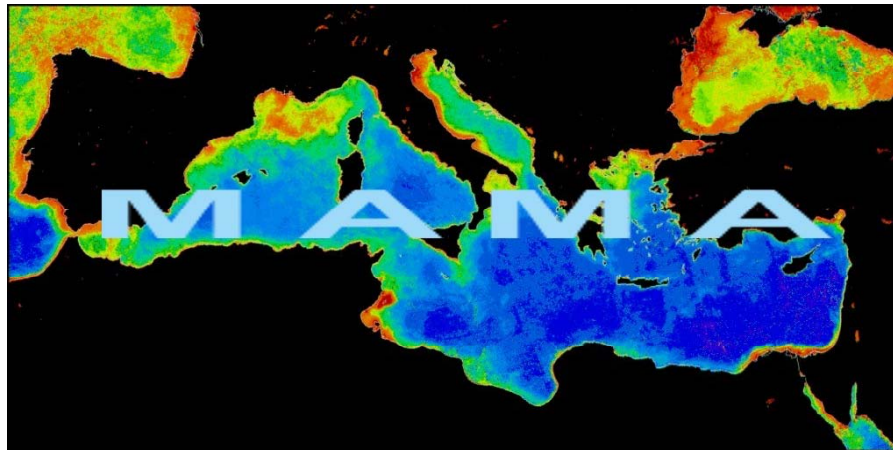Mediterranean network to Assess and upgrade the Monitoring and forecasting Activity in the region

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The role of Remote Sensing in Operational Oceanography: Monitoring the Mediterranean Sea and its coastal areas

Jordi Font,
ICM-CSIC, Barcelona

MAMA 4th Meeting, Rome, 2-6
June 2003

Satellite observations of the ocean

Simultaneity over large areas
Repeatibility at short time scales
Standardised and calibrated data *(when possible)*
Easy access to different products
Possibility of Near Real Time (hours - few days)

but

Less accurate than in situ measurements
Poor spatial resolution for certain applications
Only upper ocean
Possible atmospheric interference (e.g. clouds)

Use of remote sensing for monitoring

1. Water masses tracers

Indicators of water quality
Quantification of parameters
Features detection
visible, infrared, microwave radiometers, radars

2. Input to forecasting models

Initial conditions
Data assimilation
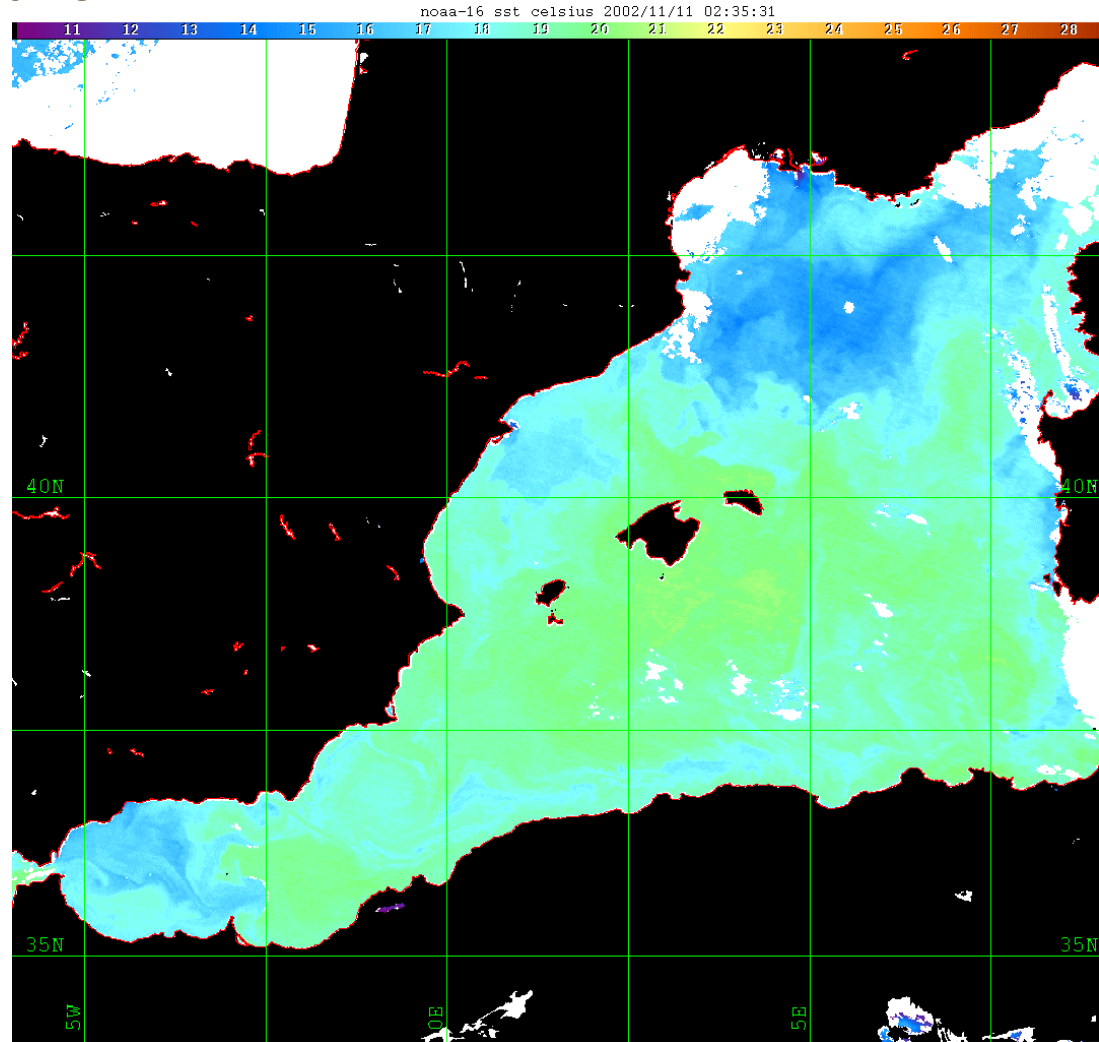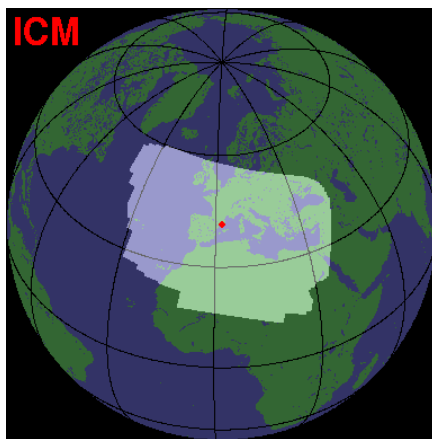*sea surface temperature, sea level, surface winds*

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Sea Surface Temperature

Infrared images
1 km resolution
several times per day

(free data, acquired by
many stations in the Med
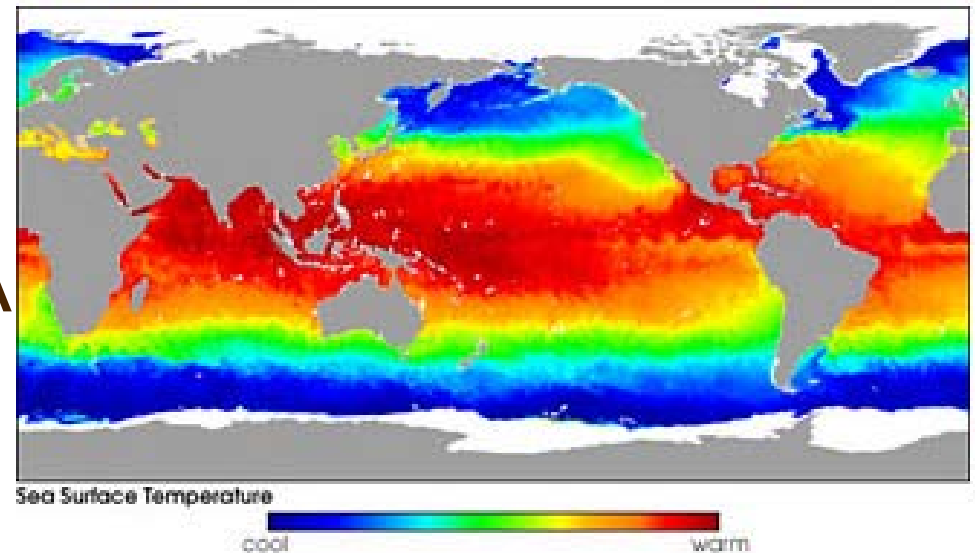area, e.g. ICM Barcelona)

noaa-16 sst celsius 2002/11/11 02:35:31

New sensors:

Sea surface temperature high resolution global map obtained by the Advanced Microwave Scanning Radiometer (AMSR-E from NASDA) on board the **AQUA** spacecraft from NASA, launched 4 May 2002
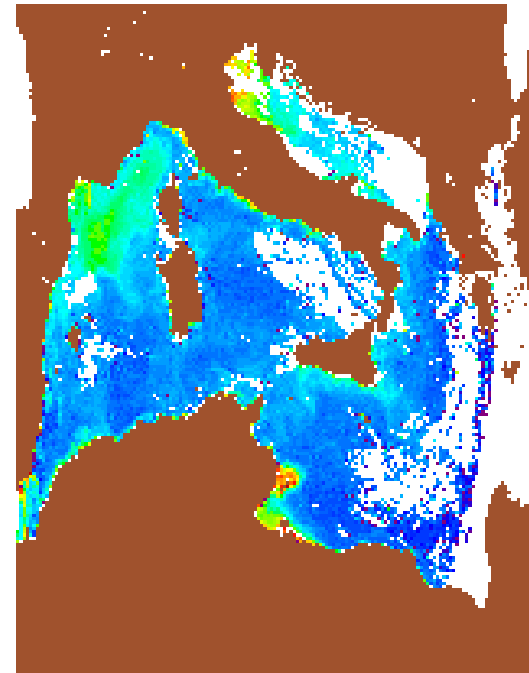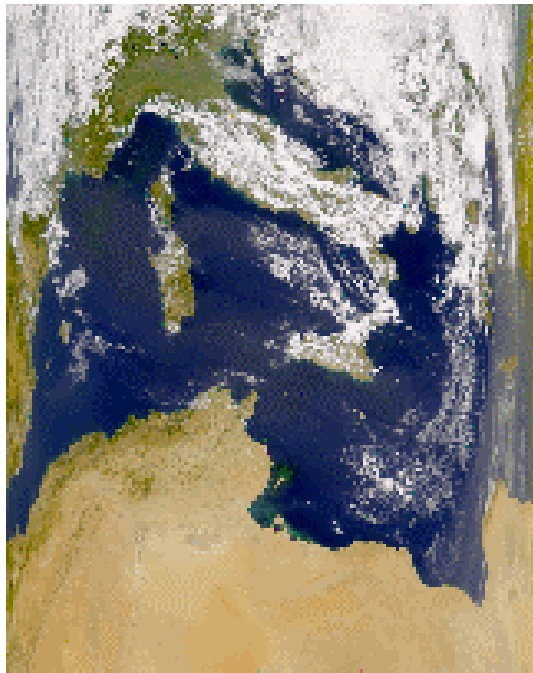
Clouds are transparent!

Data averaged 2-4 June 2002

Sea Surface Temperature

cool   warm

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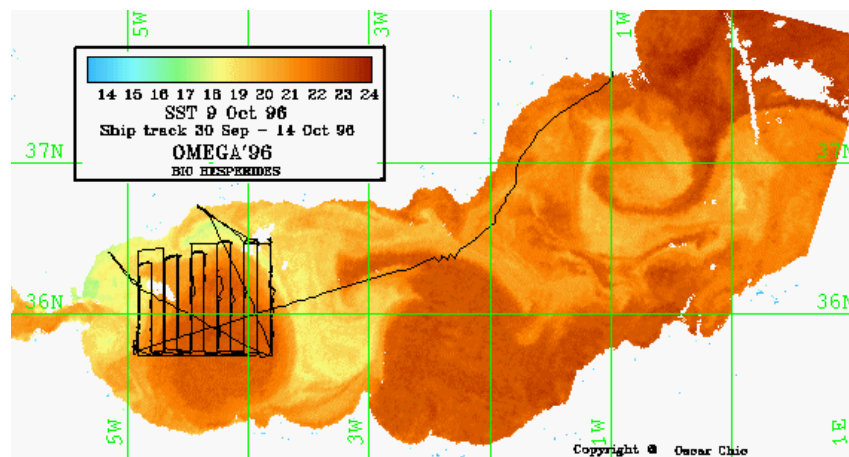
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Ocean colour:

SeaWiFS image decoded 14 days after acquisition (less than NRT)

level 1: single channel radiance   level 2: chlorophyll concentration

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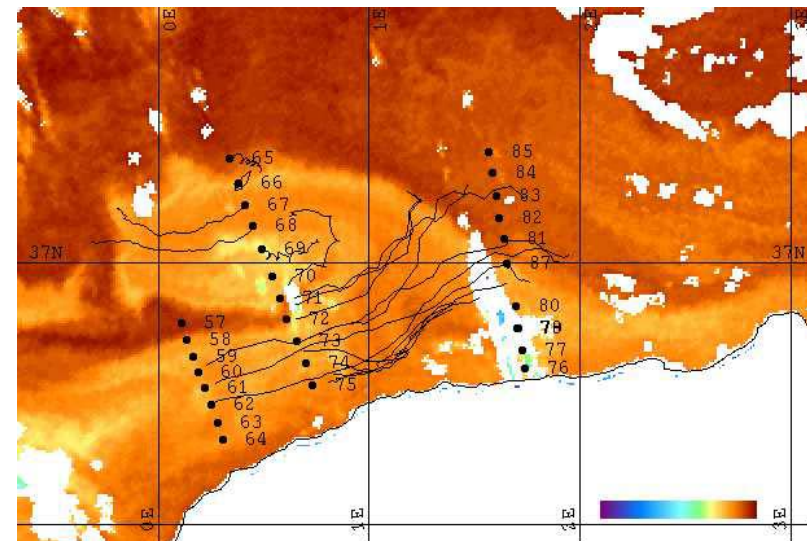
Example of Real Time (few minutes delay) application:

Fine tunning of hydrographic surveys of mesoscale circulation guided by infrared images provided by an on-board satellite receiving station

October 1996

Alboran Sea

Algerian basin

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Mediterranean network to
Assess and upgrade the
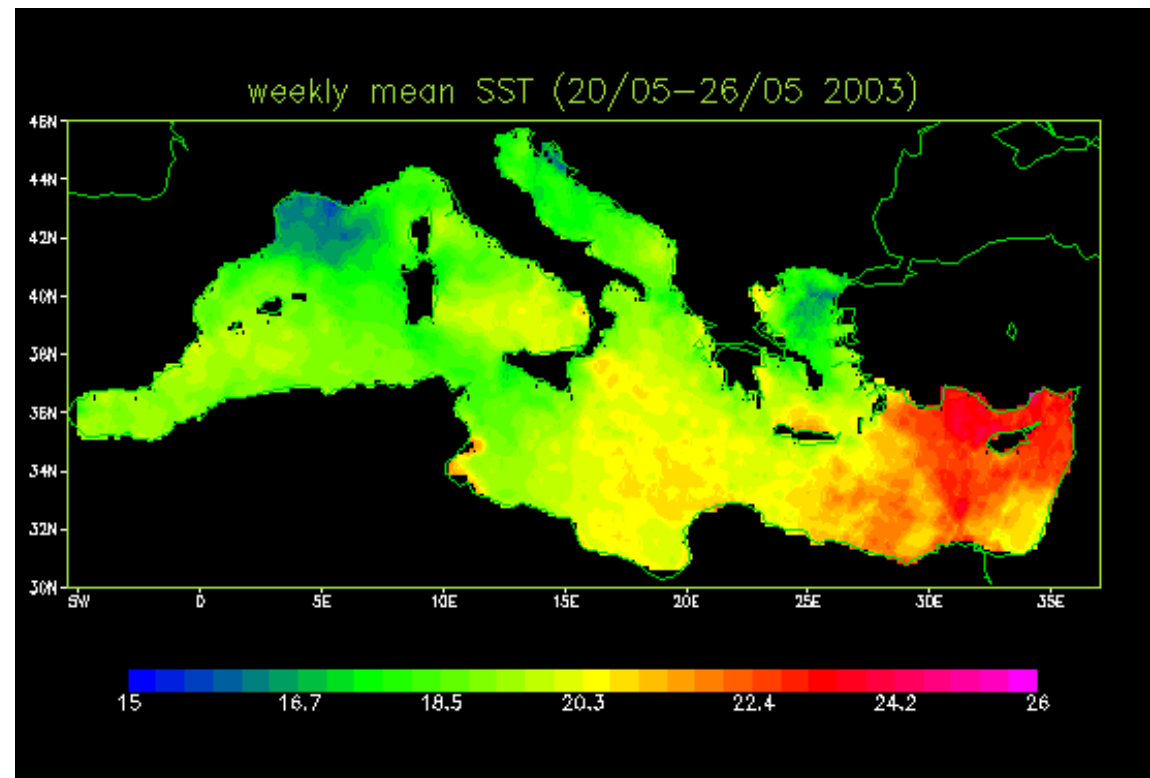Monitoring and forecasting
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Mediterranean basin scale monitoring

Global coverage
Composite images
Data assimilation
for circulation models
Example:
MFS-PP products

SST weekly mean

(other: SLA)

weekly mean SST (20/05—26/05 2003)

Used for 24 h (and more) forecasting
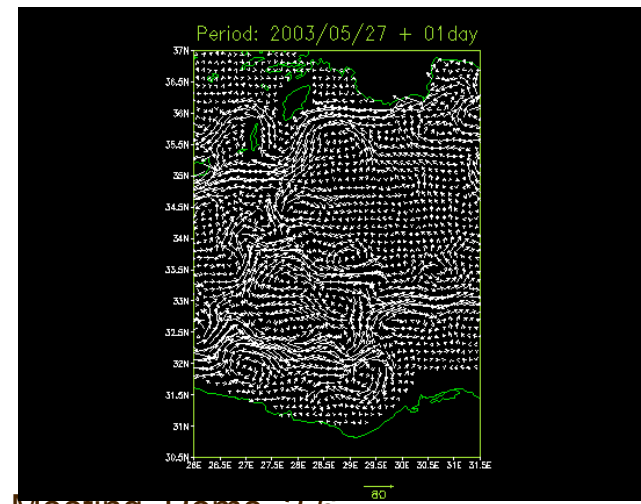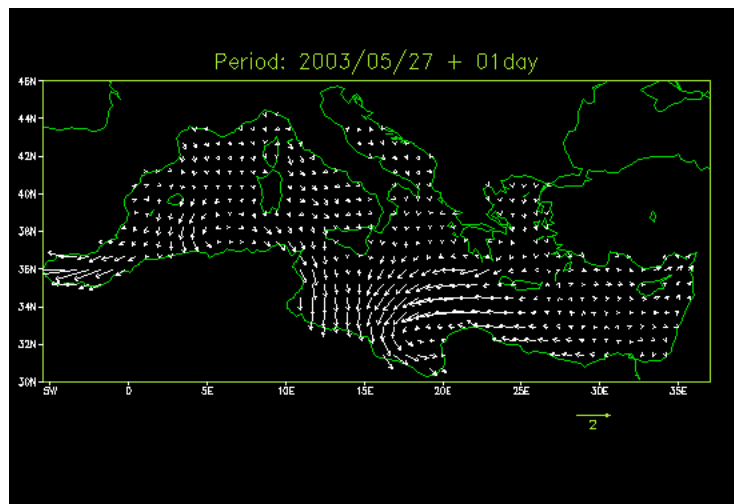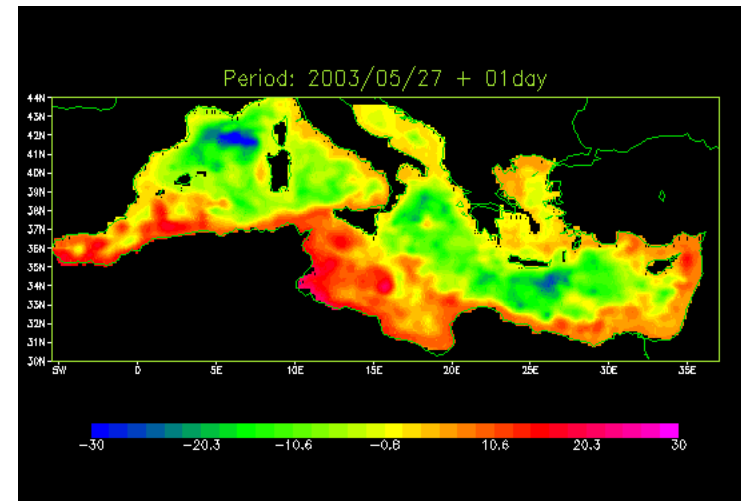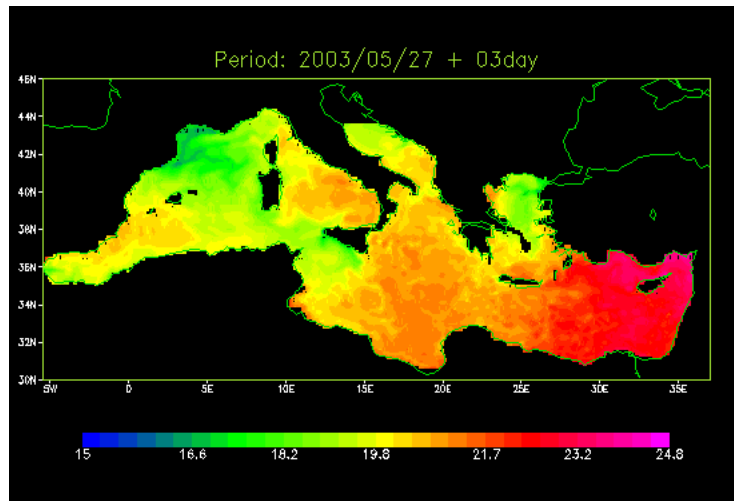
Mediterranean coastal zone monitoring

Large variety of applications
Ideally, high spatial resolution needed
NRT required in many cases
Relatively easy ground truth (calibration)

Problems:
Some sensors at low temporal resolution
Some products very expensive
Many not accessible in operational mode
(huge and/or dedicated processing)

LANDSAT 7

SPOT 4

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

But: Not free access (very expensive, not NRT)

High resolution radars: SAR

poor coverage

difficult NRT

difficult interpretation

example: Prestige oil spill, Nov. 2002
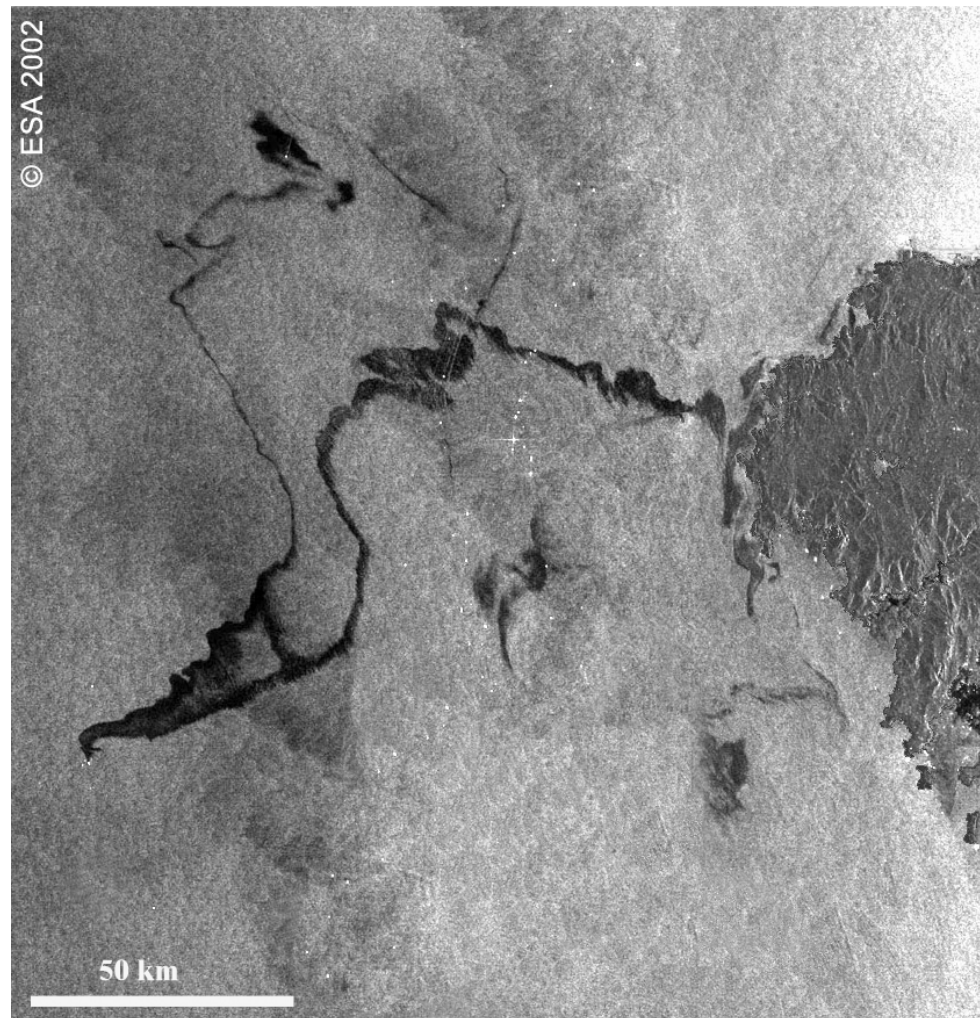

© ESA 2002

50 km

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

Remote sensing can provide (with different degrees of accuracy):

1 +++
2 + (indirect)
3 not yet (2007)
4 ++
5 ++
6
7
8 +
9
10 ++
11
12
13 +++
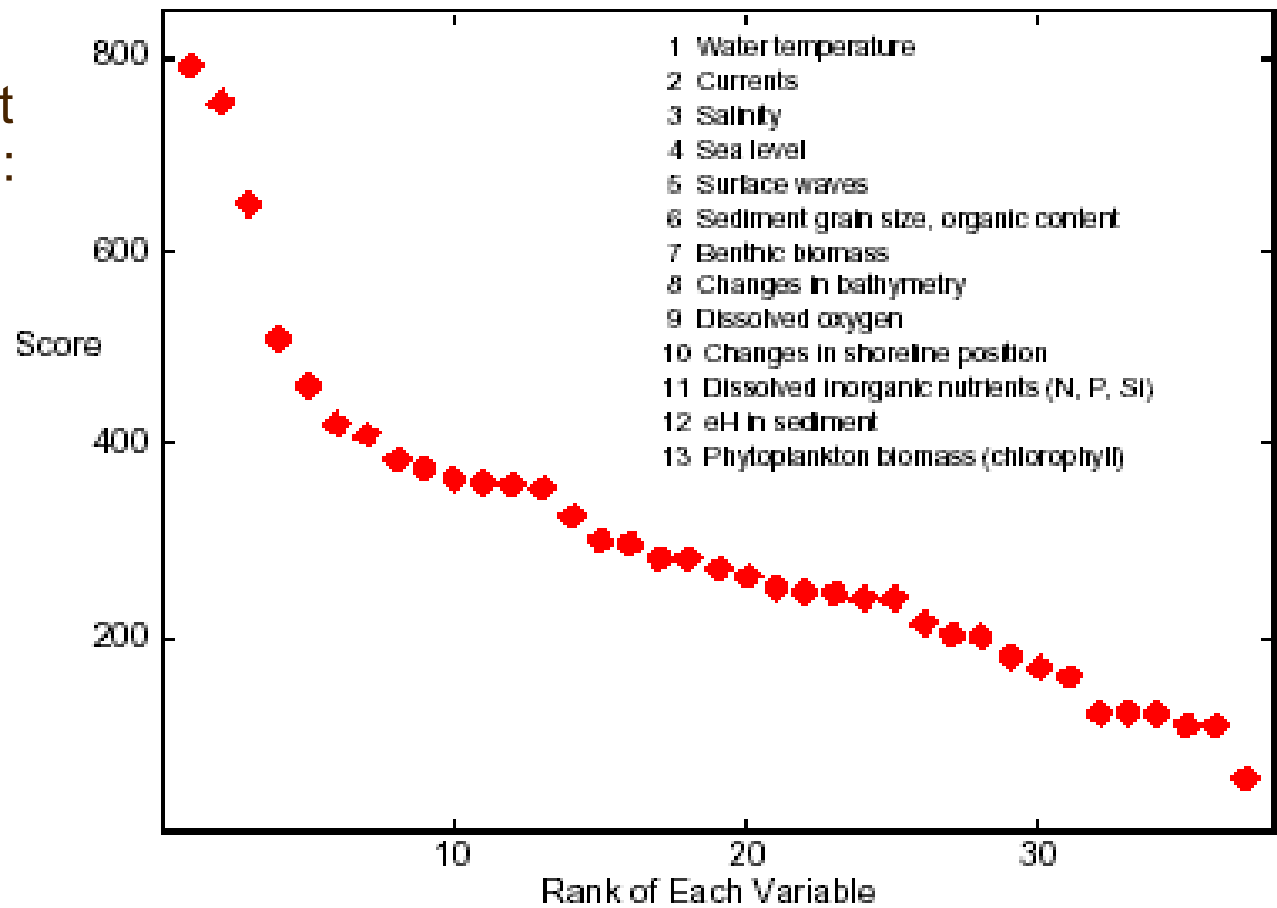
1 Water temperature
2 Currents
3 Salinity
4 Sea level
5 Surface waves
6 Sediment grain size, organic content
7 Benthic biomass
8 Changes in bathymetry
9 Dissolved oxygen
10 Changes in shoreline position
11 Dissolved inorganic nutrients (N, P, Si)
12 eH in sediment
13 Phytoplankton biomass (chlorophyll)

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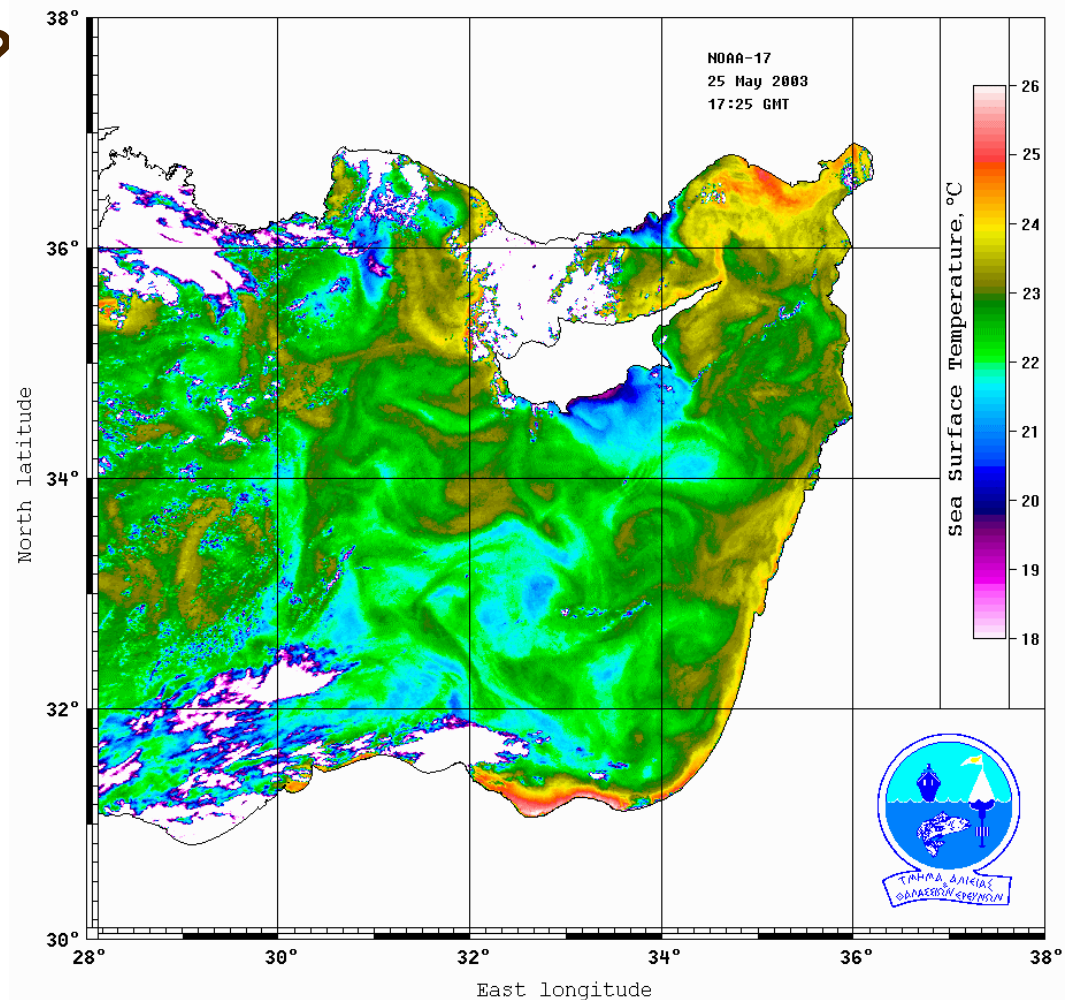*The First MedGOOS Project*

What can we access?

Near Real Time SST

**Cyprus Coastal Ocean
Forecasting & Observing
System
(CYCOFOS)**

DMFR, Univ. Cyprus
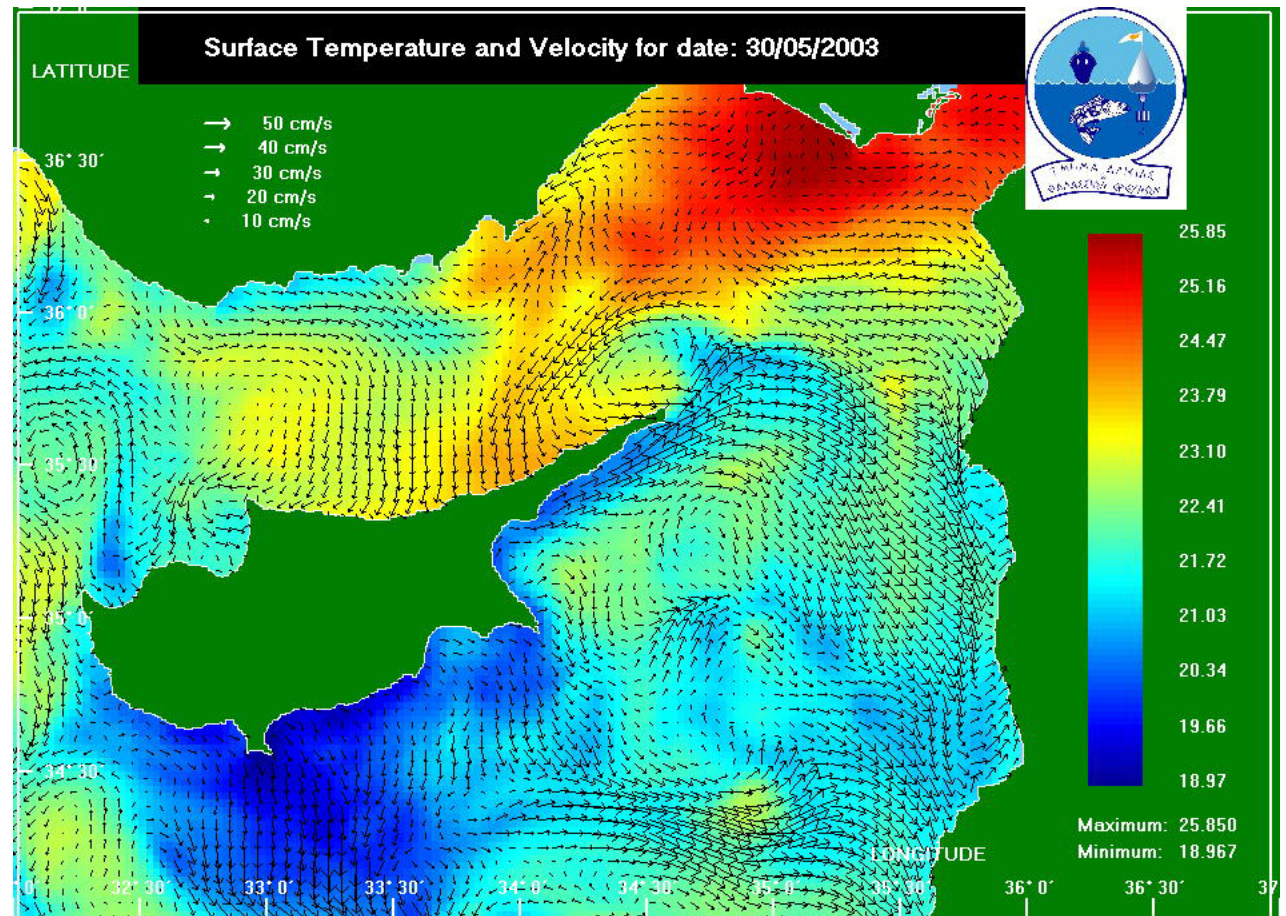
On line bulletin

example: 25 May 03

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Used for forecast

CYPRUS OCEANOGRAPHIC BULLETIN

example: 27 May 03

24 h forecast of surface currents and temperature

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Mediterranean network to
Assess and upgrade the
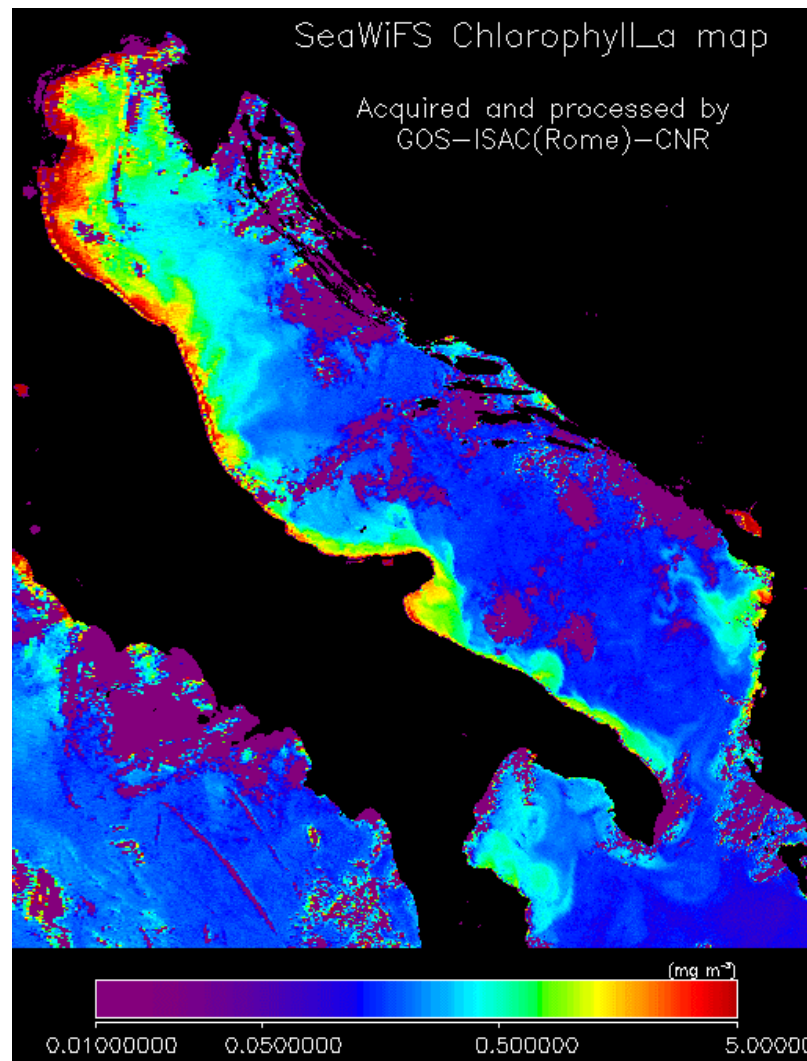Monitoring and forecasting
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Near Real Time SeaWiFS

ADRICOSM
project

image distributed
1-2 h after acquisition
by GOS-ISAC
Rome

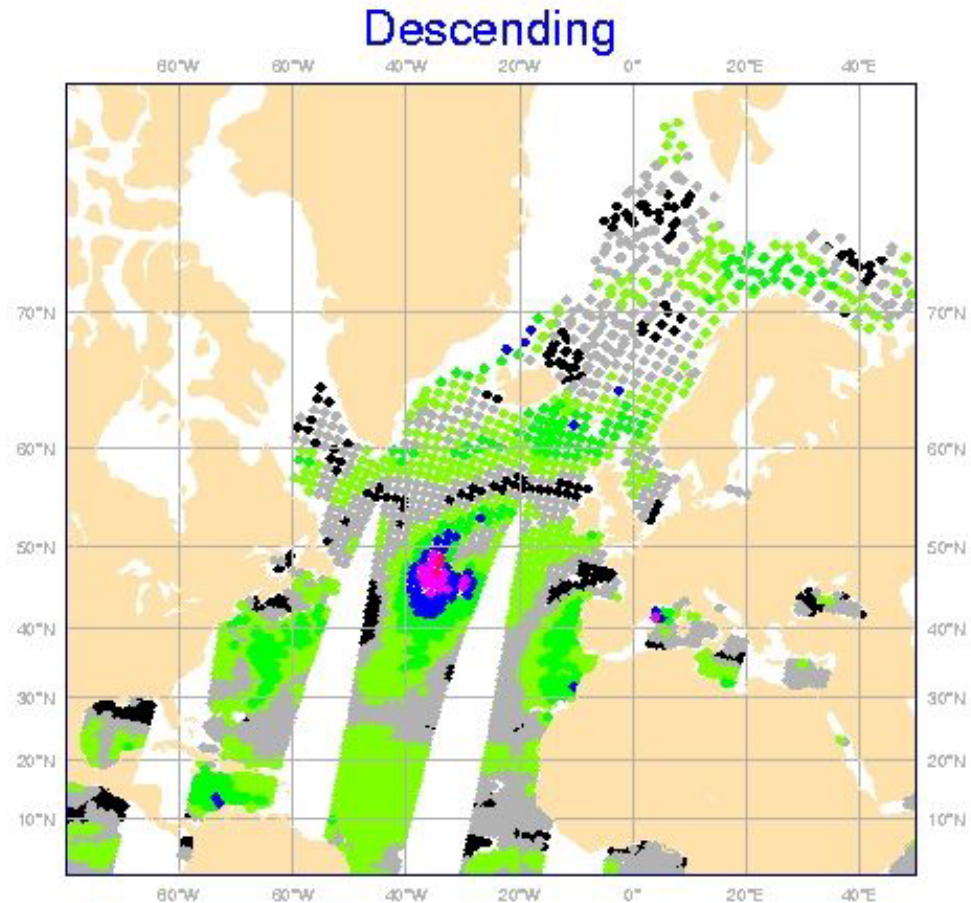example: 29 May 03

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Near Real Time wind

SeaWinds radar
on board QuikSCAT

data distributed by
KNMI, Netherlands
few h after acquisition

example: 29 May 03

Descending

Near Real Time wind

QuikSCAT wind vector (red) compared to HIRLAM model output (blue) over METEOSAT SST

100 km resolution

29 May 03 17h46

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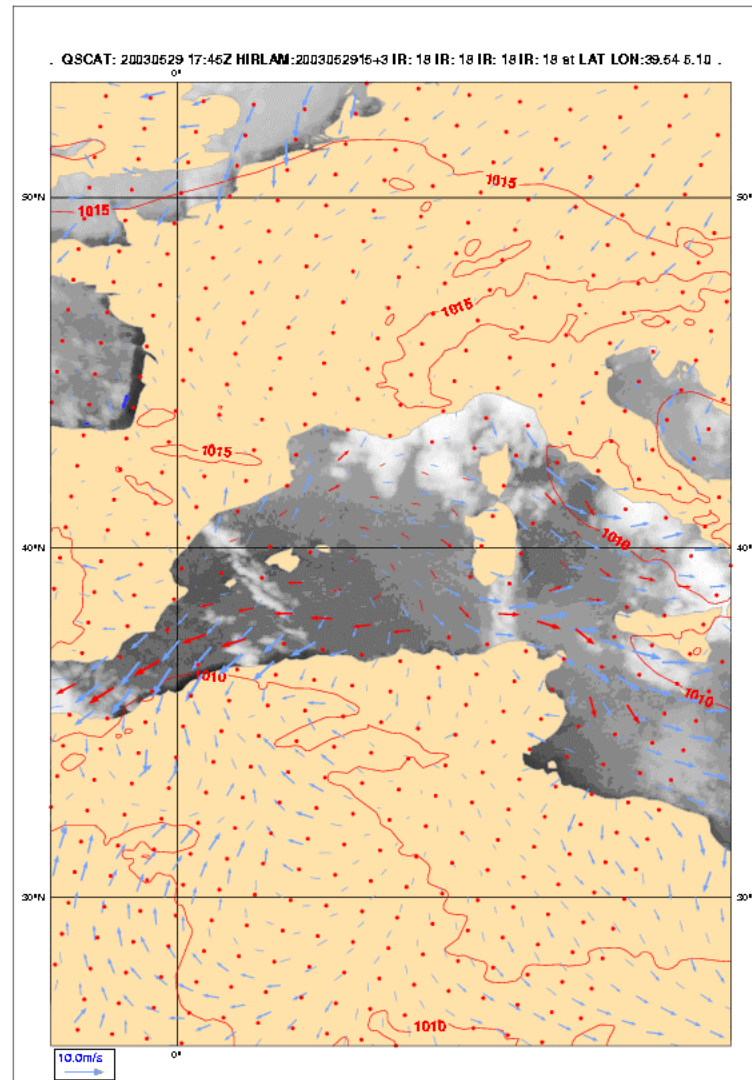
MedGOOS Remote Sensing strategy for coastal monitoring

What are the MAMA partners needs?
    Objectives
    Requirements
    Sampling scales

What can we achieve?
    Available Near Real Time products *Task 2.5 in WP2*
    Delayed mode
    Access through MAMA-NET

MAMA-OBS 2.5 *"Evaluation of the NRT satellite data"*

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

SST	Full resolution (1 km) daily images
	Daily data files (variable resolution)
	Weekly composites
Colour	*Daily SeaWiFS Chl.a*
	MERIS (ESA, during demonstration test period)
Wind	Daily files (uncomplete coverage)
SSH	10 day maps

Need feedback from MAMA partners $\Rightarrow$ web page

MAMA-OBS 2.5 *"Evaluation of the NRT satellite data"*

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

Here I run an Internet Navigator with a local copy of the HTML file we have prepared to be uploaded to MAMA WWW for information and feedback from partners.

The page contains information on the different products available classified by variables: Institution/project that generates the product, availability of images and/or data files, spatial resolution, updating time step, area imaged, coverage of a single product/map, Readme file (detailed information on the sensor, product, etc. and downloading instructions), web address for the institution/project, and examples of images with indication of file size.

MAMA-OBS 2.5 *"Evaluation of the NRT satellite data"*

Future (beyond MAMA-NET test period)

SST   MODIS (new receiving stations in the Med.)
         Merged products (IR + MW), JRC GHRSST-PP

SSS   >2007-8 SMOS / Aquarius
         (hardly useful in Med. coastal areas)

Colour SeaWiFS problem
         MODIS ocean products *(e.g. soon from U. Valladolid)*
         MERIS accessible?

Wind   New missions
         Merged products ?