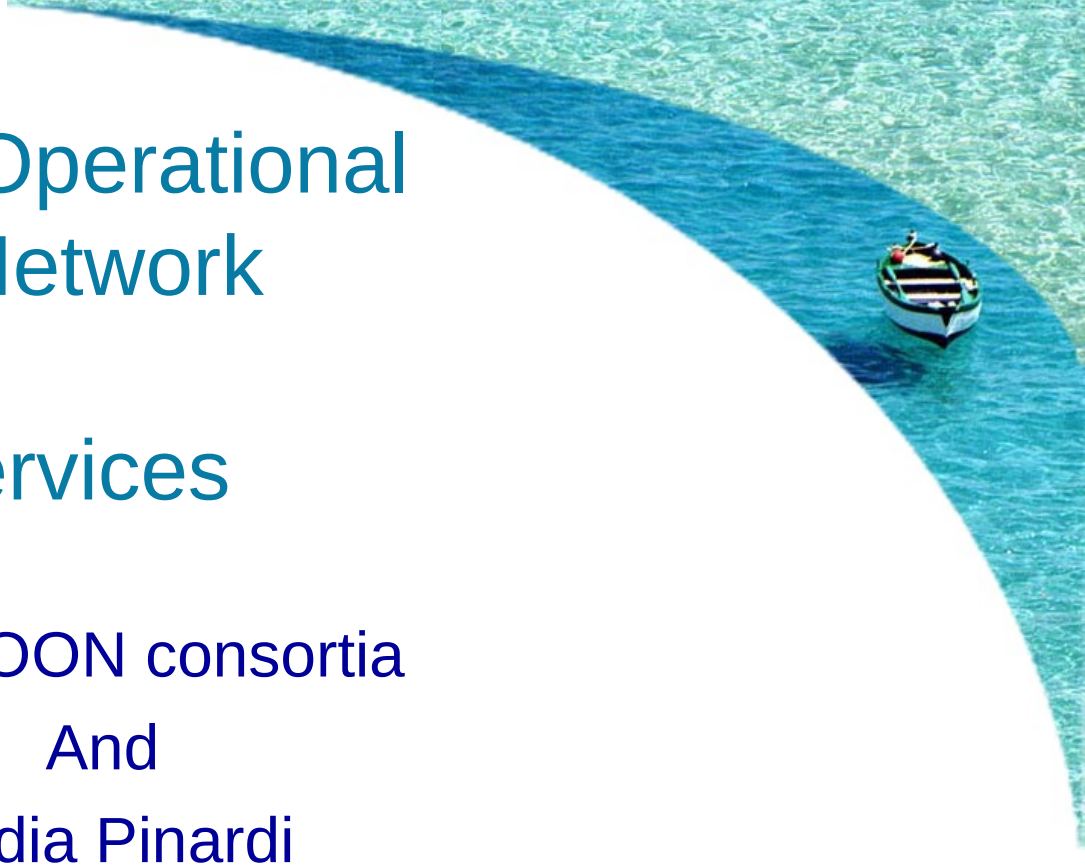
The Mediterranean Operational Oceanography Network (MOON): Products and Services



The MOON consortia

And

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Co-chair of MOON

Istituto Nazionale di Geofisica e Vulcanologia

Department of Environmental Sciences, Bologna University

Outline

1. The concepts of operational oceanography
2. The MOON system within the GMES Marine Core Service
3. MOON products and the sea level
4. MOON service
5. Final remarks

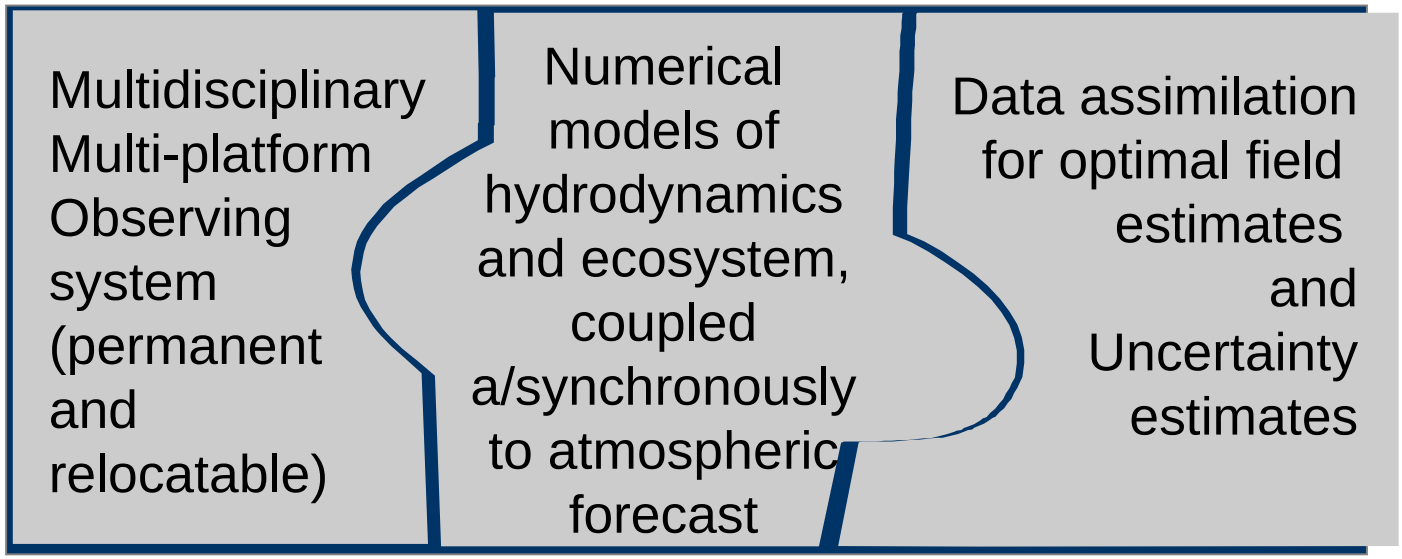
What is operational oceanography?

- It is a branch of applied research that bridges science and engineering in order to solve a practical problem: the protection, management, and sustainable exploitation of, the marine areas and resources.

- In the 80s operational research started to be applied to the ocean (meteorology started in 1930s)

- Operational earth science research is concerned with real time data transmission, continuous monitoring, optimal estimates via model and data fusion, numerical modeling for forecasting, uncertainty estimation

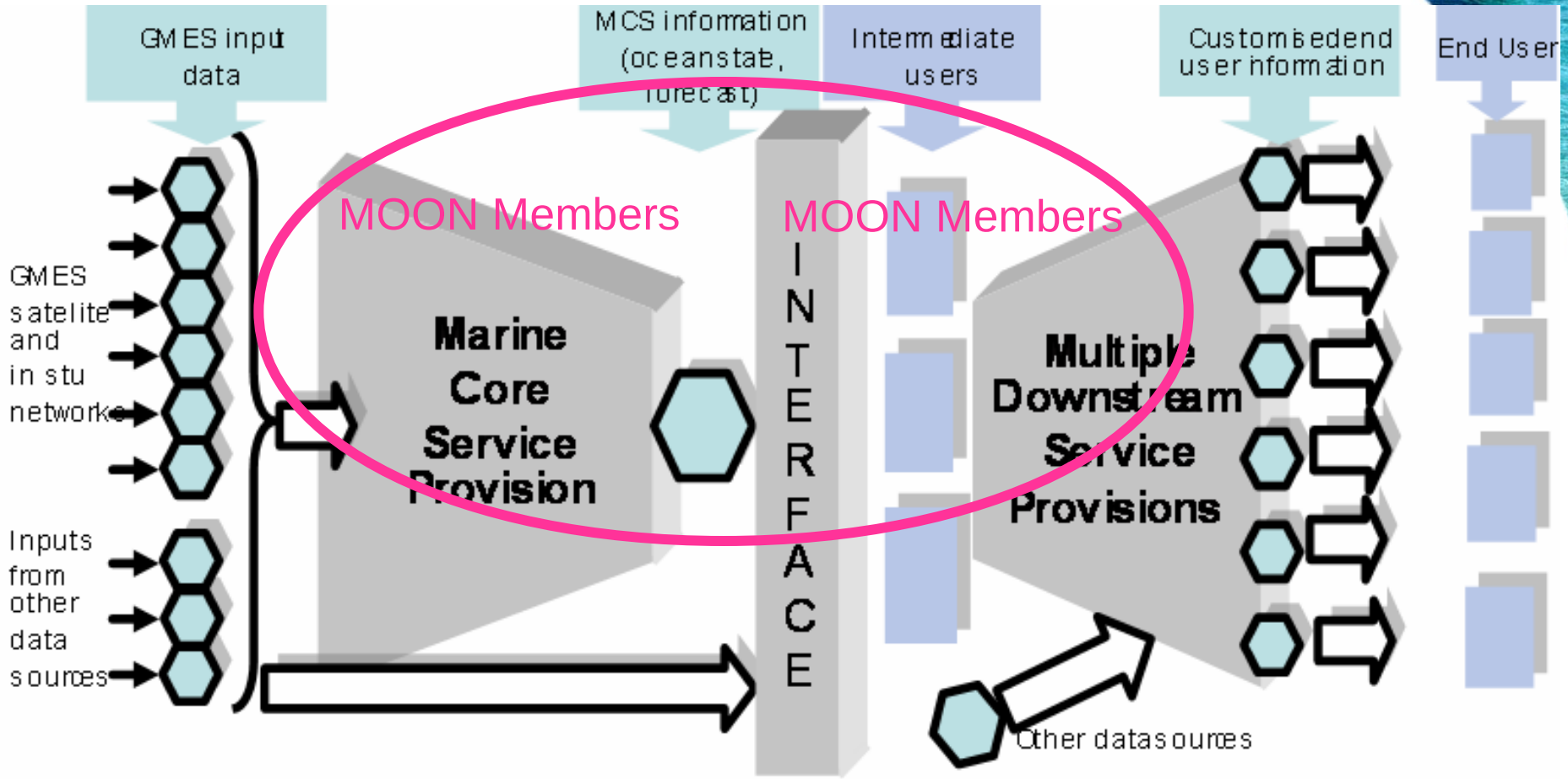
The Operational Oceanography approach



Continuos production of nowcasts/forecasts of relevant environmental state variables

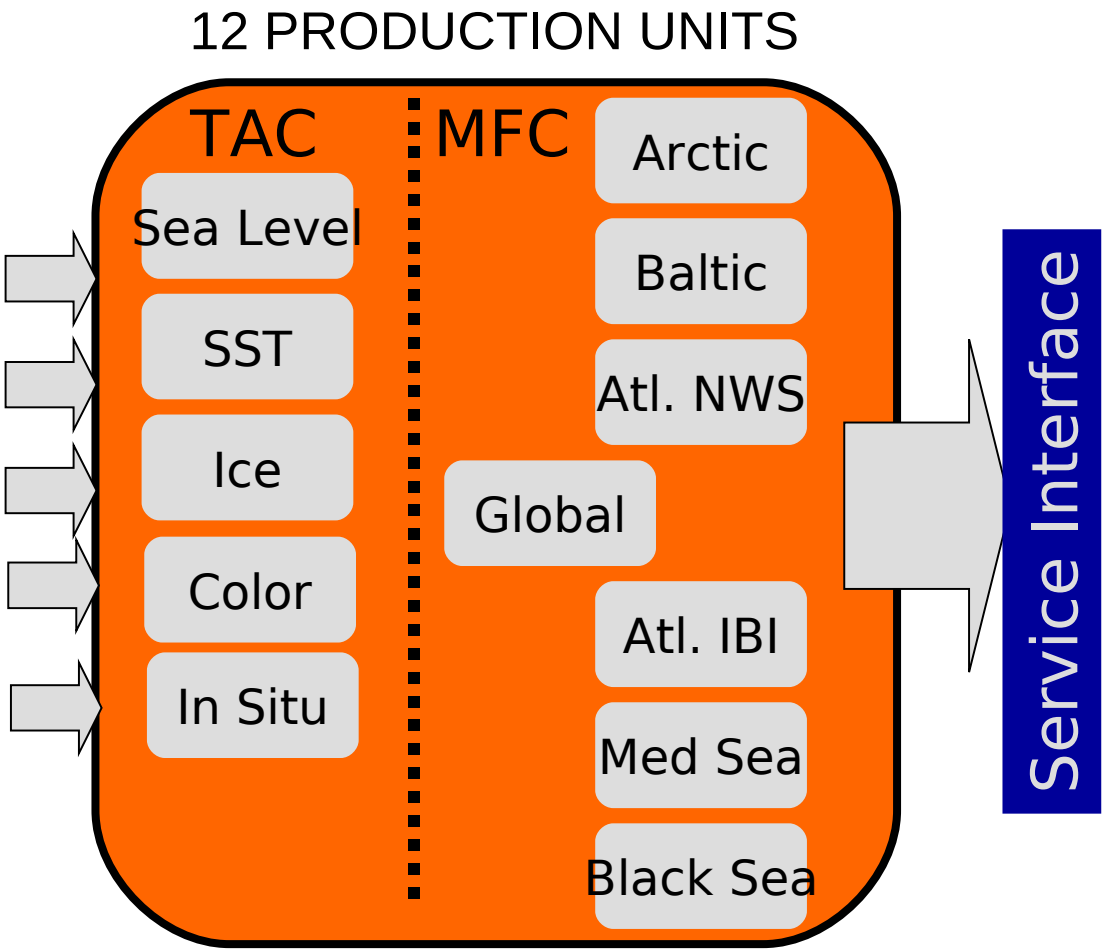
The operational approach:
from large to coastal space scales (NESTING),
weekly to monthly time scales

The European Marine “core” service: the Global Monitoring of Environment and Security (GMES) concept



From GMES MCS Implementation Group report by P.Ryder & al

The GMES Marine Core Service architecture: the *MyOcean* System of Systems



- **5 TAC : Thematic Assembly Centers**
  - "Observations"
- **1 global and 6 regional MFC: Monitoring and Forecasting Centers**
  - "Model / Assimilation"
- **Service Interface:**
  - Unique European entry
  - Bulk delivery
  - Help desk and expert support
  - Web portal

The implementation of operational oceanography in the Mediterranean Sea: 1998-today

RT Observing System satellite SST, SLA, VOS-XBT, moored multiparametric buoys, ARGO and gliders

Ocean forecasting models at basin and shelf scales Limited Area Atmospheric Models



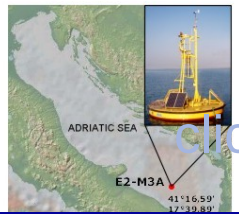
Ecosystem Models for the open ocean and the coastal areas

End-User applications Development of modules for oil spill monitoring, ICZM and fishery management

MOON: Mediterranean Operational Oceanography Network
10 nations involved, 26 institutions

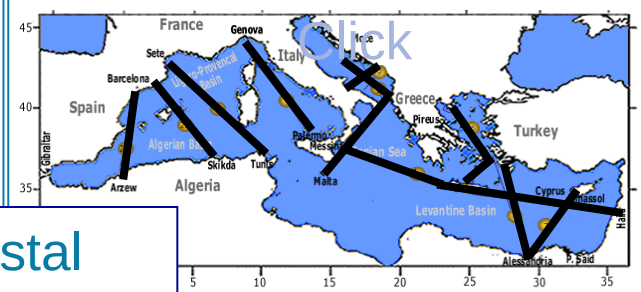
MOON upstream data collection
Basin Scale RT Observing System





click

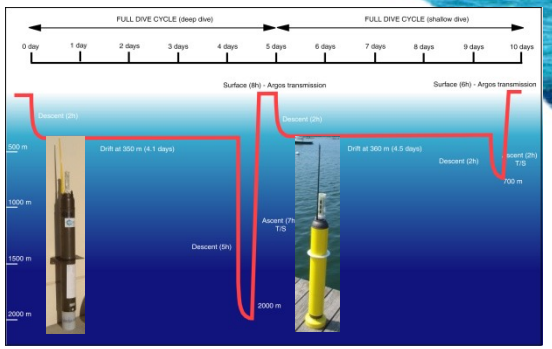
Multiparametric buoys in: Ligurian Sea, Adriatic Sea and Cretan Sea (few hours delay)



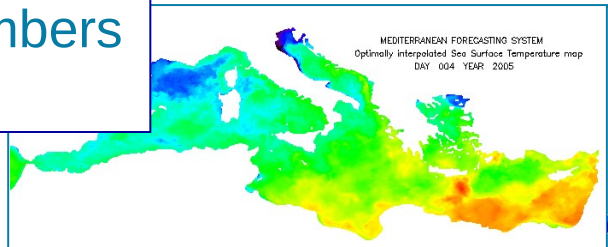
Click

OS/SOOP high resolution
along track and full profile
mission, few hours delay)

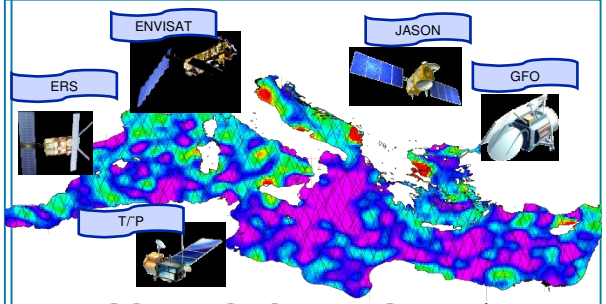
The National coastal networks are started to be interfaced and data shared between MOON Members in real time



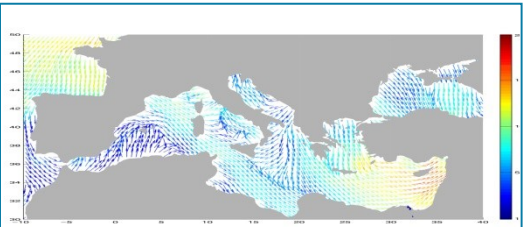
20 ARGO floats deployed from VOS (few hours delay)



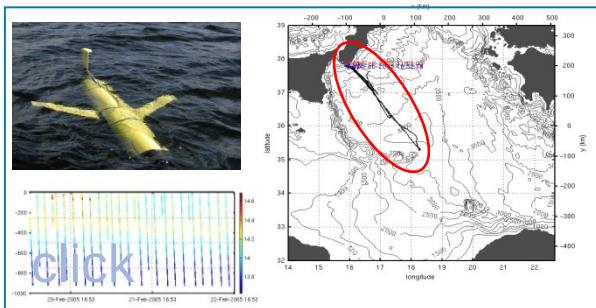
Daily satellite SST interpolated in RT on model grid (one day delay)



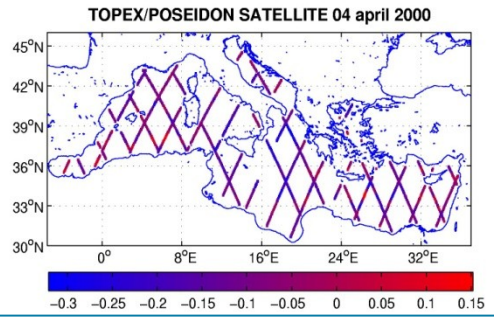
JASON-1, GFO, ENVISAT, T/P Sea Level Anomalies (few days delay)



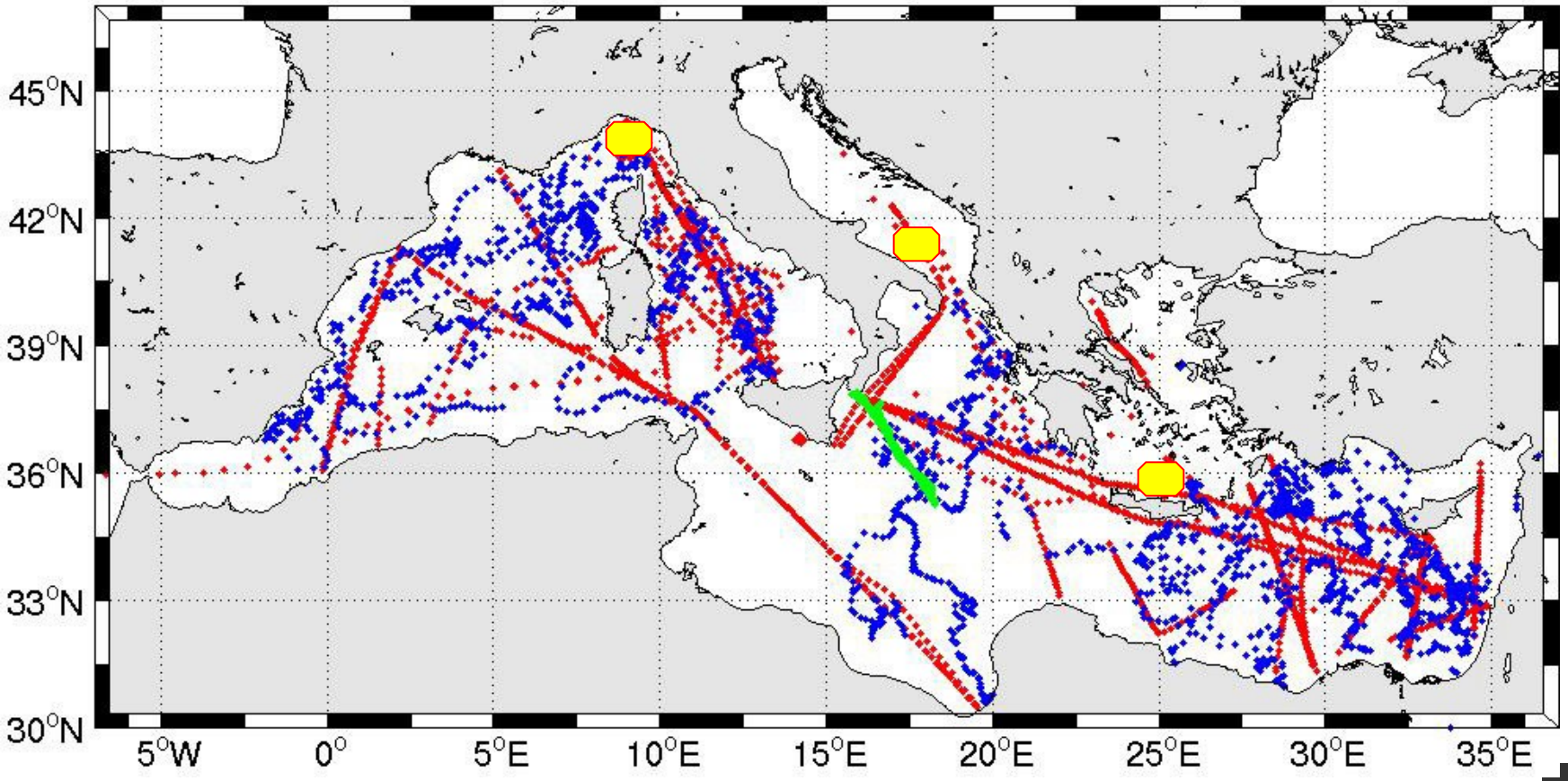
Scatterometer DAILY winds analysis, 1/2x1/2 (one week delay)



Open ocean monitoring by gliders (few hours delay)



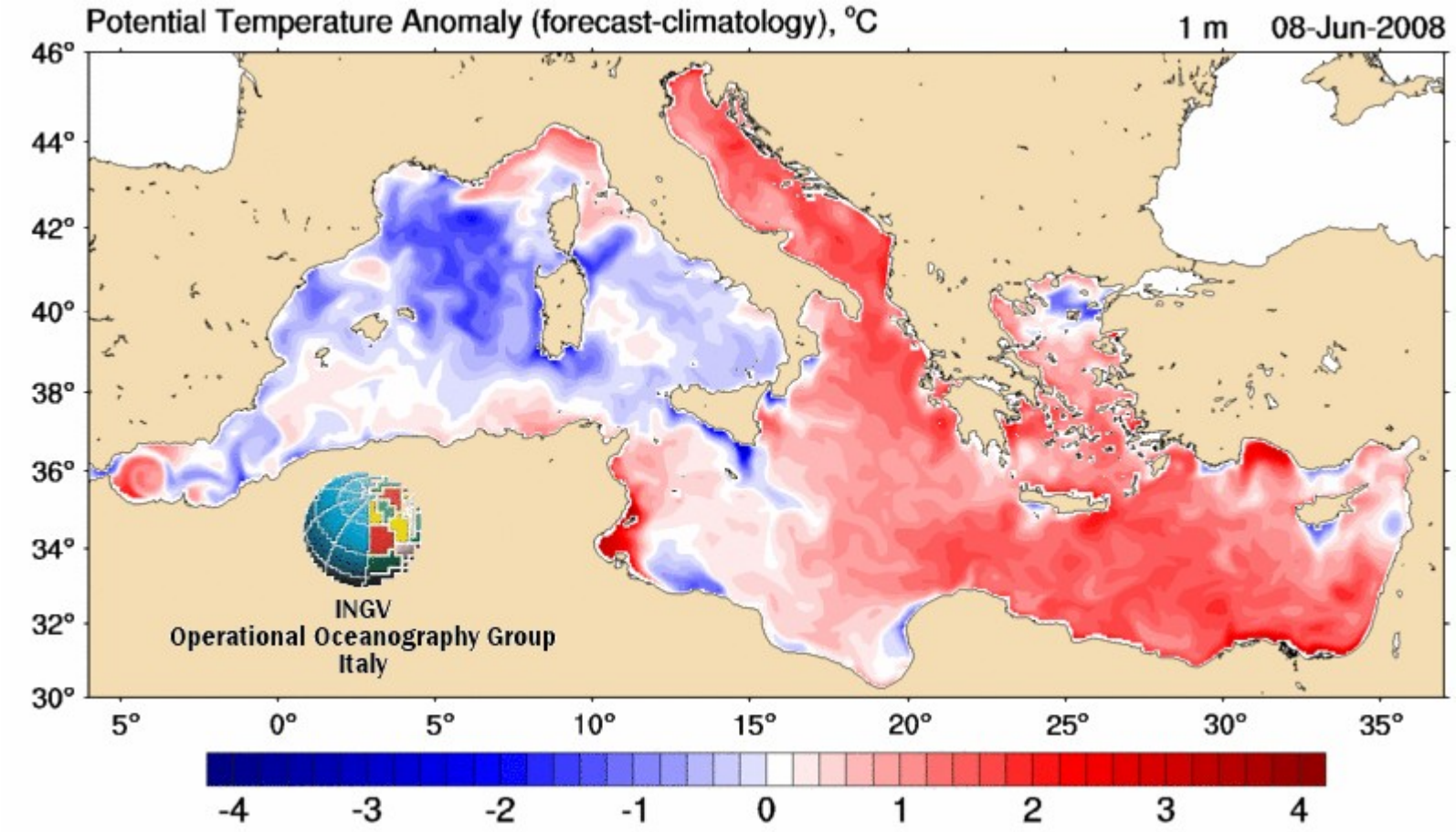
MOON now: real time data coverage (2004-2006 period)



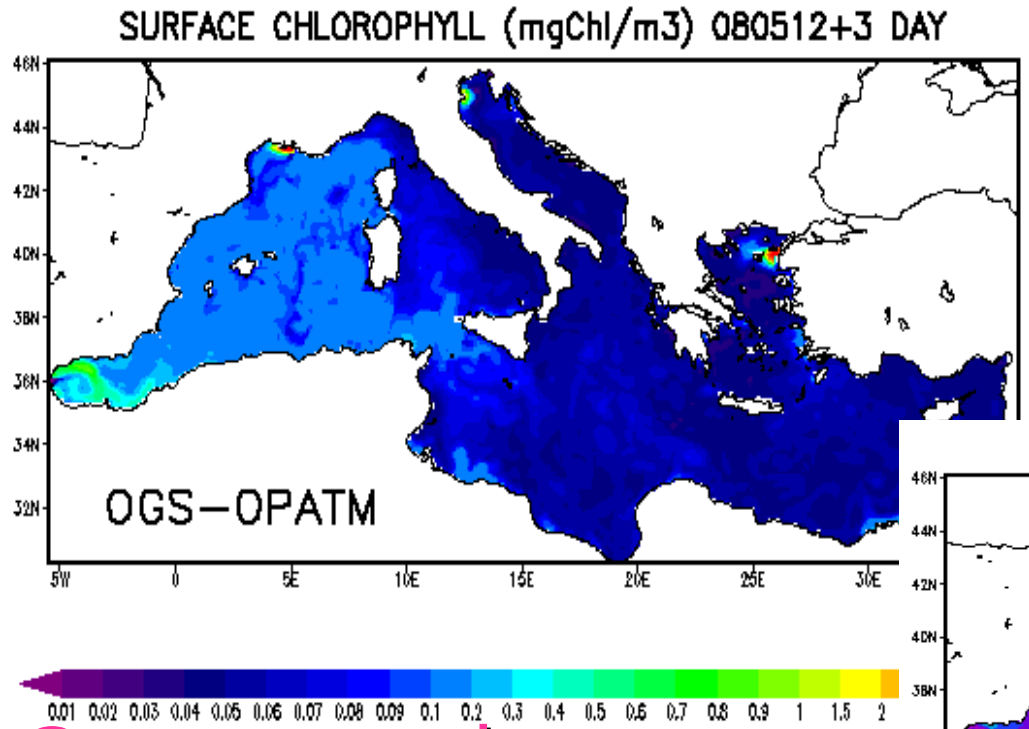
gliders SOOP ARGO M3A Buoy

The Med MFC: hydrodynamics analyses and forecasts at basin scales

http://gnoo.bo.ingv.it/mfs

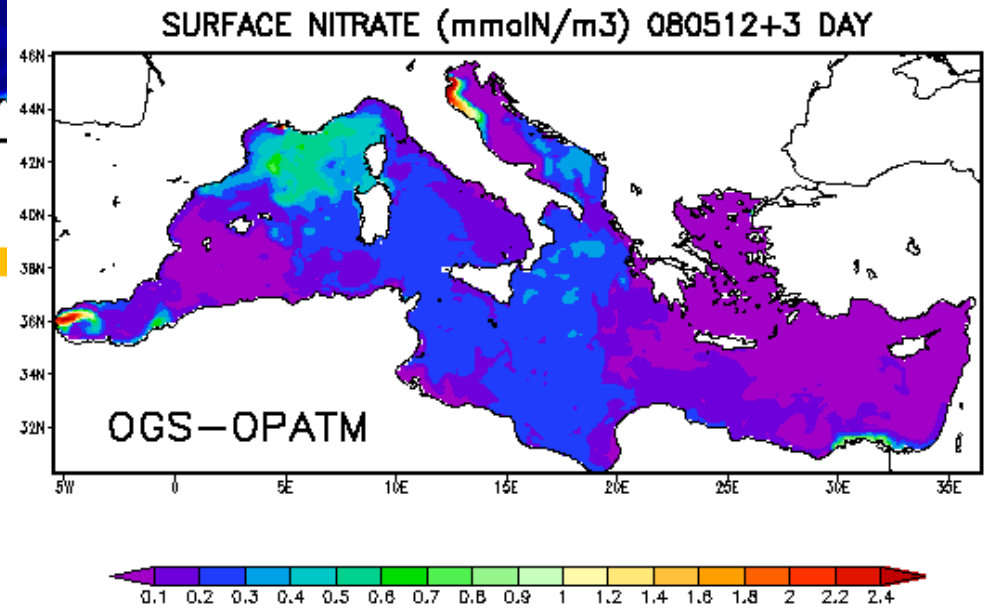


The Med MFC: pelagic biochemistry forecast



SURFACE CHOLOROPHYLL

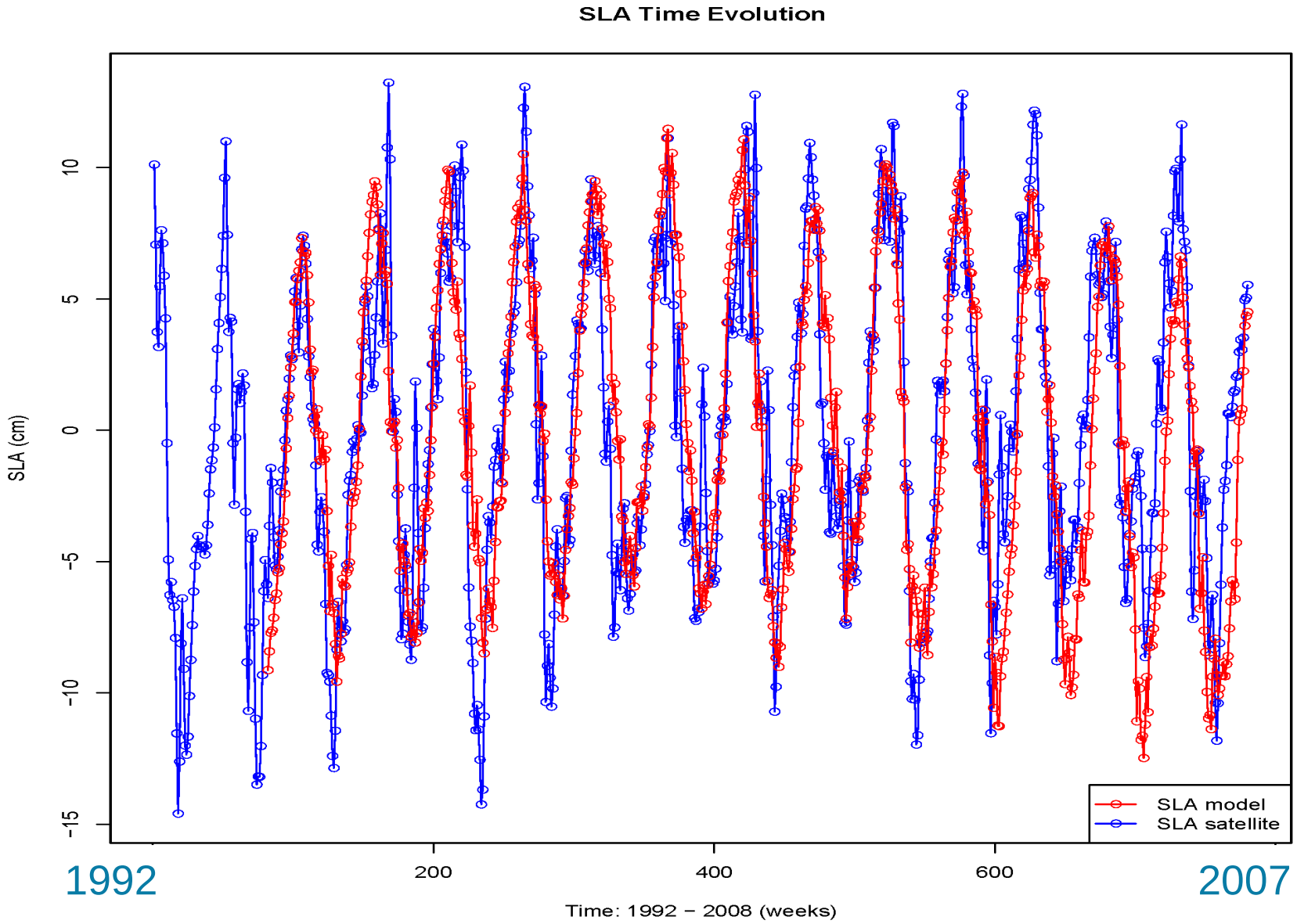
NITRATE



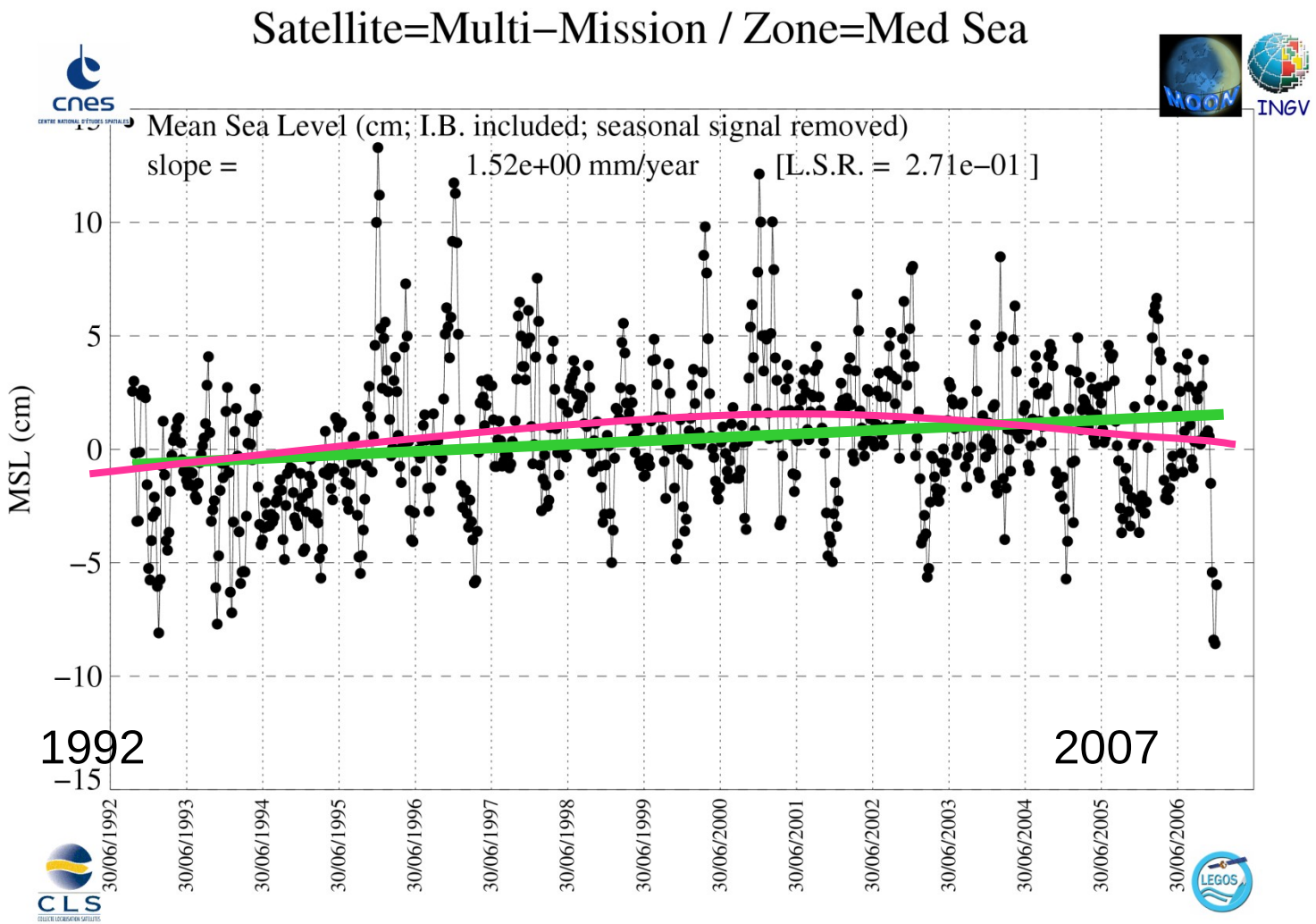
Once a week a 10 days forecast of pelagic primary producers biomass

GEO First Regional Workshop, Athens, 2008

MOON Sea Level Monitoring: Satellite altimetry and model estimates

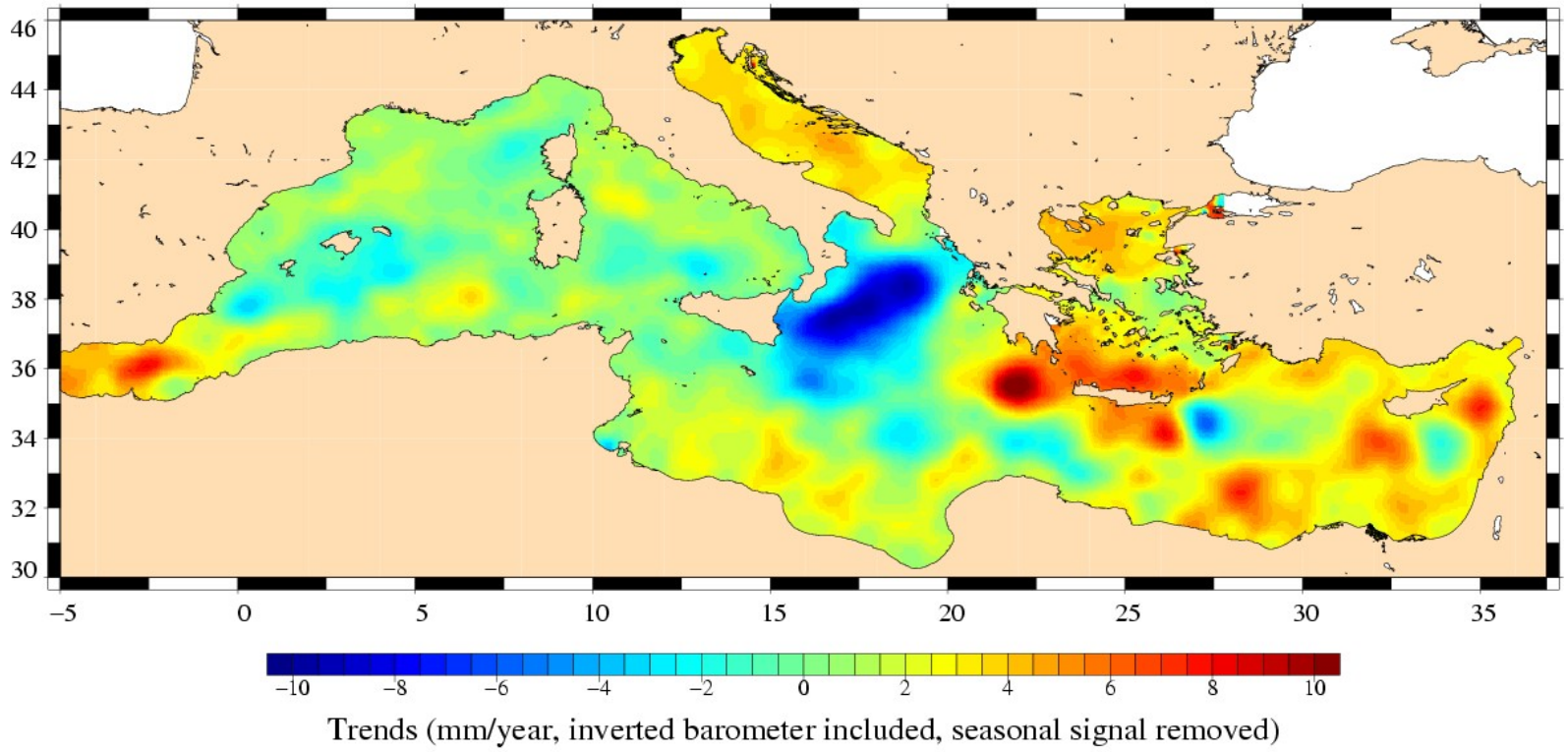


The Sea Level trends for the past 16 years



Slope: 1.52 mm/yr

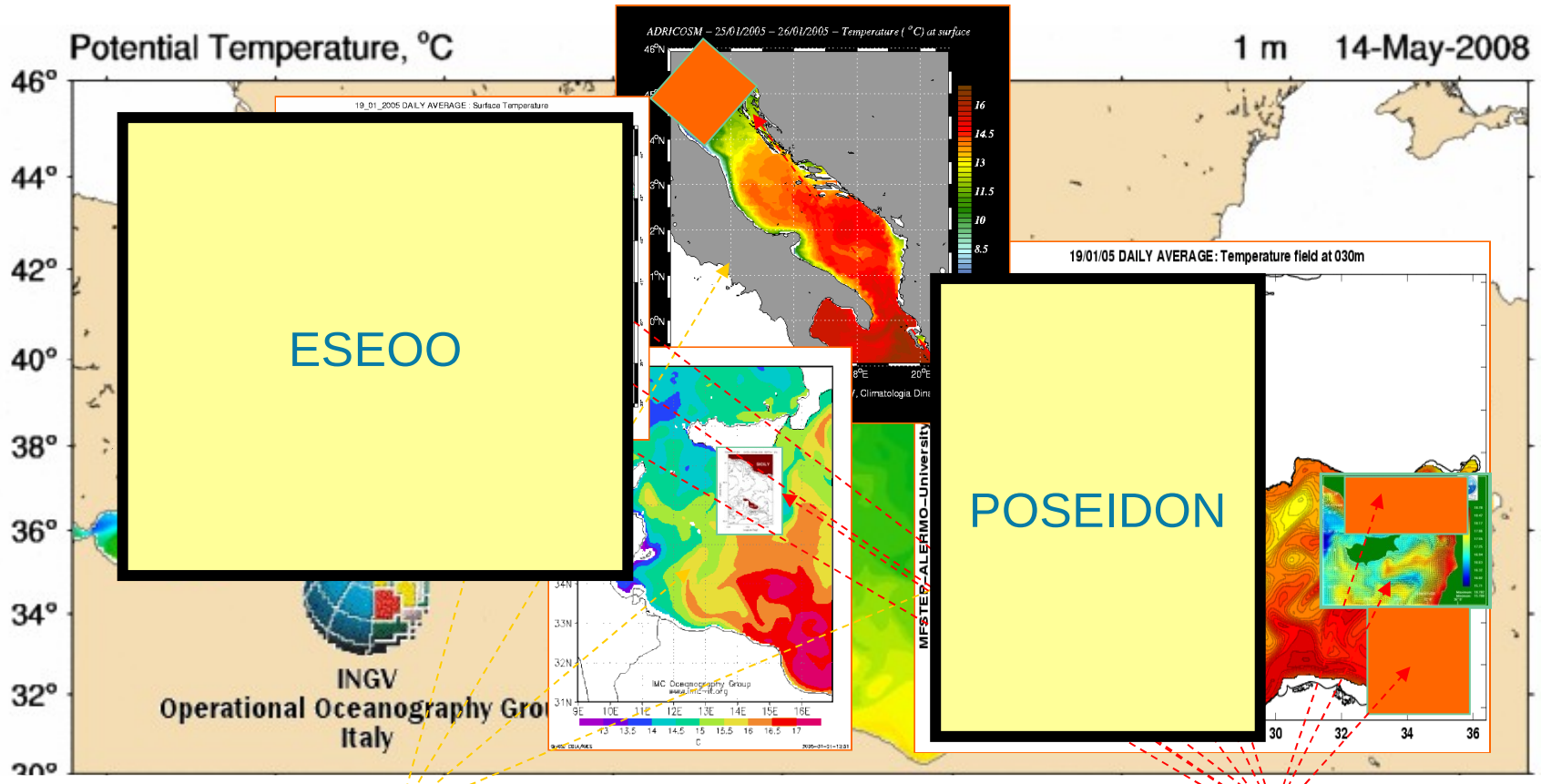
Horizontal structure of linear sea level trend



Sea level trend horizontal structure

MOON Downstream Services: from the basin scale to shelves

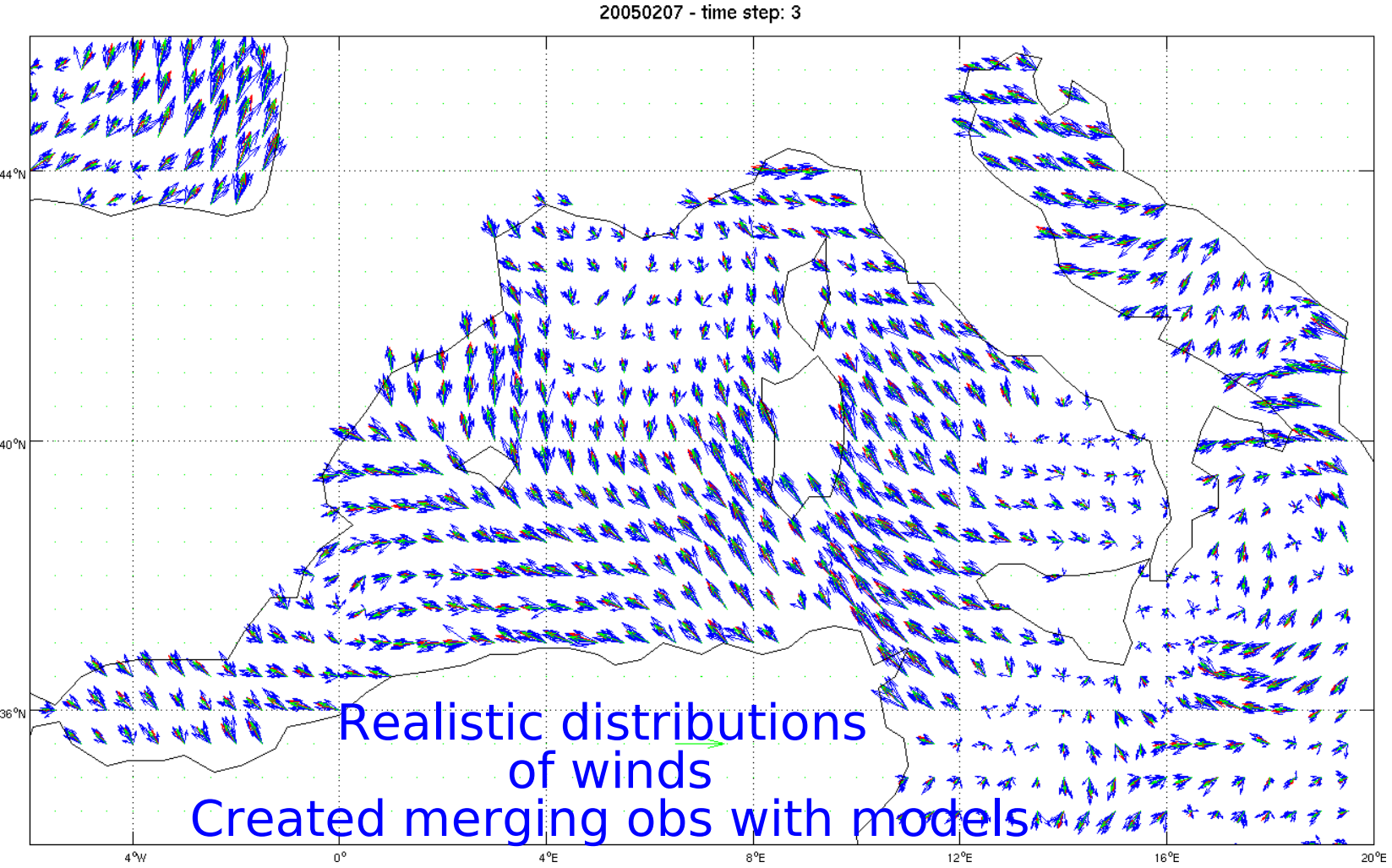
Every day an analysis and forecast of the marine state



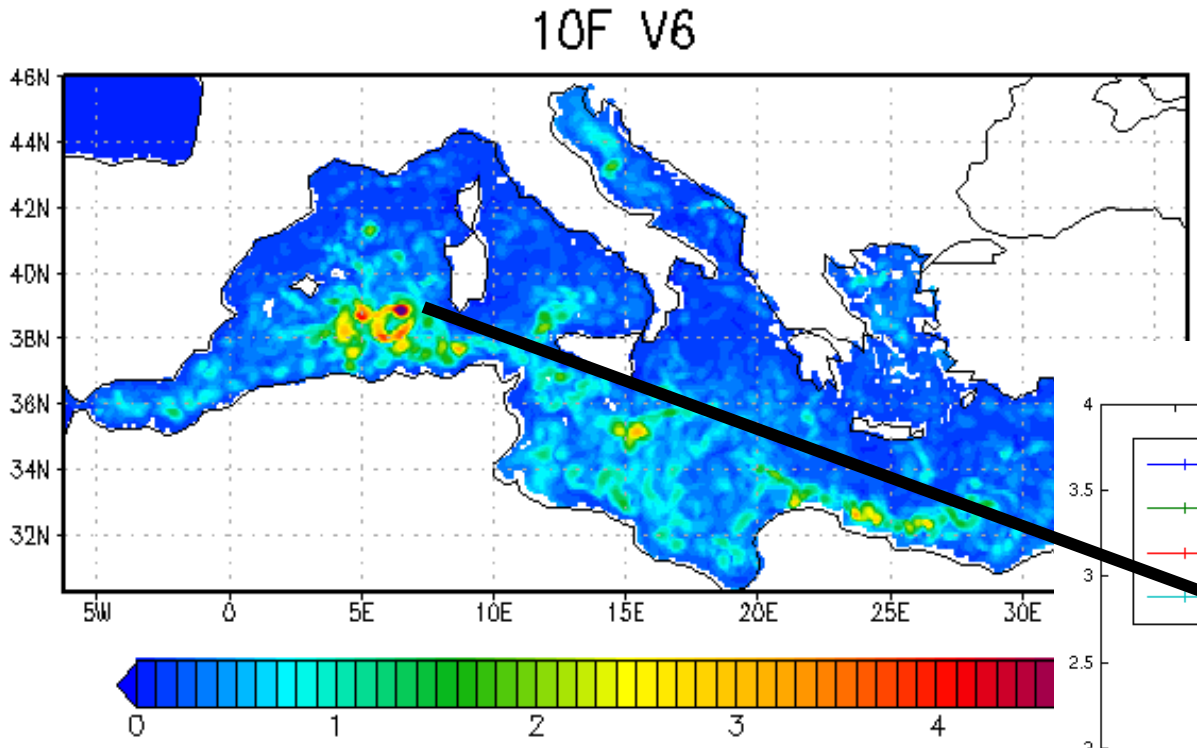
Sub-regional models at 3 km

Shelf models at 1-2 km

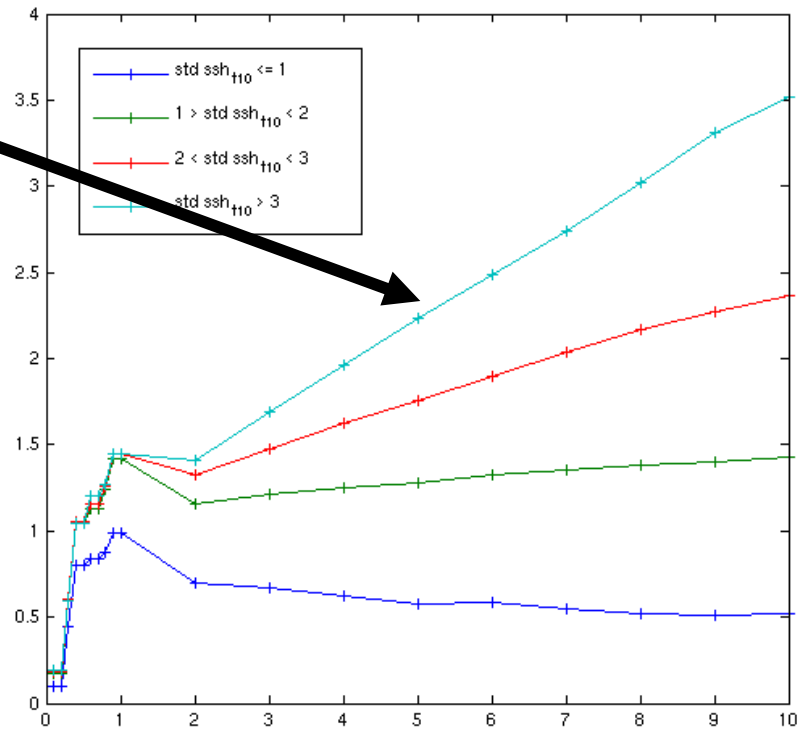
MOON research frontier: uncertainity estimates with ensemble forecast



MOON research frontier: ensemble model variance



S Ensemble 10-th day ensemble Spre



Final remarks

- Operational oceanography in the Mediterranean Sea is a reality with coordinated basin scale observations and forecasting models
- Sea level is one of the products of such system that will require carefull validation in the next five years
- The basic products of MOON should serve to downscale properly to the coasts
- Analyses and re-analyses from MOON will give the basic products to monitor climate variability and change in the basin
- Important considerations in the future will involve a good balance between operationality and continuous research