

Mediterranean Remote Sensing

Basin scale monitoring

Coastal zone monitoring

Near Real Time data availability

Distribution through MAMA WWW



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ICM-CSIC, Barcelona**

Remote sensing observations

Simultaneity over large areas

Repeatability at short time scales

Standardised and calibrated data

Cheap to users (*compare to in situ acquisition!*)

Easy access to different products

Although:

Less accurate than in situ measurements

Poor spatial resolution for certain applications

Only upper ocean

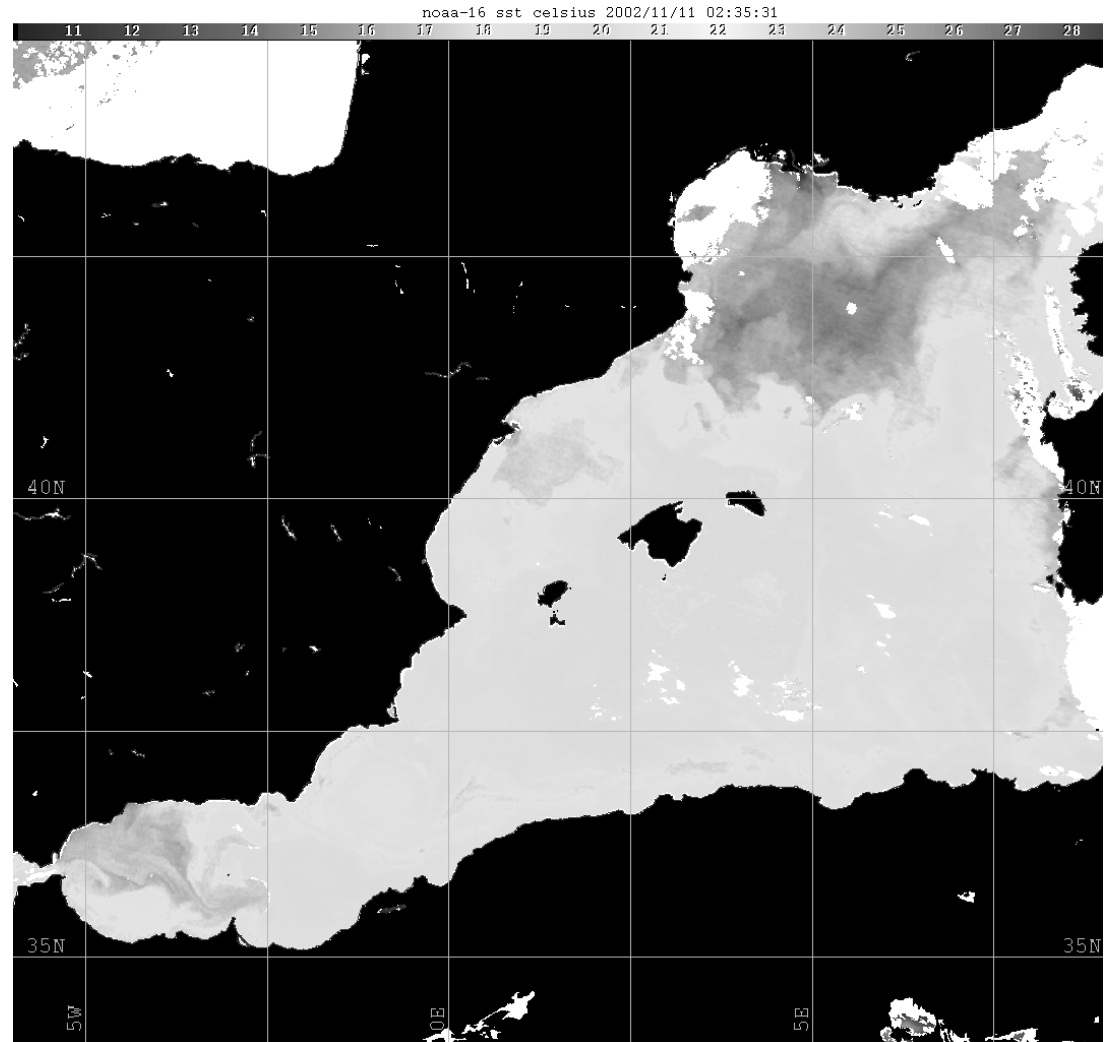
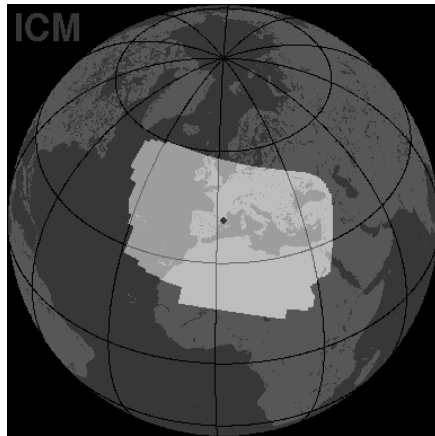
Possible atmospheric interference (e.g. clouds)

Huge effort for operating agencies!

Well known SST imagery:

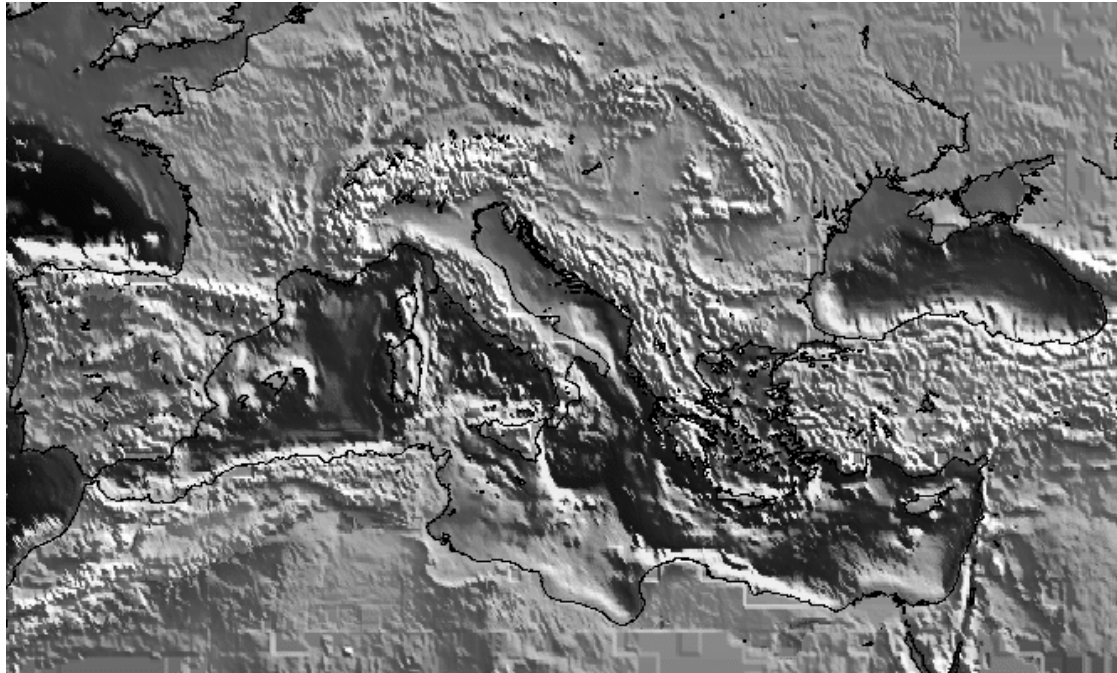
Single infrared images at near 1 km resolution available several times per day (free data, acquired by many stations in the Med area)

ICM Barcelona
11 Nov 2002
02:35 h



Long-term averages:

Mediterranean bathymetry derived from altimeter measurements

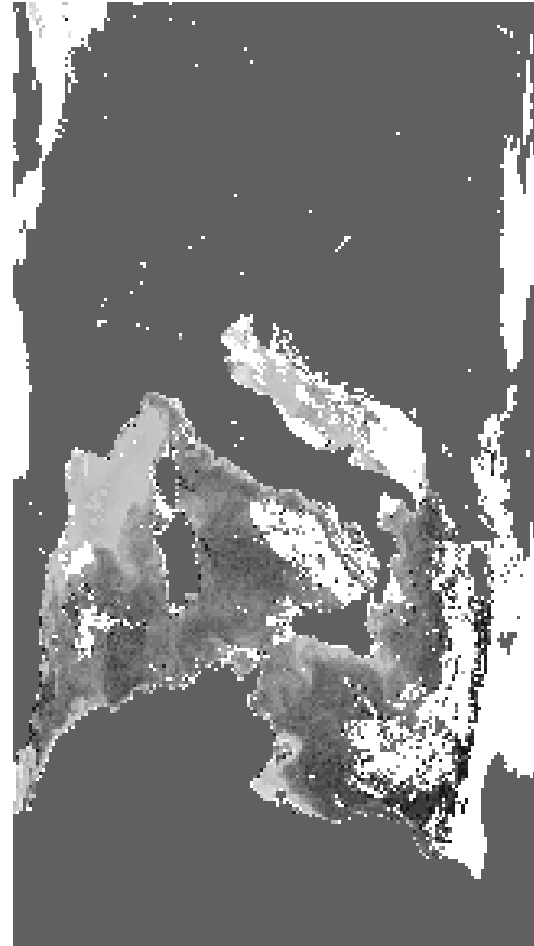
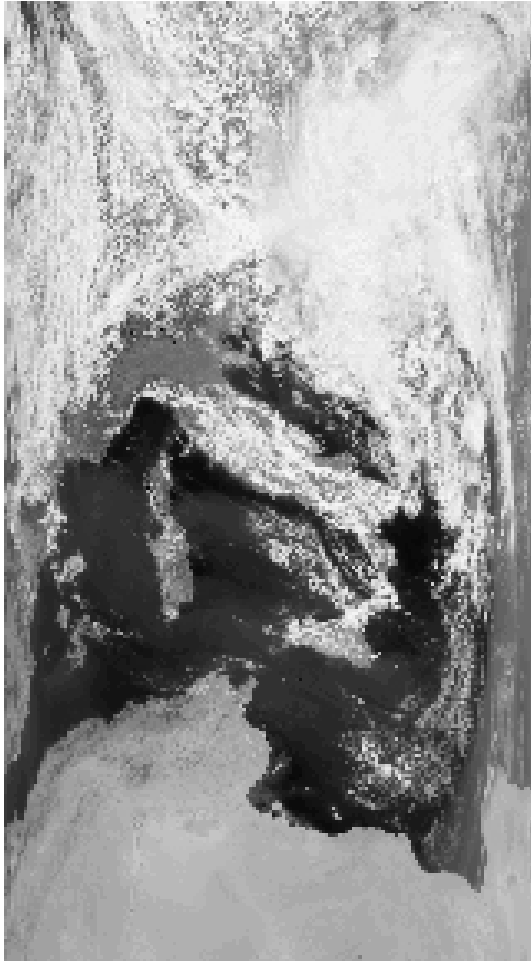


SeaWiFS: processed data

Ocean colour image acquired at ICM, Barcelona, 10 June 2002

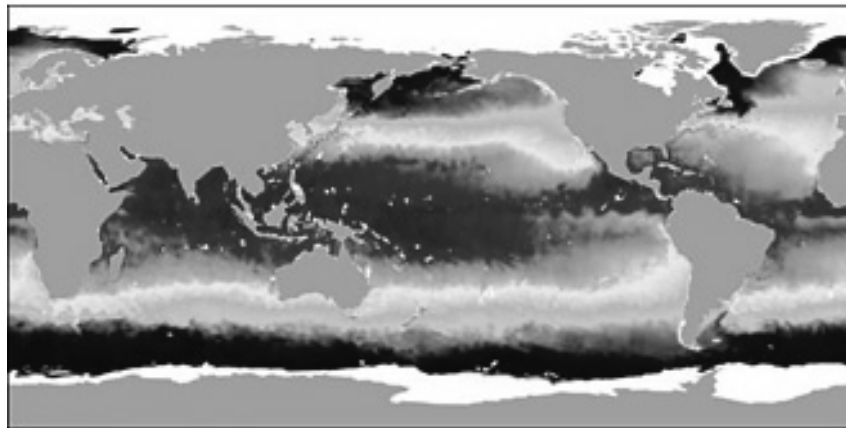
level 1: single channel radiance

level 2: chlorophyll concentration

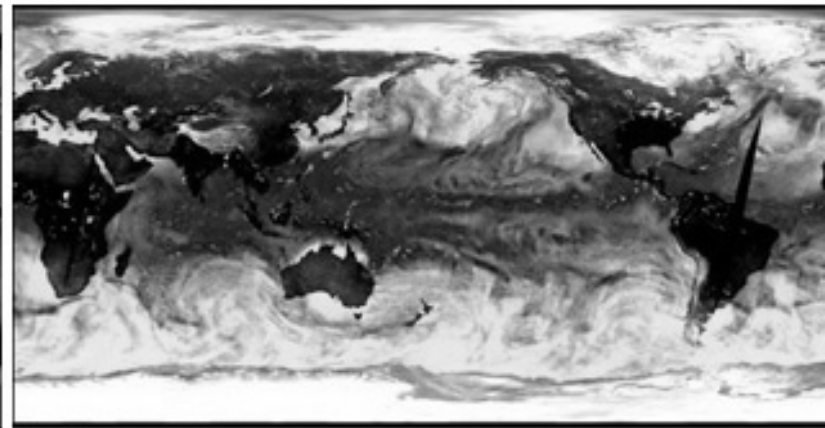


New sensors:

Sea surface temperature (6.9 GHz) and brightness temperature (89.0 and 23.8 GHz) high resolution global maps obtained by the Advanced Microwave Scanning Radiometer (AMSR-E from NASDA) on board the **AQUA** spacecraft from NASA, launched 4 May 2002



Sea Surface Temperature

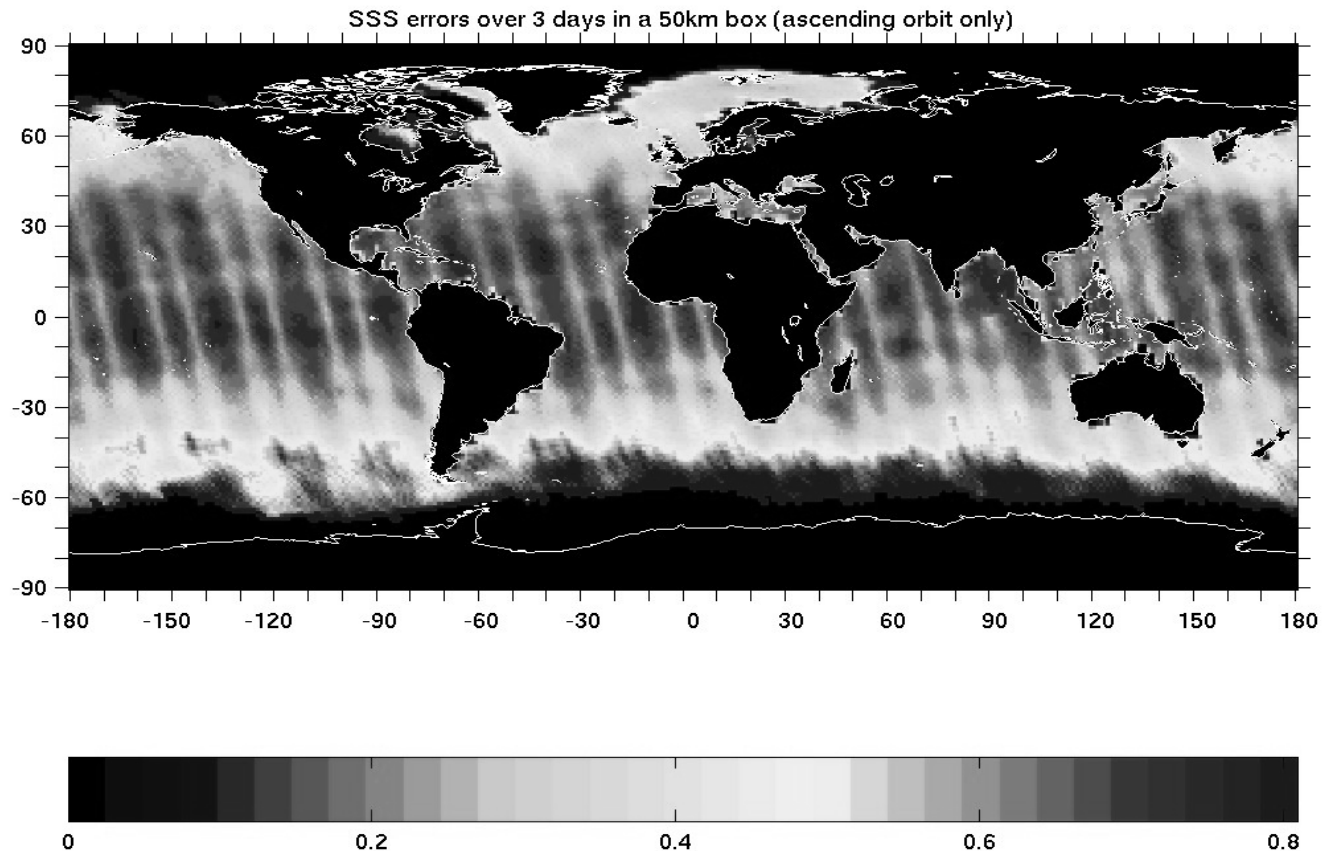


Brightness Temperature

Data averaged 2-4 June 2002

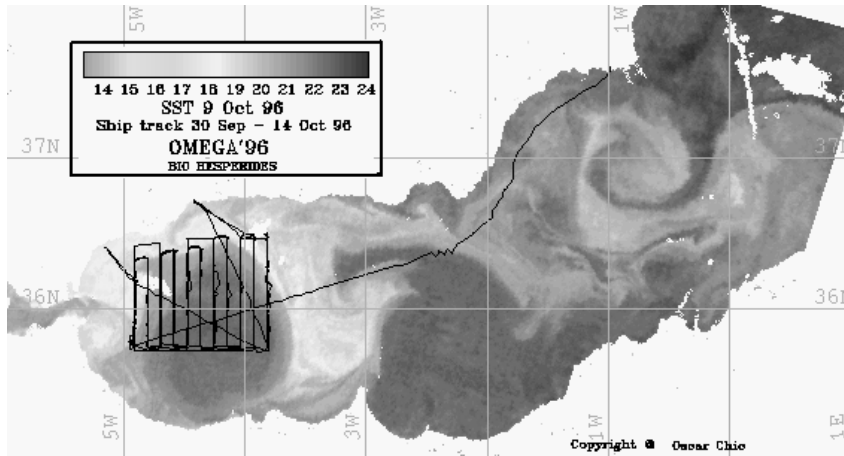
The future:

Expected uncertainty in salinity measurements by SMOS (ESA mission, expected launch 2006)

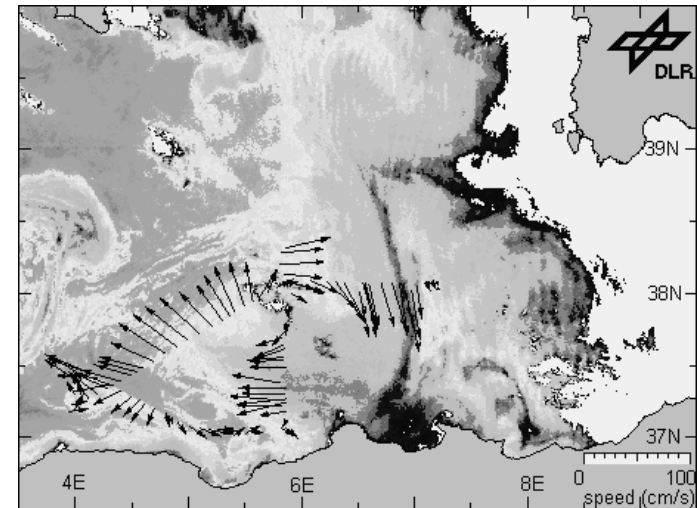
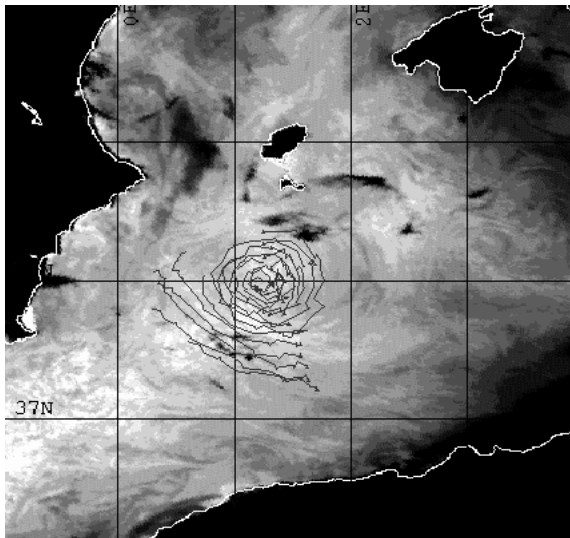


Example of Real Time (not Near) application:

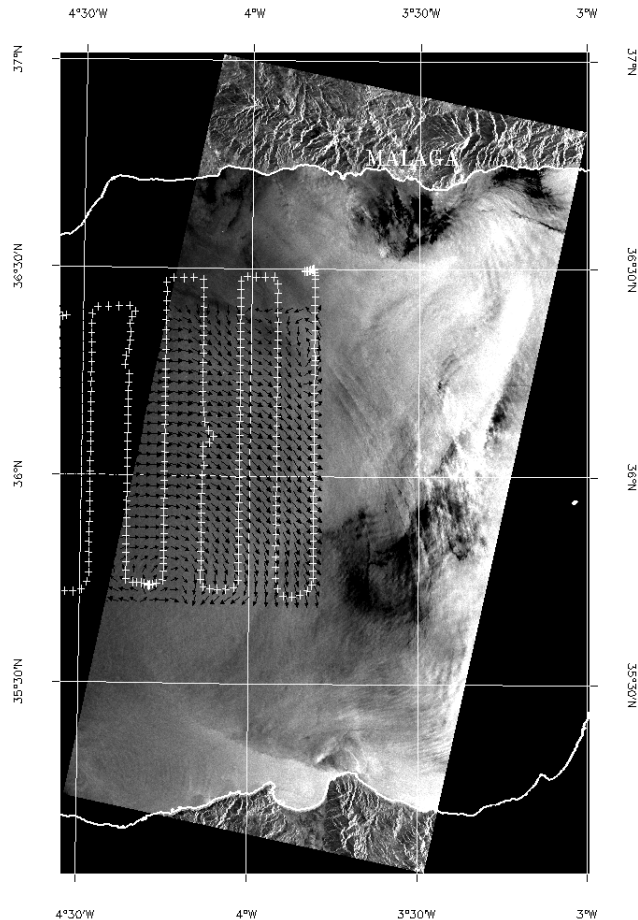
Fine tuning of hydrographic surveys of mesoscale circulation guided by infrared images provided by an on-board satellite receiving station or transmitted in few hours



MATER cruises
Alboran Sea, 1996
E Algerian Basin, 1997
W Algerian Basin, 1998



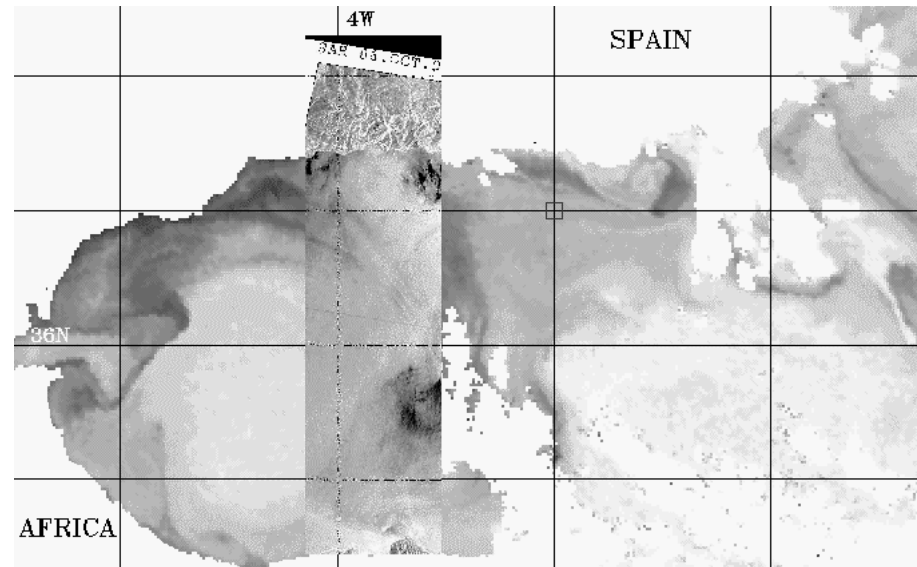
Near Real Time data reception:



Alboran Sea, October 1996

Processed ERS-2 Synthetic Aperture Radar image received with 24 h delay

Multi-sensor: SST + SAR



Basin scale monitoring

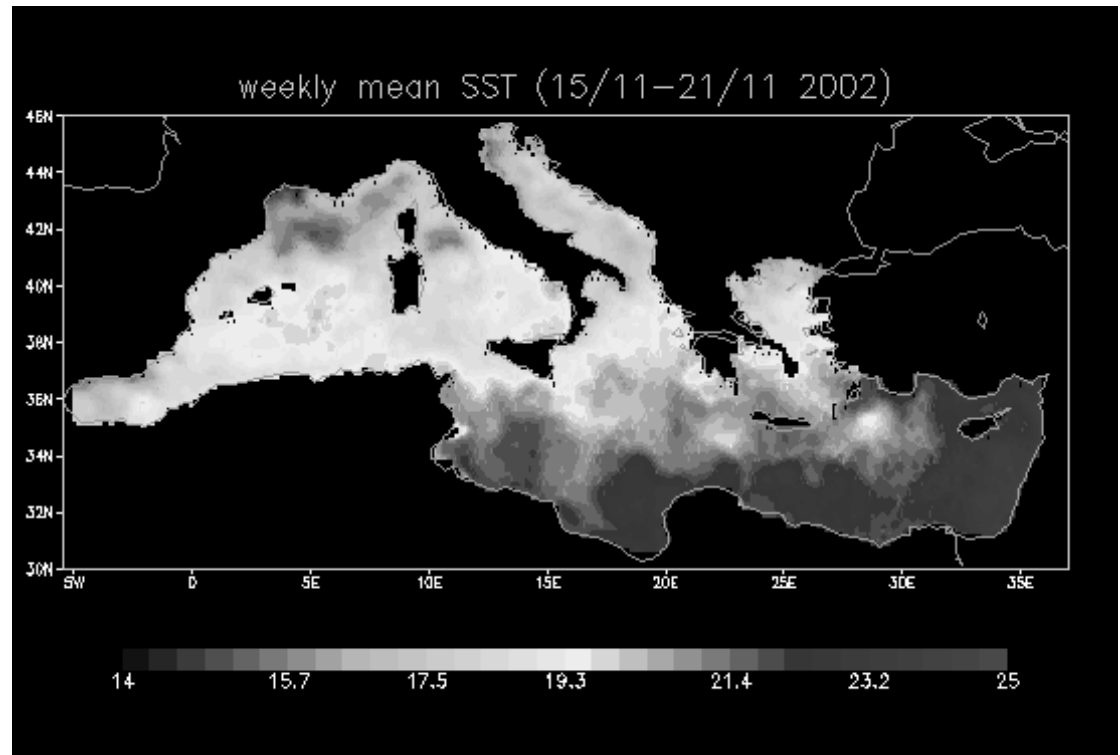
Global coverage

7-10 days composites

Data assimilation for circulation models

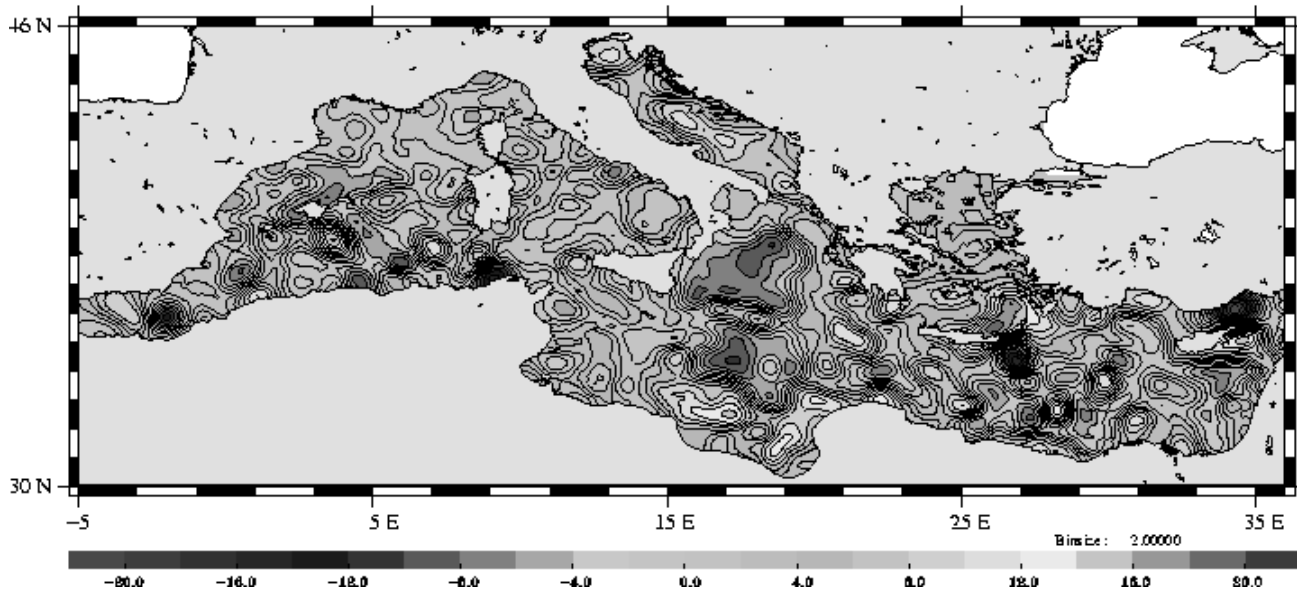
Example: MFS-PP bulletin products

SST weekly
mean



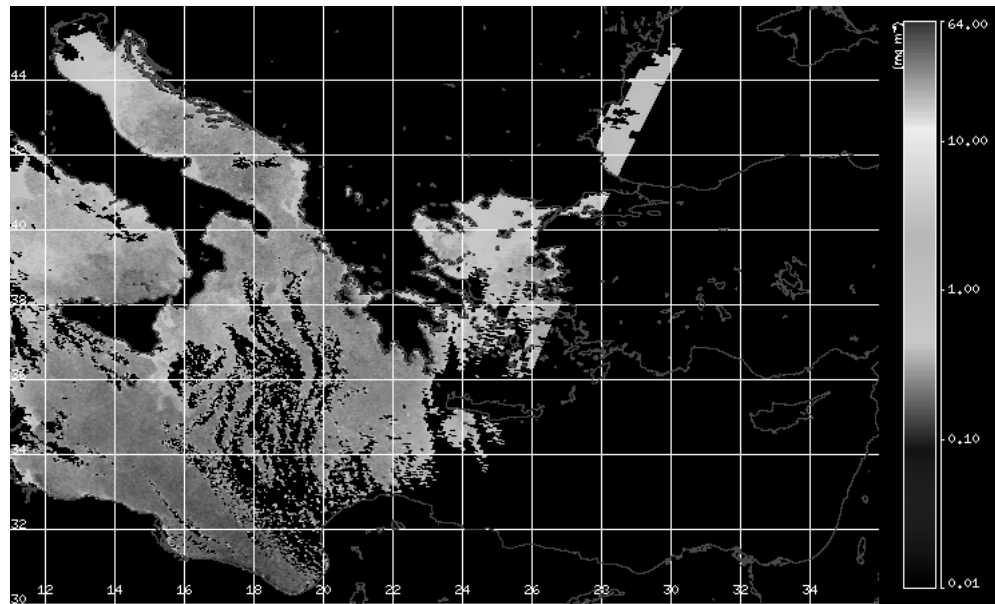
Mediterranean Forecasting System:

SLA TP + ERS-2, 19036



Sea Level Anomaly
10-day map

Chlorophyll
concentration
(single image)

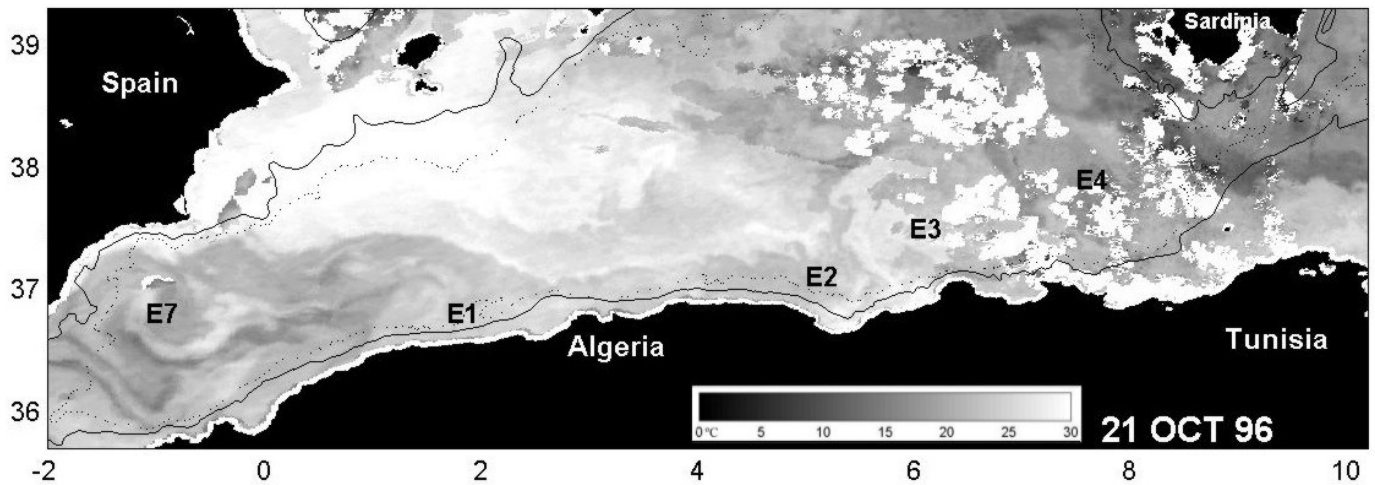
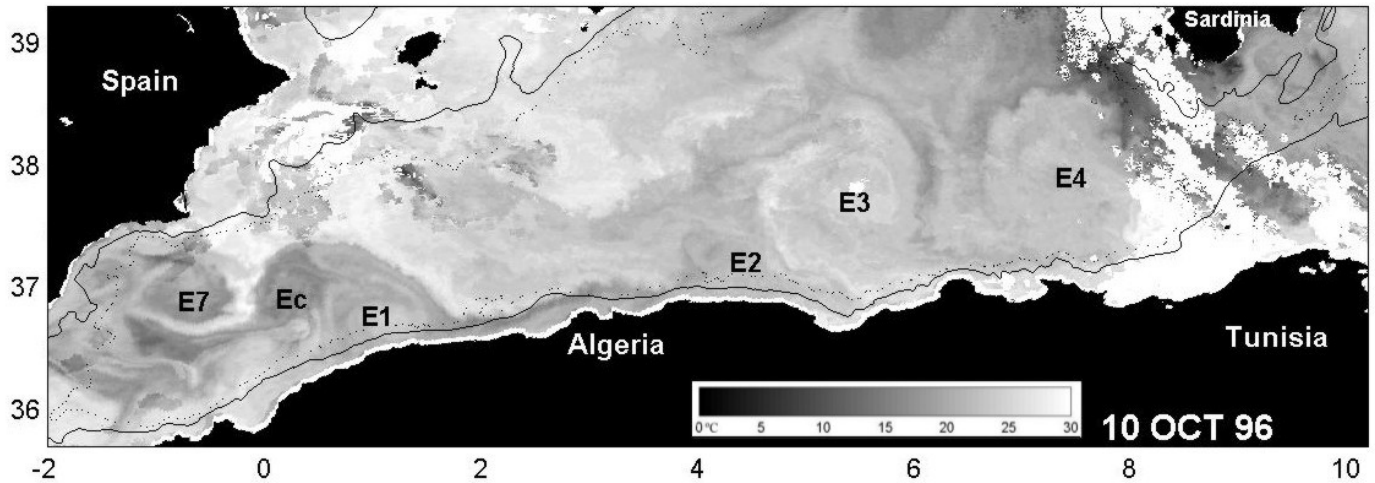


December 2000

Off-line products: Use of processed data from different sensors, vegetation index over land (AVHRR) + phytoplankton concentration over sea (CZCS)



Sub-basin scale



Algerian basin eddies tracked in daily composites of SST images

MAMA 3rd Meeting, Athens, 1-5

December 2000

Coastal zone monitoring

**Key aspect in MAMA-OBS
Not developed in MFS-PP**

Variety of applications

High spatial resolution needed

NRT needed in many cases

Relatively easy ground truth

Integration in Geographical Information Systems

Problems:

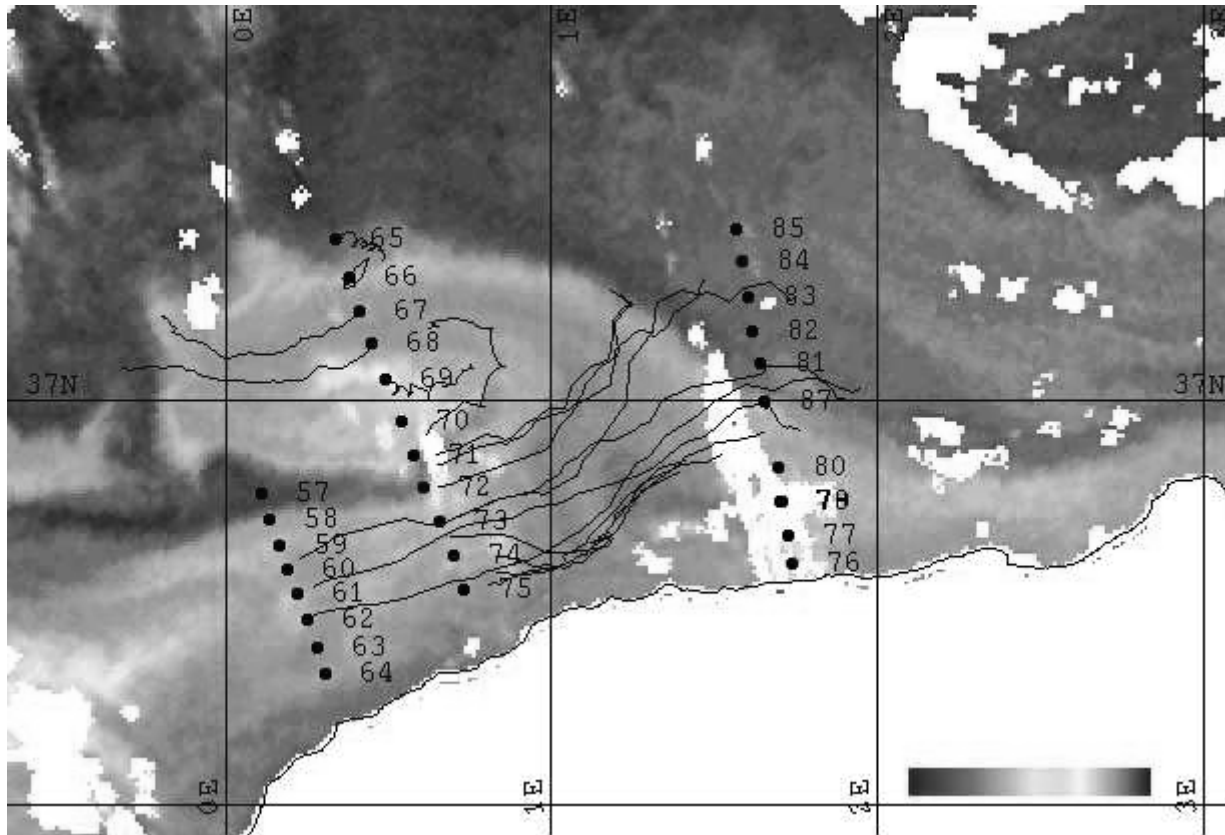
Some sensors at low temporal resolution

Some products very expensive

Difficult access at NRT (processing)

Real time AVHRR

Rapid evolution of a coastal event off Algeria tracked by surface drifters released in different parts of its structure following remote sensing information (SST at 1.1 km resolution)



Delayed mode (14 days) SeaWiFS

Moderate resolution (4 km) ocean colour image of a river discharge (Ebro delta, NW Mediterranean, 6 August 2001)

1° x 1° subscene

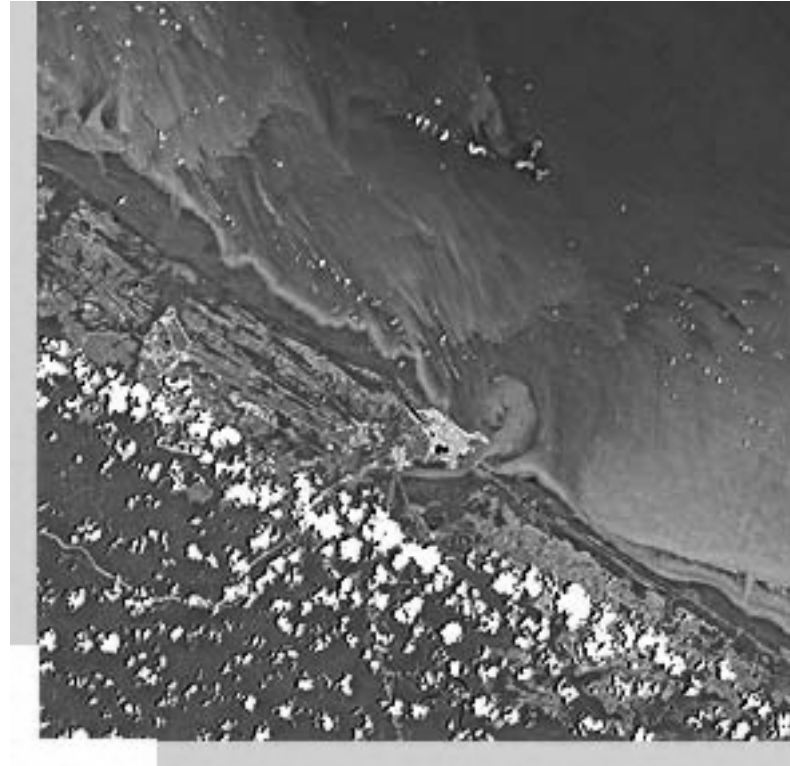


High spatial resolution imagery

LANDSAT 7



SPOT 4



Multispectral radiometers produce high spatial resolution (10-20 m) images suitable for coastal applications

ENVISAT MERIS image of Sicily

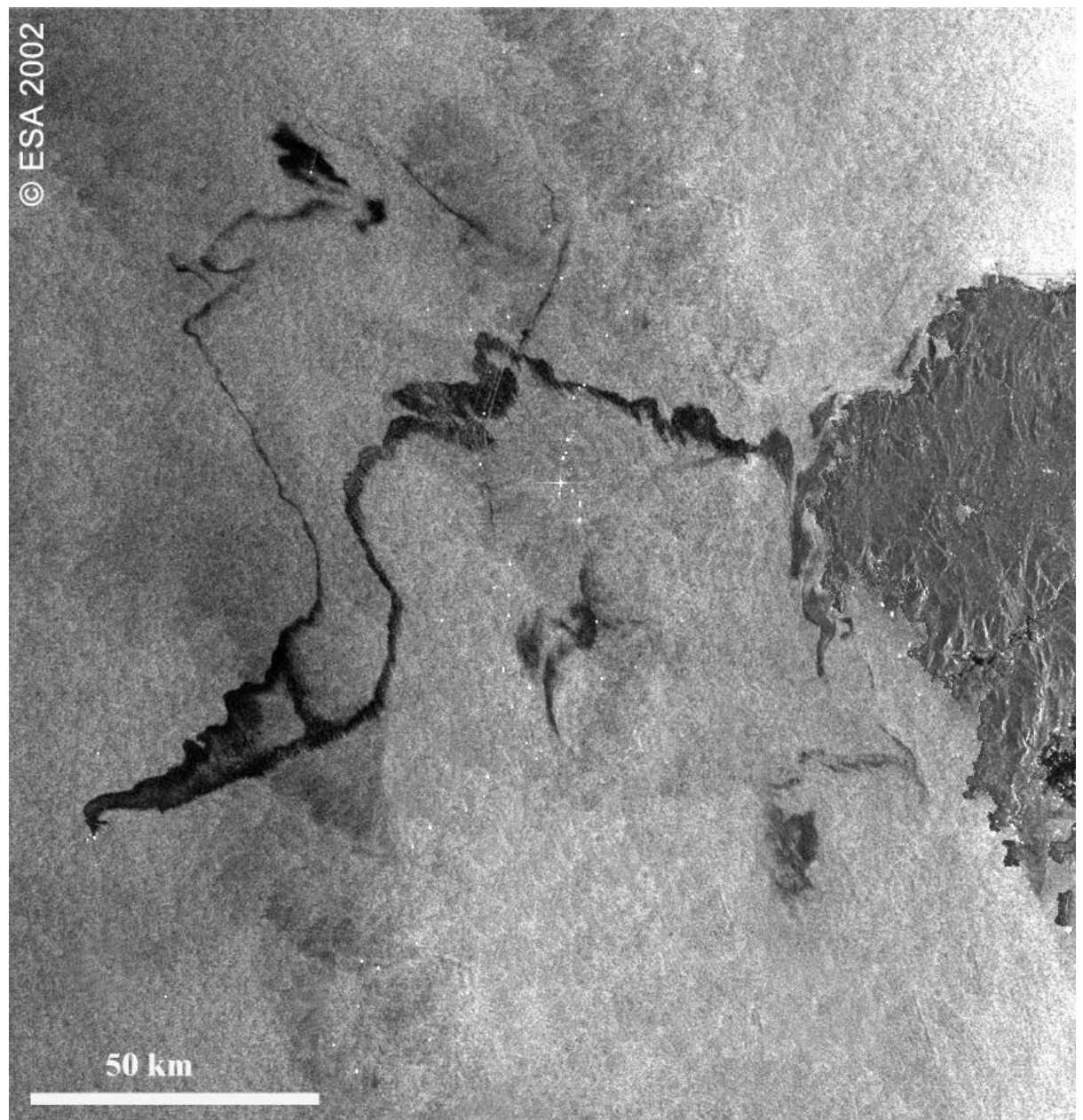
21 March 2002. MEidium Resolution Imaging Instrument (MERIS) at 300 m resolution. The green colour of the water along the southern coast of Sicily is due to the coastal erosion by currents in the straits of Sicily. Suspended matter taken away from the beaches is visible in the long plume extending along the southeast extremity of the island



Synthetic Aperture Radar

Oil spill
off Galicia
Nov. 2002

ENVISAT
ASAR



Sofisticated coastal remote sensing monitoring

The ARGUS multi-camera video system, ICM Barcelona

1 June 2002, 18 h



MAMA Remote Sensing strategy for coastal monitoring

What are the partners needs?

- Objectives

- Requirements

- Sampling scales

What can we achieve?

- Near Real Time

- Delayed mode

- Access through MAMA www

Complementarity to *in situ* monitoring

Priorities for the MedGOOS Initial Observing System

Coastal Ocean Observation Panel

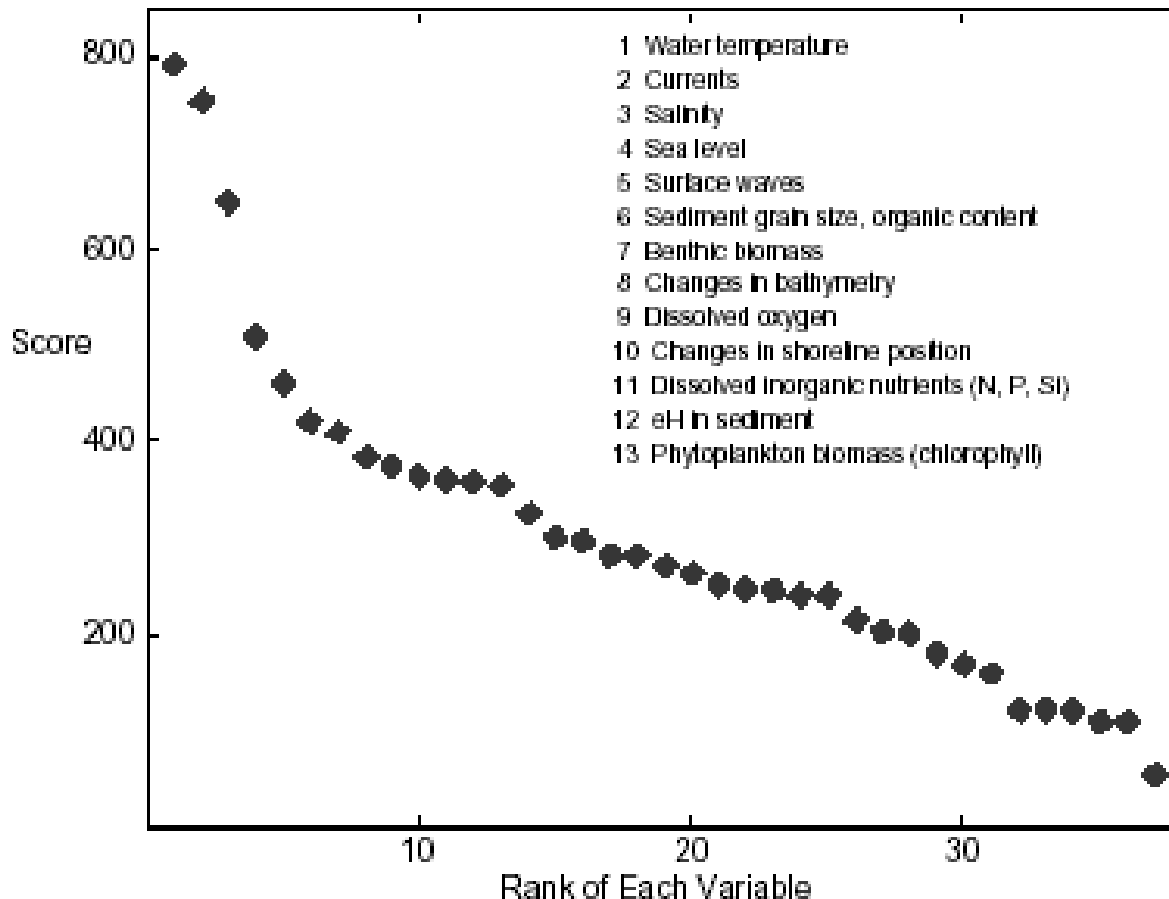
Responsible for the coastal module of GOOS. It has established the main phenomena of interest grouped into four themes

Table 1: The major phenomena of interest to the Coastal Ocean Observations Panel.

Coastal Theme	Main Phenomena of Interest
Coastal Marine Services and Hazards	Sea level Changes in shallow water bathymetry Sea state Shoreline changes Coastal circulation and hydrography
Living Marine Resources	Changes in the abundance of exploitable living marine resources Change in landings (both plants and animals) Changes in aquaculture production
Ecosystem Health	Habitat modification and loss Changes in biodiversity Invasive species Eutrophication Harmful algal events Disease and mass mortalities of marine organisms Biological effects of chemical contaminants
Public Health	Seafood contamination Abundance of pathogens

COOP: priorities for monitoring

Assessment of user interest in 37 variables, based on their ability to predict change through coastal ecosystem models



MAMA-OBS 2.5 “*Evaluation of the NRT satellite data*”

1. Survey on available NRT remote sensing data for the Med. area

(observed variables, level of processing, accuracy, spatial resolution, spatial and temporal coverage, NRT delay, data sources, authorisation/cost)

SST single passes (ICM Barcelona, DFMR Nicosia)
 daily composites at 1 km (IFA Roma)
 daily composites at 2 km (JRC Ispra, NASA-JPL)
 weekly composites (MFSTEP)

Colour daily SeaWiFS Chl.a (IFA ROMA for ADRICOSM)
 MERIS (ESA, during demonstration test period)

SSH 10 day maps (MFSTEP)

other possible? roughness (SAR), surface wind ...

Further activities for MAMA-OBS task 2.5

2. Survey on partners' product needs for water quality control and assimilation into models
3. Submission to ESA of a proposal for the demonstration use of ENVISAT -MERIS ocean colour NRT data in MAMA
4. Analysis of possibilities to generate/adapt new products within MedGOOS to fit partners needs
5. Organisation of links to MAMA-NET for partners access to operational data
6. Test of NRT data access to all MAMA partners for non-standard (or not free) products during demonstration test period
7. Analysis of possible provision of interpretative tools

EARSeL Special Interest Group:

Remote Sensing of the Coastal Zone

<http://las.physik.uni-oldenburg.de/projekte/earsel/>

The SIG is a platform for information exchange among people interested in:

- *the physical dynamics of currents, tides, waves and sediment transport,*
- *the flux and transformation of chemical and biological seawater constituents including pollutants,*
- *the relevance of physical conditions for biological and chemical processes,*
- *morphodynamical processes and their relevance for coastal engineering,*
- *the relevance of these factors for living conditions, tourism, shipping and economy*

and their investigation with Remote Sensing