration, thickness, motion)	✓	✓
Biophysical State Variable		
Attenuation of solar radiation – Note 4	✓	
Bio-geochemical State Variable		
Chlorophyll-a	✓	✓
Dissolved inorganic nutrients	✓	✓
Dissolved O ²	✓	✓
pCO ²	✓	
Benthic biomass – Note 3	✓	
Sediment grain size & organic content	✓	
Faecal indicators - Note 1		
Oil slicks - Note 2		

Data are available from 1985 or earlier

Every day an analysis and a forecast of the sea



MyOcean Catalogue is available



myOcean
CATALOGUE V.0
 THE OCEAN IN ONE CLICK

myOcean project : www.myocean.eu.org

Temporal Extent	Quality Control Flag	QUALITY & DELIVERY CHARACTERISTICS			DISSEMINATION ¹		
		Timeliness	Format	User Standards	Ordering / Request	Distribution Tools	Viewing / Discovery
14/14 day hindocast 14/14 day forecast	-KPI production: Yes - metrics: Yes	- regular: every 7/1 days - on request: 1 day after request (70% of the time) 3 days after request (30% of the time)	NetCDF	FTP connexion OpenDAP access	Yes	Yes	Yes

- **A simple and single portfolio** of products for the whole pan-European **GMES Marine Core Service**
- A **reference definition** shared by users, producers and stakeholders, regularly updated



Market Segmentation- Areas of benefit

- v MyOcean products will support 4 major areas of benefit

Area 1
« MARINE SAFETY »
(marine operations,
oil spill combat, ship routing,
defense, search & rescue, ...)

Area 3
**« MARINE AND
COASTAL ENVIRONMENT »**
(water quality, pollution,
coastal activities, ...)

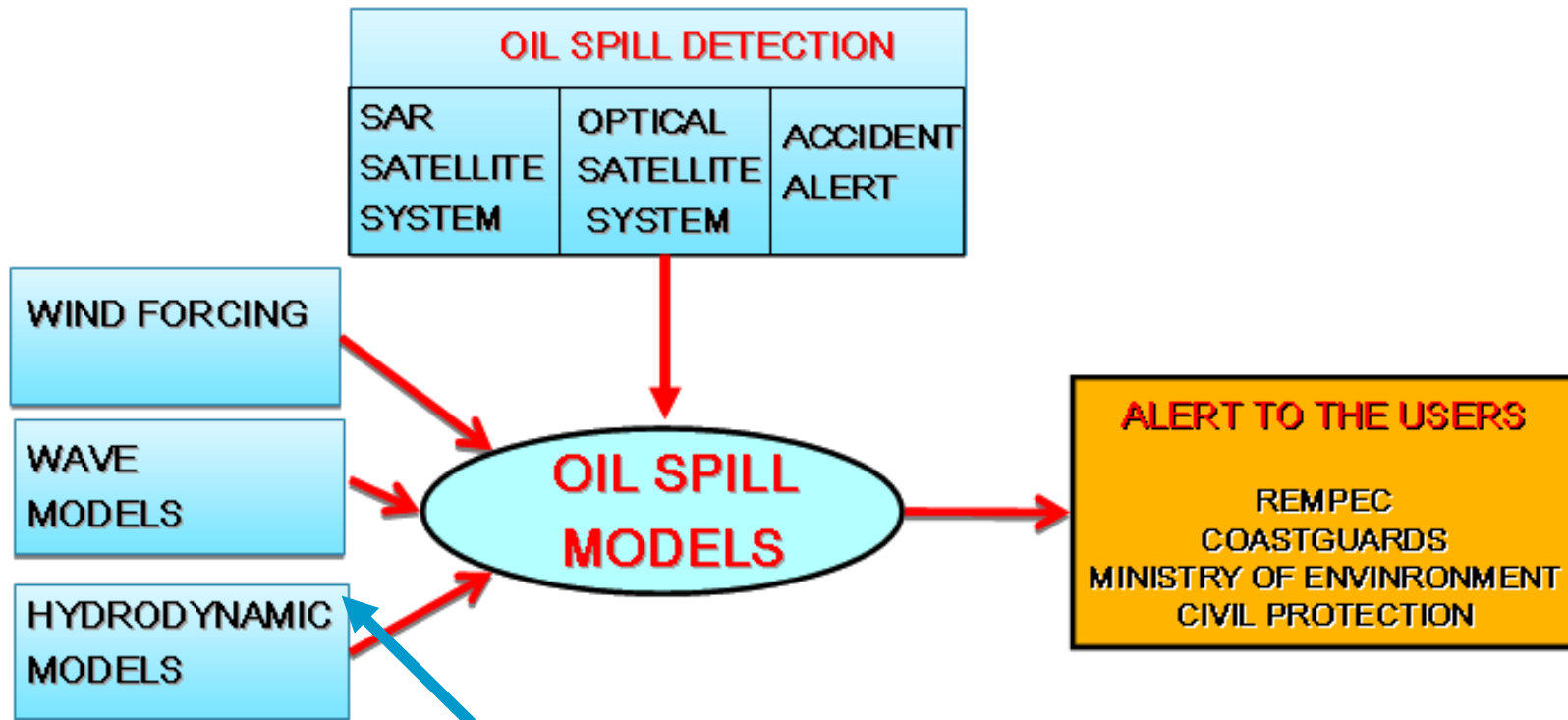
Area 2
« MARINE RESOURCES »
(fish stock management,
ICES, FAO, mariculture,
offshore renewables,..)

Area 4
**« WEATHER, CLIMATE &
SEASONAL FORECASTING »**
(climate monitoring, ice,
seasonal forecasting, ..)

Marine Safety: oil spill forecasting

Marine Core Service

- v An integrated oil spill monitoring and forecasting

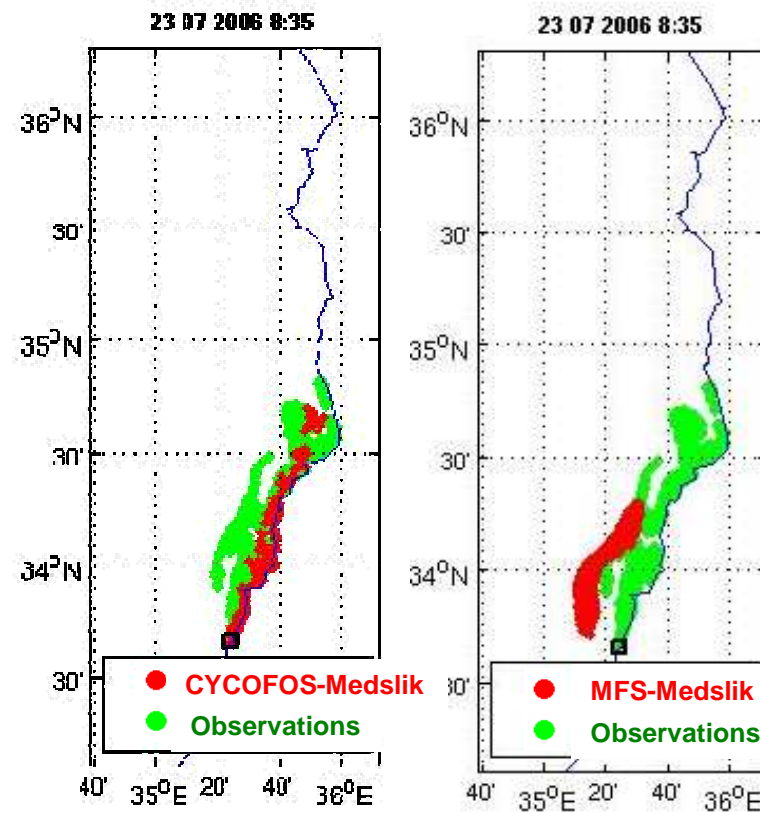


**Now the currents can be taken from Myocean:
waves and winds will be in the same portfolio soon**

- v The MyOcean integrated oil spill monitoring and forecasting at work: the Lebanon accident emergency



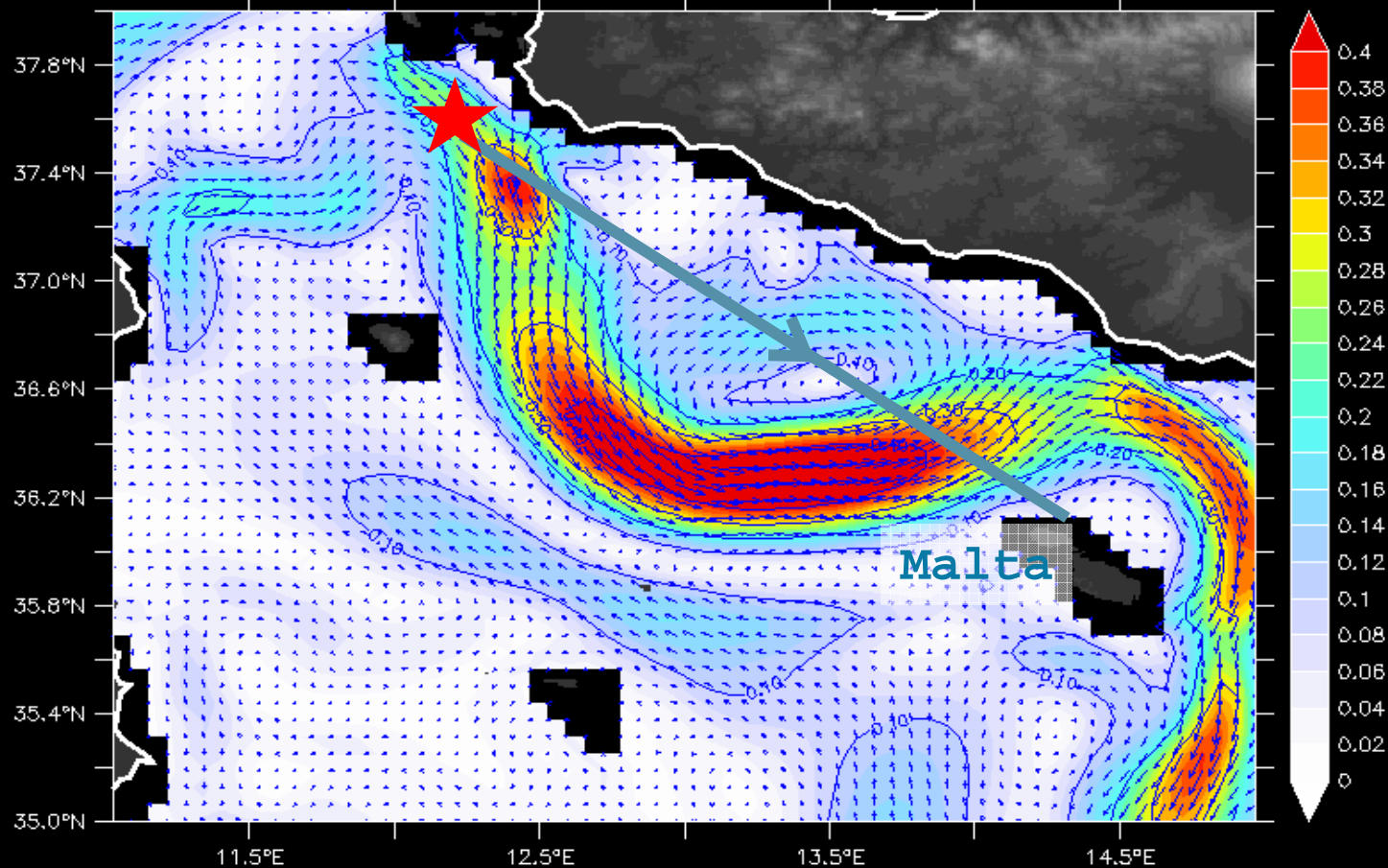
MERIS image of the accident



Forecasts of the oil movement and transformation with low and high resolution currents

Mediterranean Sea

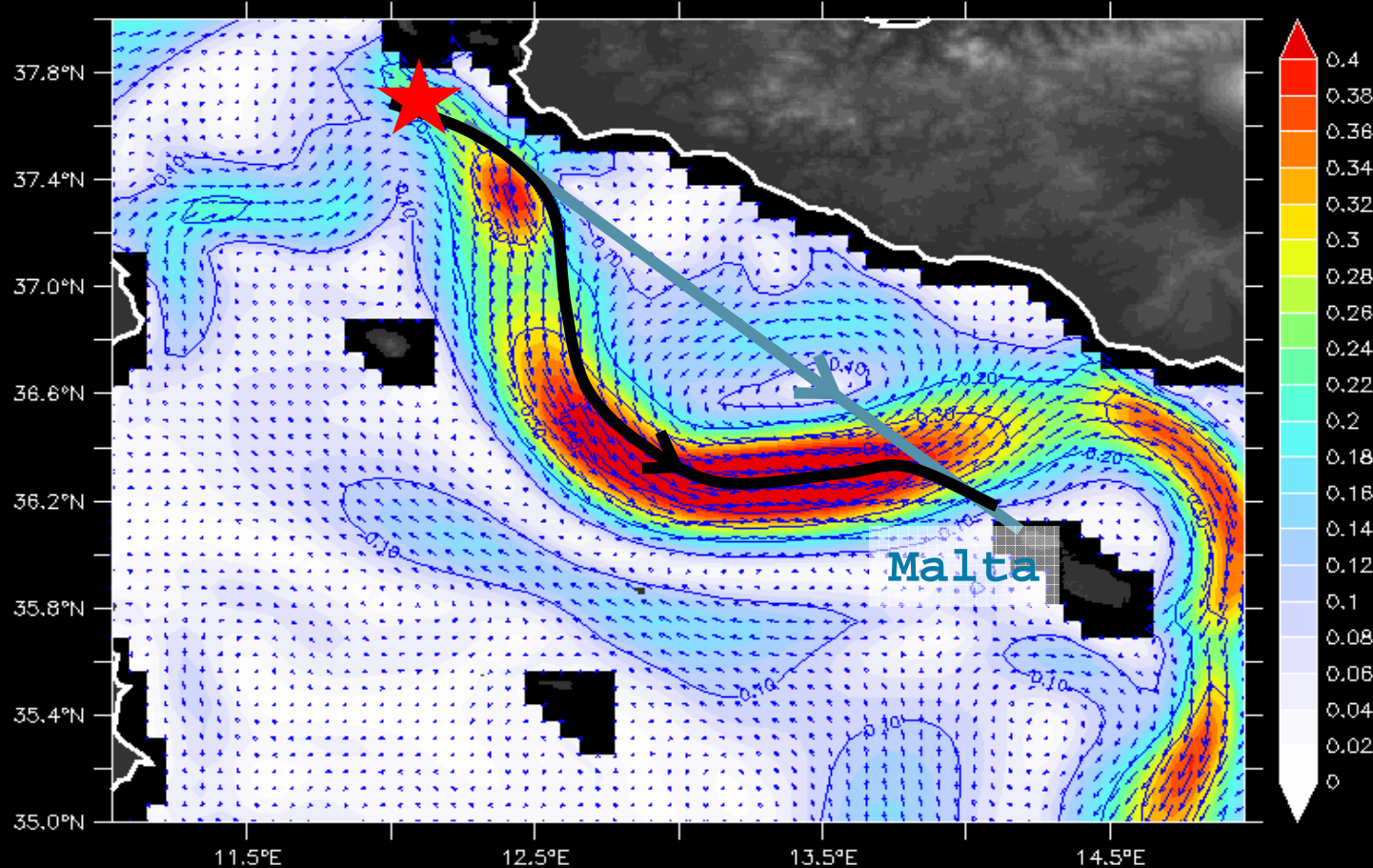
X and Y components are offset



20 Sep 2008, Currents, Surface

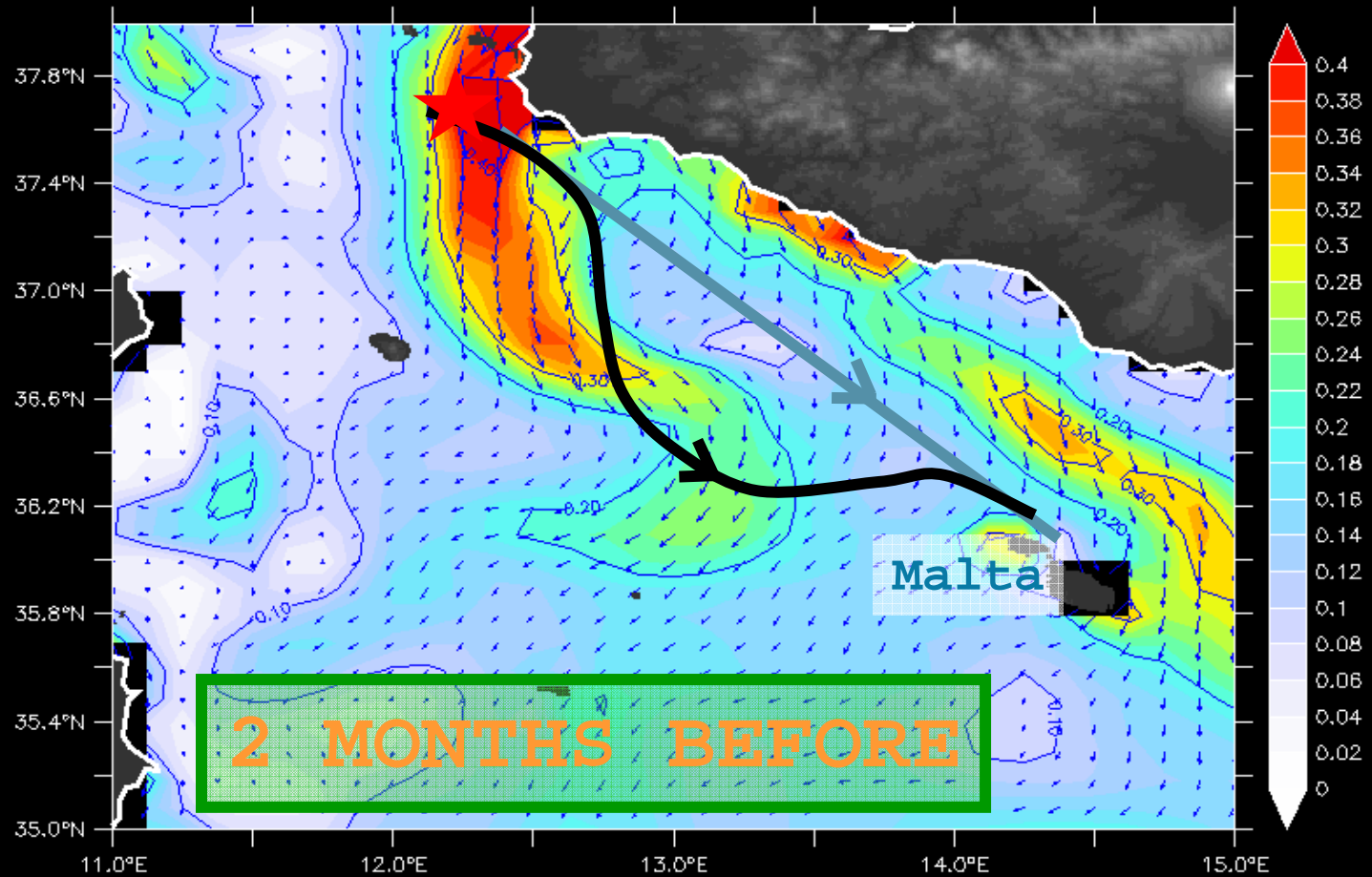
Mediterranean Sea

X and Y components are offset



20 Sep 2008, Currents, Surface

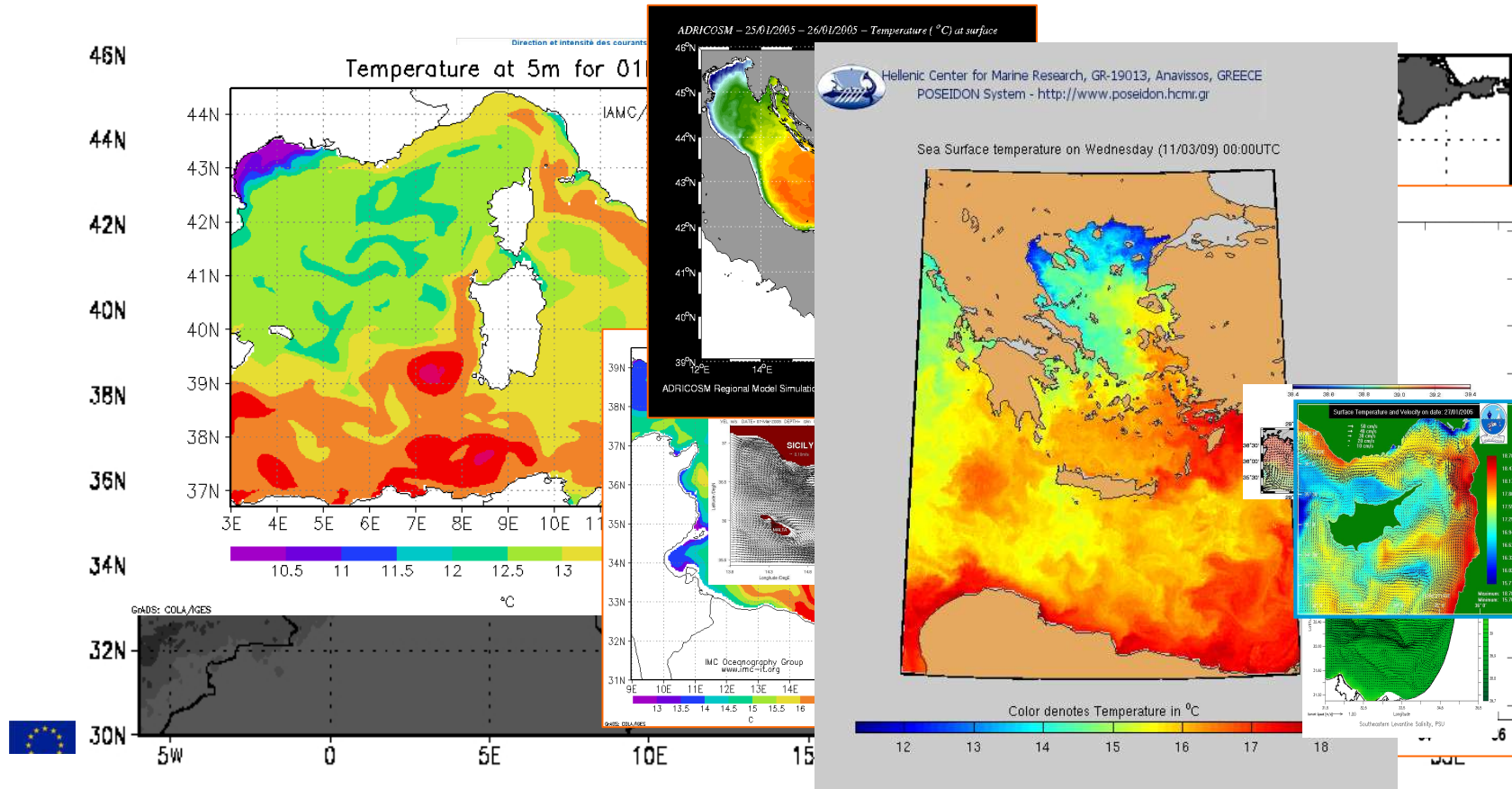
Mediterranean Sea



23 Jul 2008, Currents, Surface

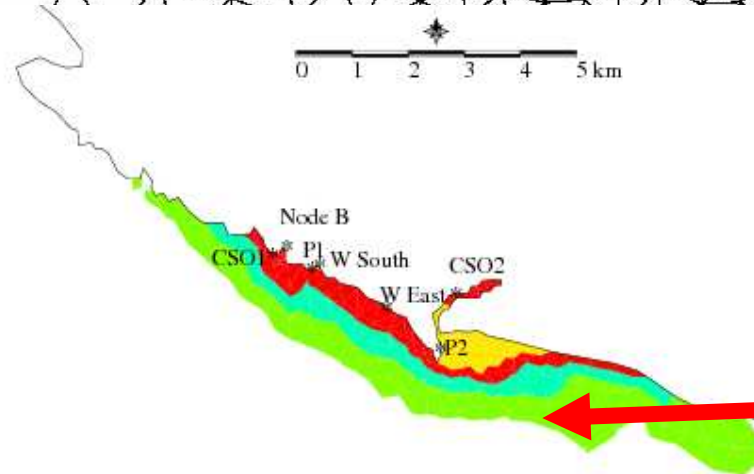
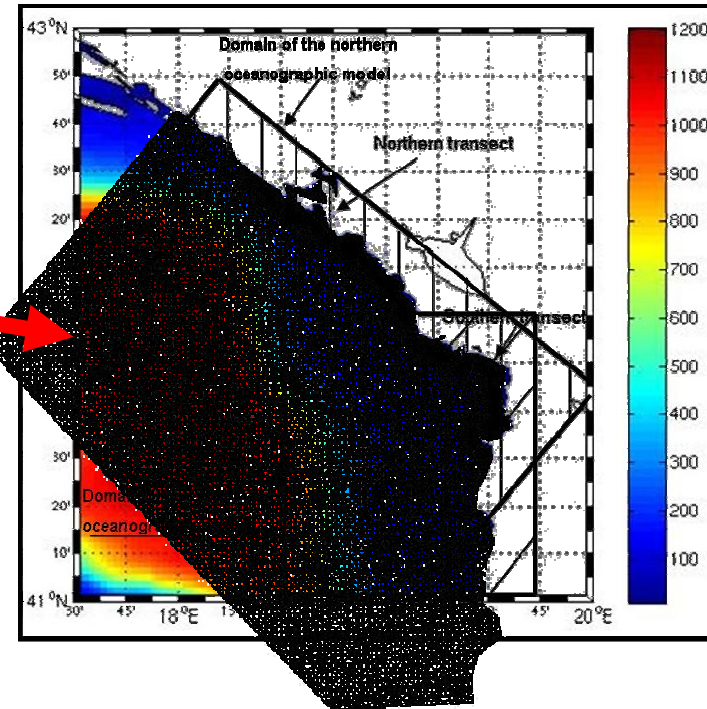
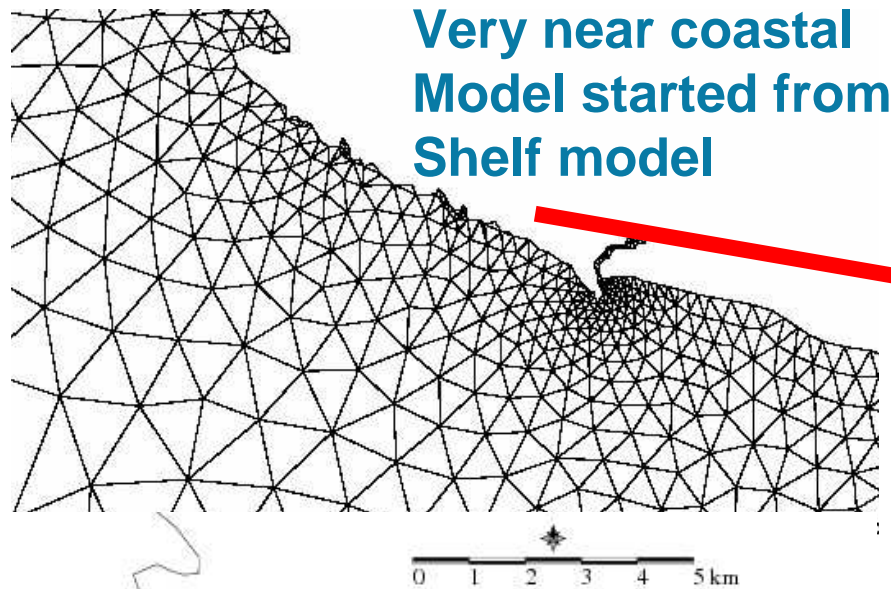
Marine and coastal environment: limited area modelling for the shelf and coasts

MyOcean disseminates daily forecasts to 13 nested national models every day



Shelf and sub-regional models now reach 1 - 3 km resolution

Marine and coastal environment: land pollution control



Analysis of land sources of pollution and their impact In the sea

BOD5 Sources - Areas of Influence (conc > 30% of total)

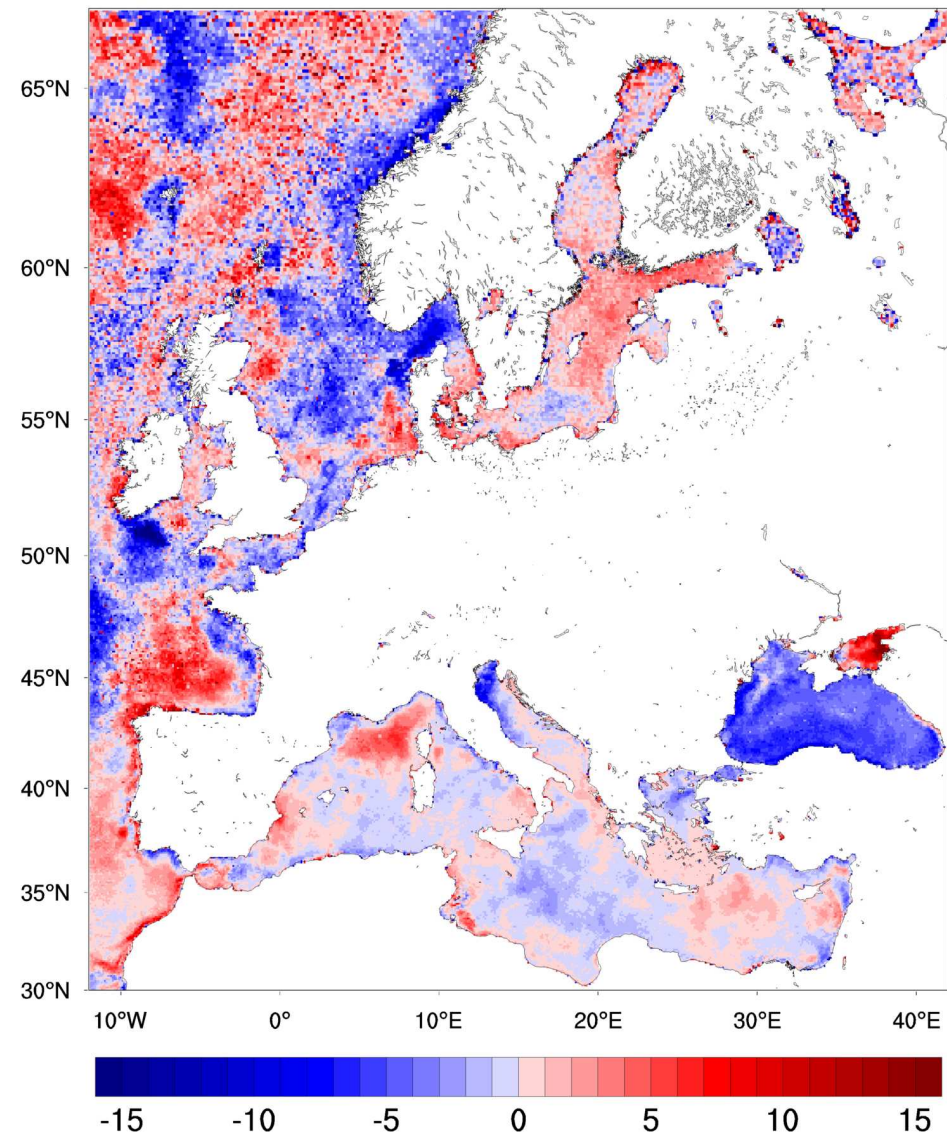


Marine and coastal environment: EEA eutrophication indices (ETC-Water, 2009)

- **New Chlorophyll indicator based upon the MyOcean Ocean color data from 1998-2007**
- **Spatial mapping of % of Chl content per year: indication of coastal eutrophication trends and open ocean productivity**
- **Indicator may suggest impact of implemented policies in the coastal areas**
- **Indicator may suggest climate-related changes In open ocean waters**

Chlorophyll-a trend, %/year

Summer 1998-2007

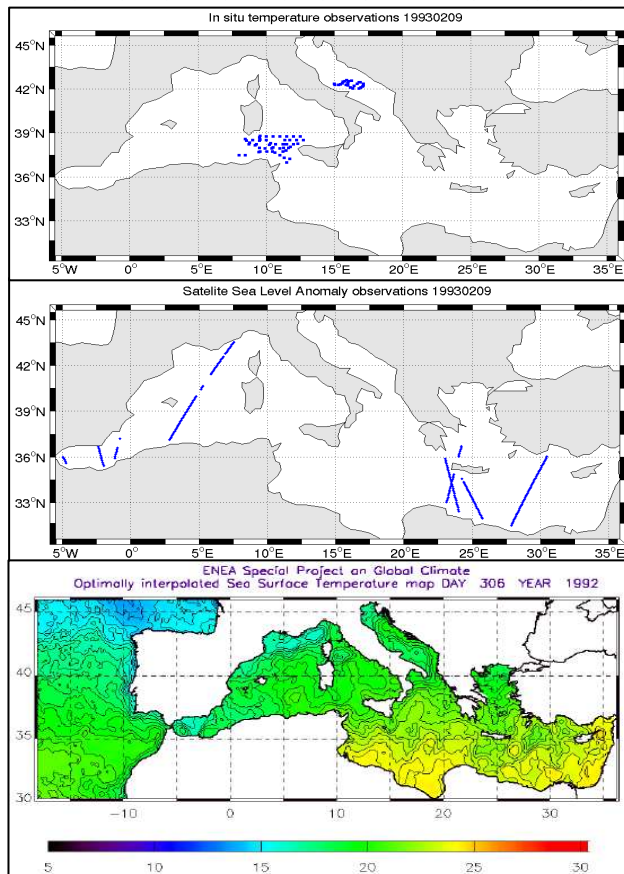


Weather, climate and seasonal forecasting: re-analyses at high resolution

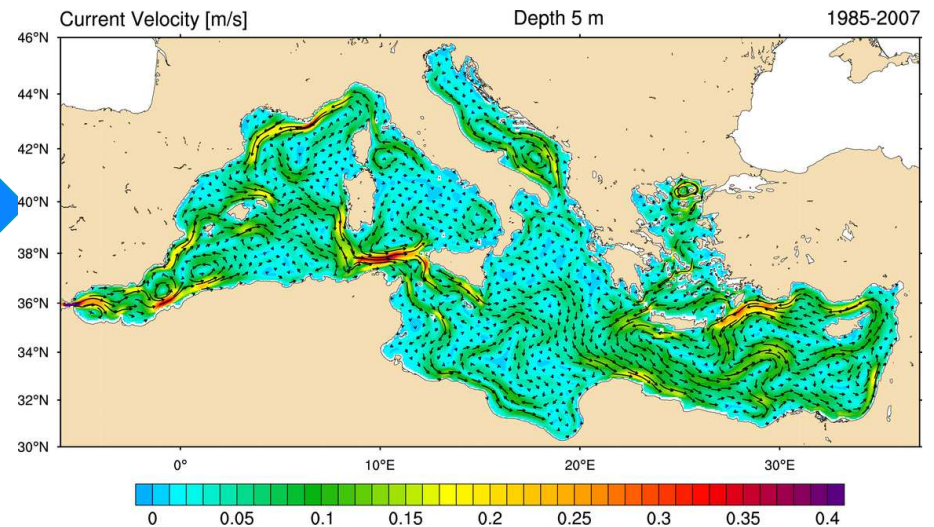
Marine Core Service

- Long time series from high resolution ocean re-analyses will form the basic data set for climate impact detection and planning of long term investments

Data available in one day



Uniform representation of environmental variables with optimal estimation methods



MyOcean re-analyses

Final remarks

- The European Operational Oceanographic service is now a reality, the GMES Marine Core Service
- Products have pan-european standards, harmonized quality and development plans, free and open access to all users
- An initial portfolio of end-user applications shows the impact of MyOcean innovative products in support of MFSD implementation

