

WEST AFRICA NMHSs DIRECTORS MEETING

Las Palmas de Gran Canaria, Spain 17 - 19 October 2007



Marine Meteorology and Remote Sensing in West Africa

¹E. Cuevas, ²A. González-Ramos, ¹J. Conde

¹Instituto Nacional de Meteorología (Spain)

²Facultad de Ciencias del Mar; Universidad de Las Palmas de Gran Canaria (Spain)

Part I: Marine forecast products to support West Africa NHMSs (Justo Conde)

Part II: Marine meteorology in the Canary Islands: Seasnet (Antonio González-Ramos)

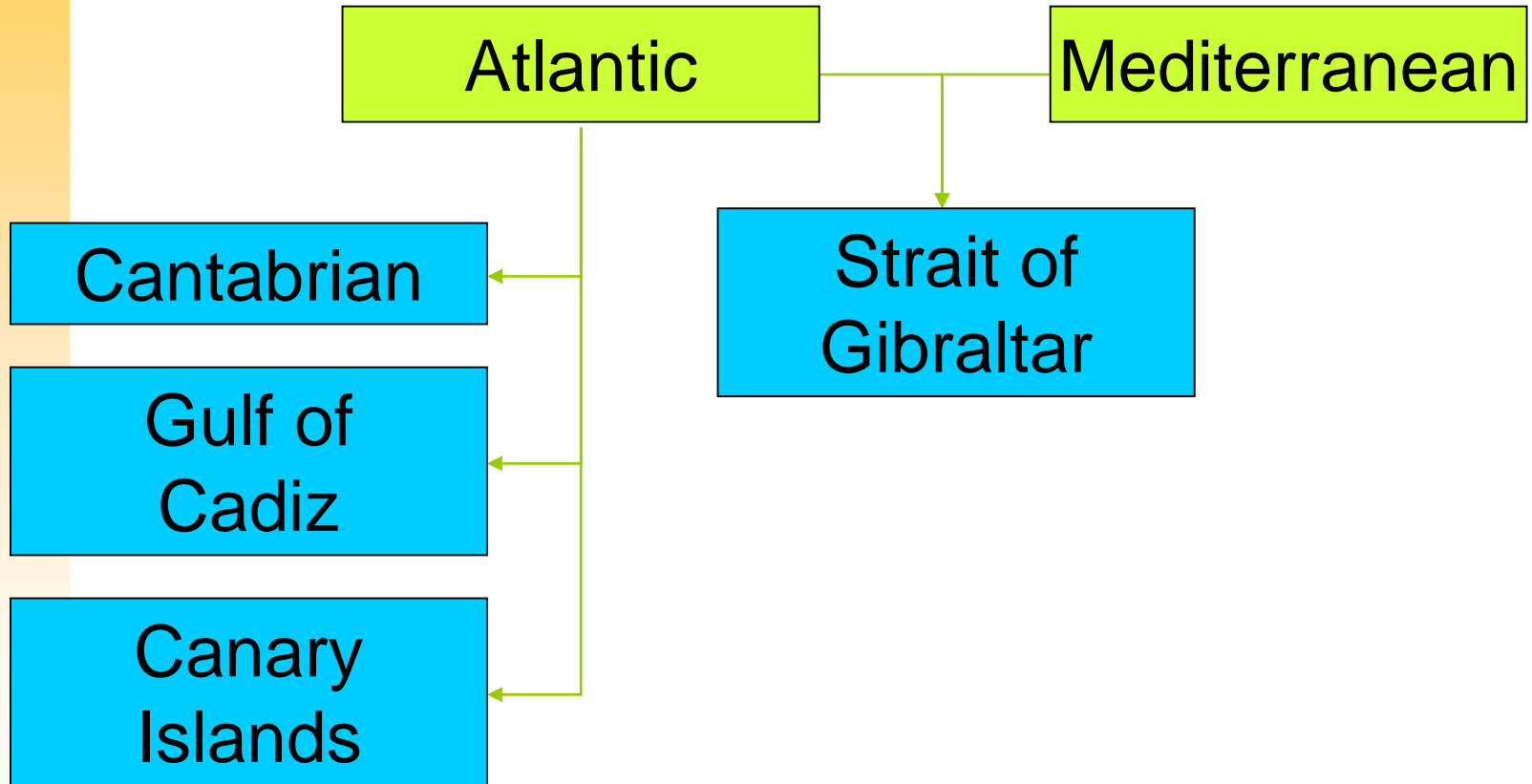
Part III: Multidisciplinary Marine Meteorology and Remote Sensing System for West Africa (Emilio Cuevas)

Part I: Marine forecast products to support West Africa NHMSs

1. What is the Spanish WS experience in marine products?
2. What meteo marine developments will the INM undertake in the near future? The “**My Ocean**” project
3. What kind of marine products useful for west Africa can the Spanish WS provide you at present?

Wave Forecast System

WAM based system running twice a day with HIRLAM 0.16 winds



Wave Forecast System

Regional module 1: Atlantic

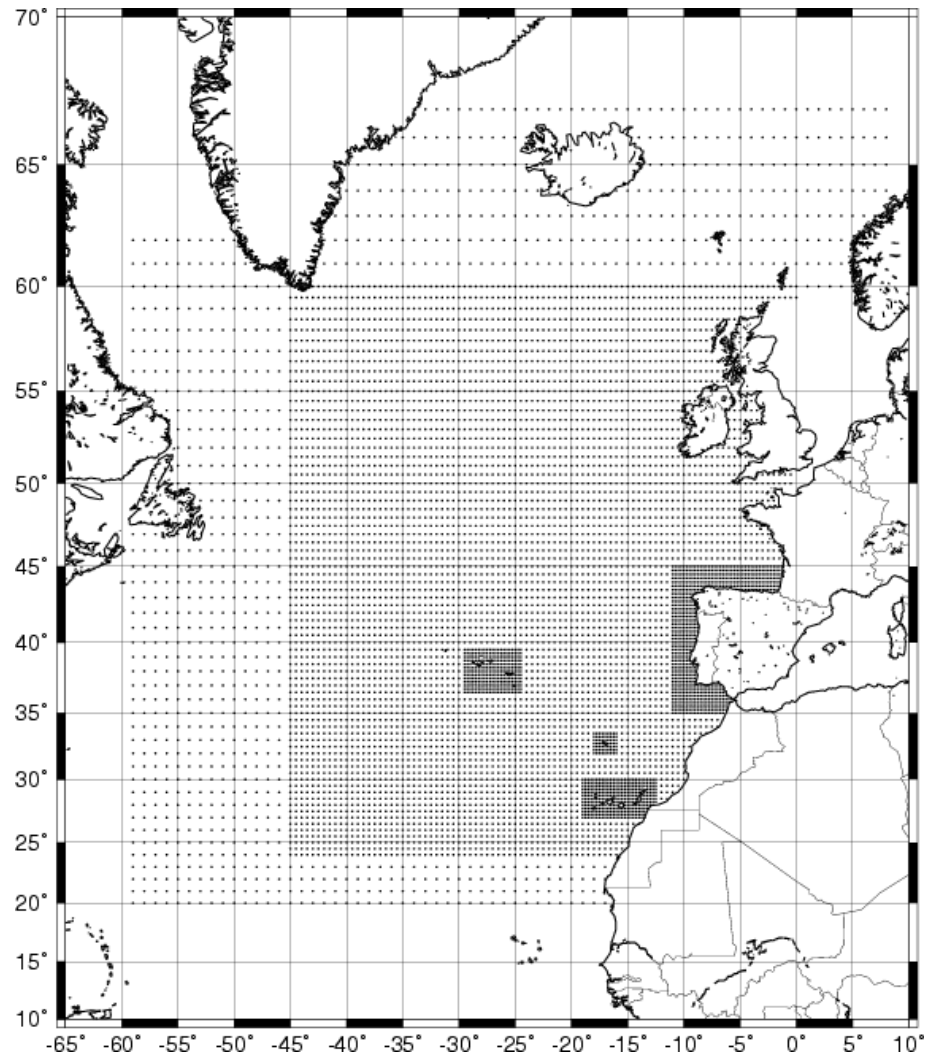
Geographic domain:

[20°N;67°N] x [59°W;0°W]

[24°N;60°N] x [45°W;0°W]

Resolution:

1° - 0.5° - 0.25°



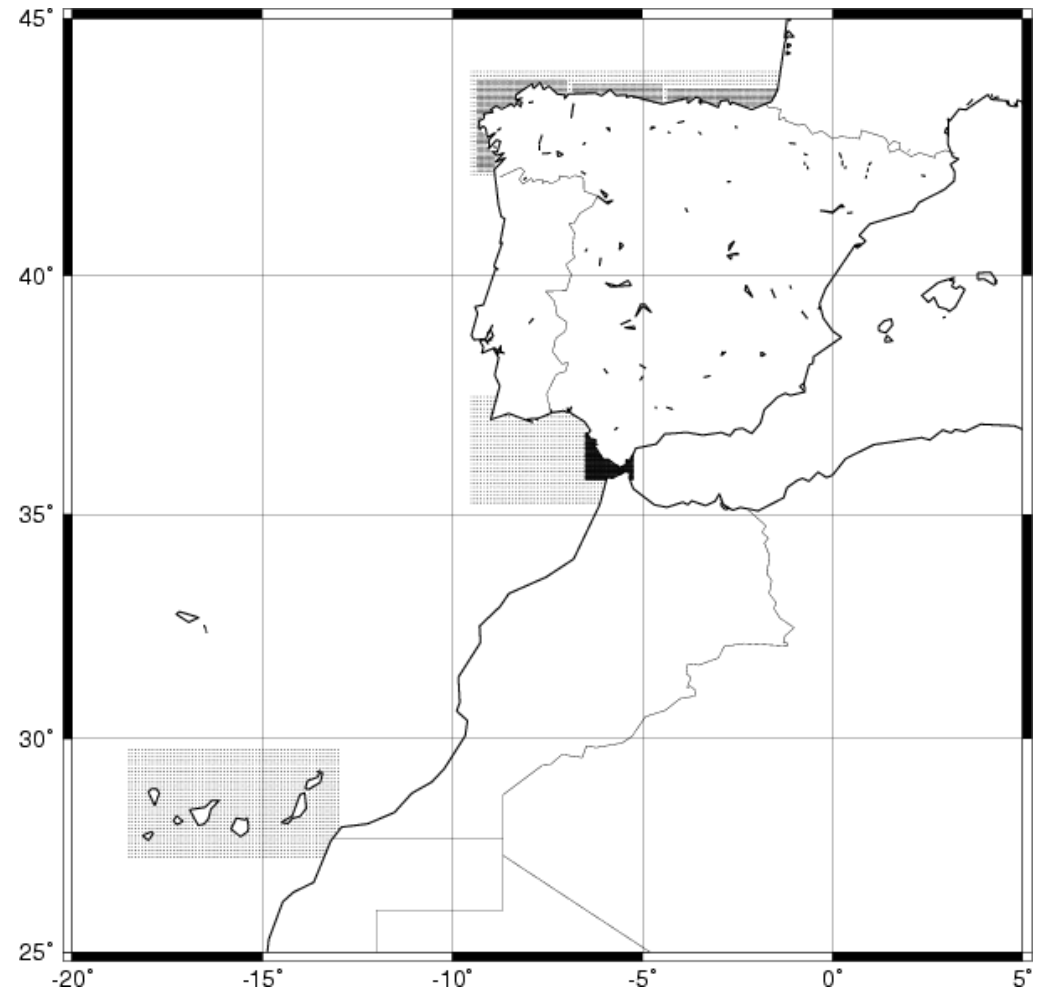
Wave Forecast System Sub Regional modules

Cantabrian Sea
Resolución: 5' – 2.5'

Gulf of Cadiz
Resolución: 5'

Canary Islands
Resolución: 5'

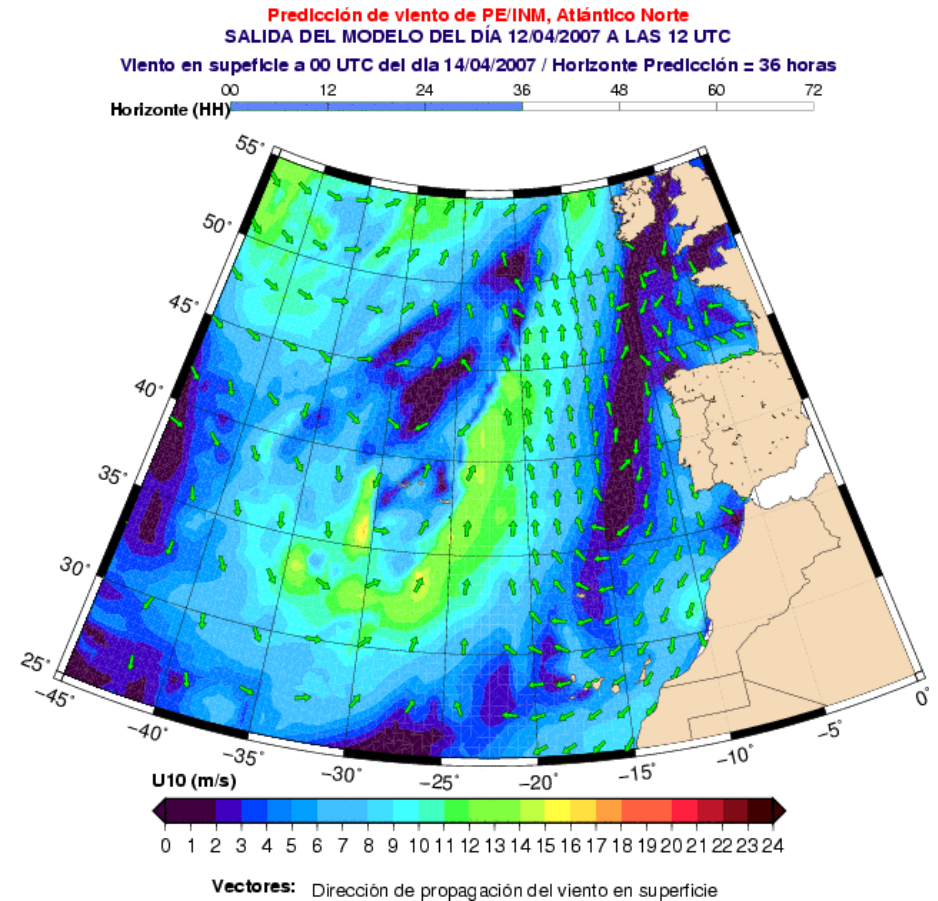
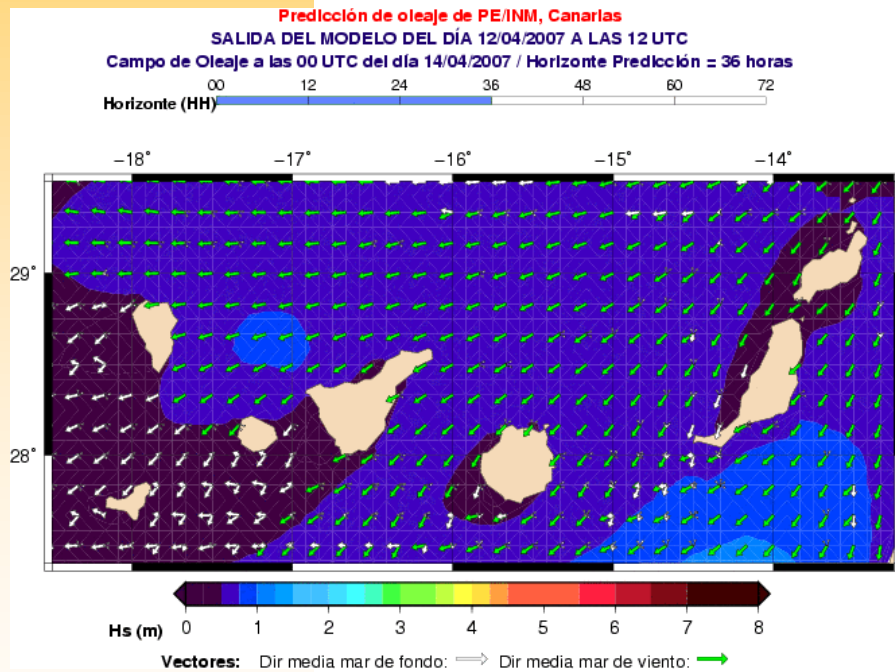
Gibraltar
WW3 based model
Resolución: 1'



Wave Forecast System an example of products

Significant Wave Height (colour field)
Mean Direction of wind waves and
primary swell (arrows)

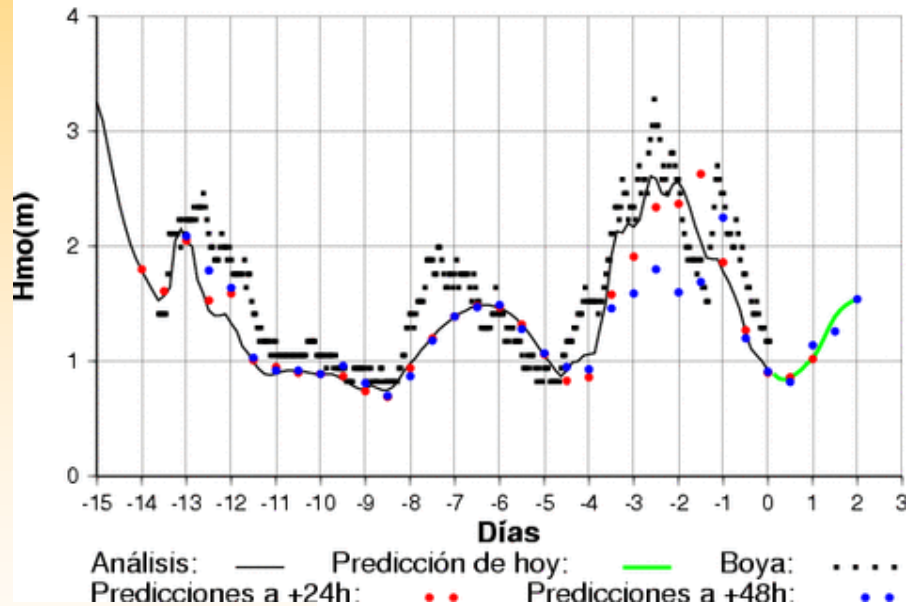
10m Wind speed (colour field)
Mean Direction of 10m wind (arrows)



Wave Forecast System continuous assessment vs. buoy record

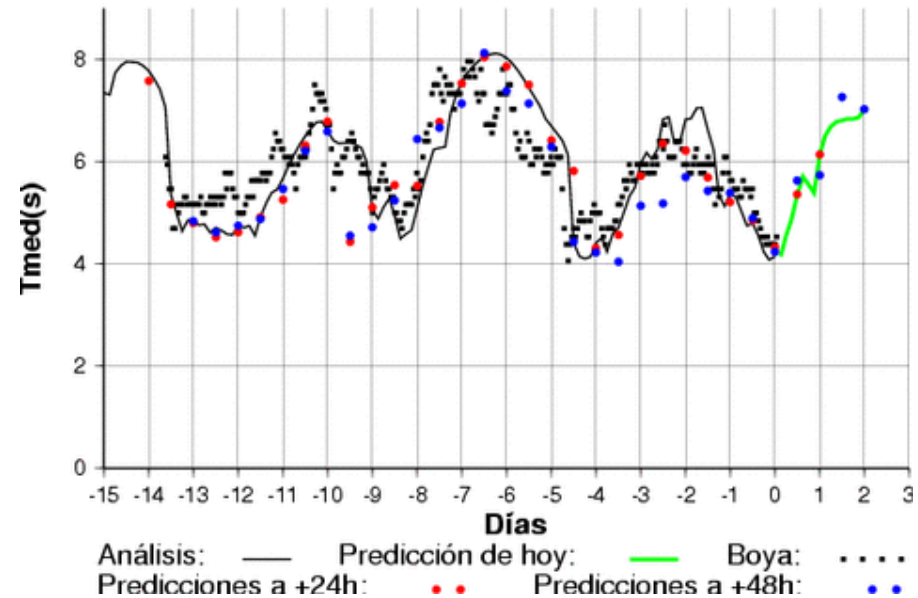
Significant Wave Height

WAM / Boya de Silleiro Red Exterior
 Altura significativa a partir del espectro
 Análisis +0h (aammdhmm): 2005051800



Mean Period

WAM / Boya de Silleiro Red Exterior
 Periodo medio
 Análisis +0h (aammdhmm): 2005051800



Buoy data: Black dots
 Analysis: Black line
 24h forecast: red dots
 48h forecast: blue dots

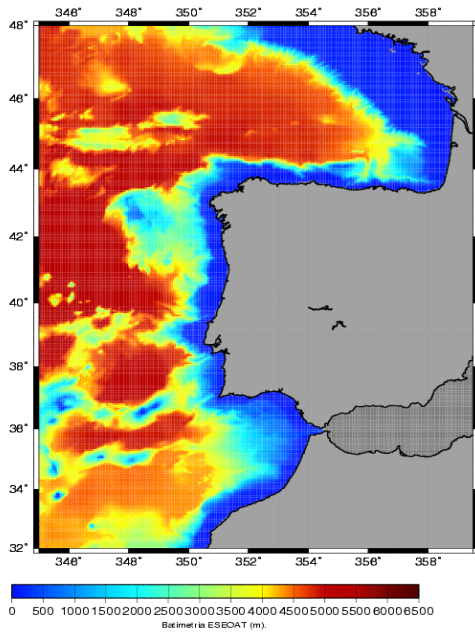
Oceanographic Forecast System

POLCOMS based systems

DieCast based system

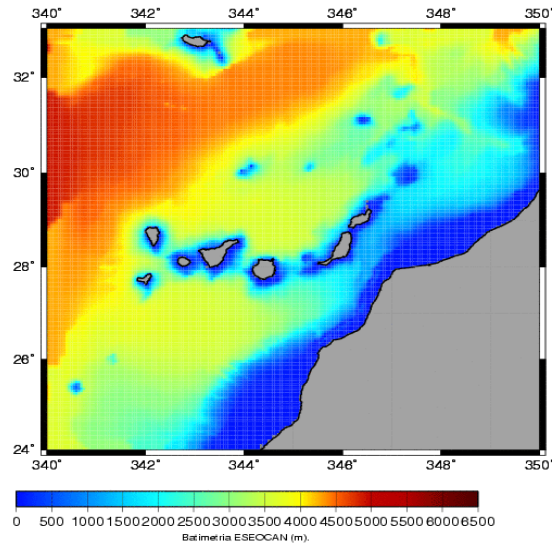
ESEOOAT

[32°N;48°N]
[15°W;0.5°W]



ESEOOCAN

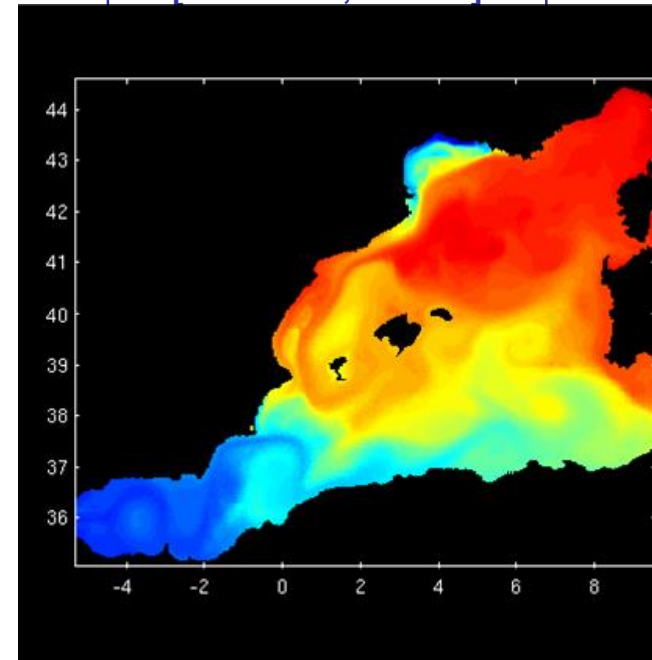
[24°N;33°N]
[20°W;0.5°W]



$(1/20)^0 \sim 5 \text{ km}$

ESEOOMED

[35.45°N;44.50°N]
[5.50°W;9.0°E]



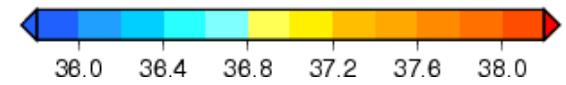
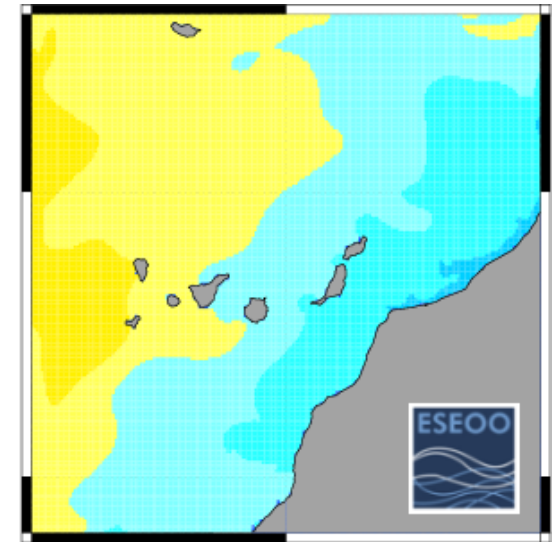
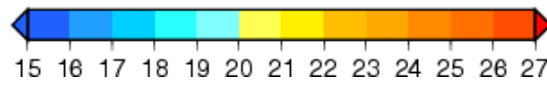
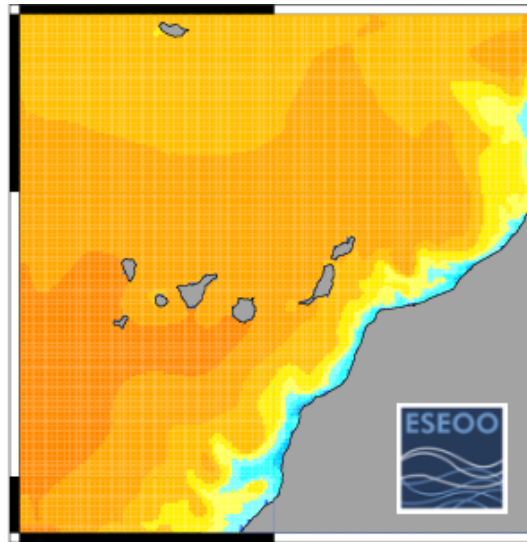
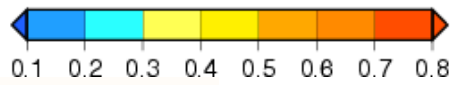
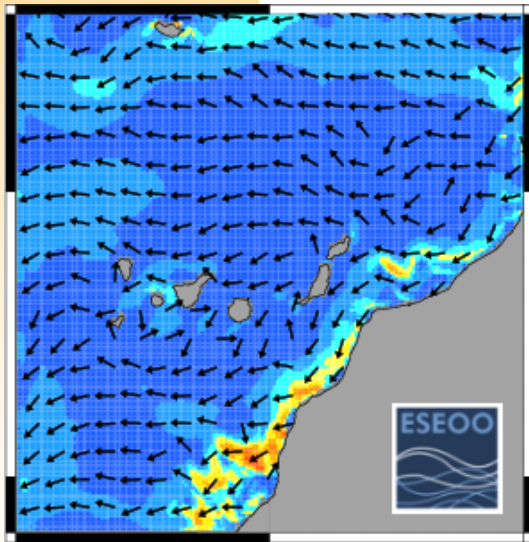
Oceanographic Forecast System: Product examples -daily means-

Integration date: 08/10/207 00UTC
Valid for: 10/1072007 12UTC

Current
Strength -m/s- (colour field)
Direction (arrows)

Temperature °C

Salinity PSU



Near-future developments

My Ocean Project



GMES is an European initiative for the implementation of information services dealing with environment and security.

One of the **GMES** thematic sectors is the **ocean**.

“*My Ocean*” arises as a proposal of an operational implementation of the GMES marine core service to produce a systematic reference information on the state of the ocean of known quality and accuracy for the global and regional European seas.

Future developments MyOcean Project



2008



KICK-OFF

2009

MY OCEAN

2010

2011



ENDING

My Ocean is a multi national project which includes several subprojects sorted in two main sections:

1. Systems of observation; and
2. Forecast systems.

The INM will participate in the establishment of a regional Monitoring and Forecasting Centre for a specific marine area.

Future developments MyOcean Project



Area I : Global Ocean & North Atlantic
Area II : NW Shelves
Area III : Arctic
Area IV : Baltic Sea
Area V : Mediterranean Sea
Area VI: SW Shelves

Partners to build an Area VI MFC:

NCOF -UK-
MERCATOR -France-
Puertos del Estado / Instituto Nacional
de Meteorología -Spain-

Users of marine forecasts in this Area:
Ireland, UK, France, Portugal, Spain...
West Africa countries



Future developments MyOcean Project



2008



KICK-OFF

2009

MY OCEAN

2010

2011



ENDING

Goal:

To produce, and supply users with, regular and systematic forecasts of the physical state of the ocean (currents, temperature, salinity).

Phase 1: Upgrade the service to users using existing systems:

(18 months) Focus on validation and quality of products.

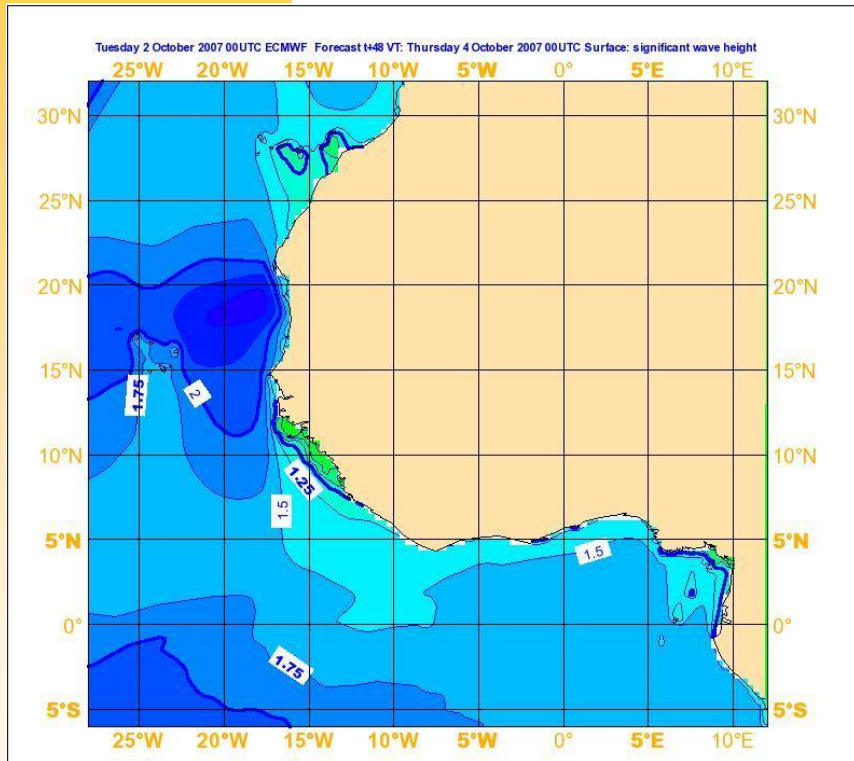
Attention to different social and economic sectors

Focus on operation

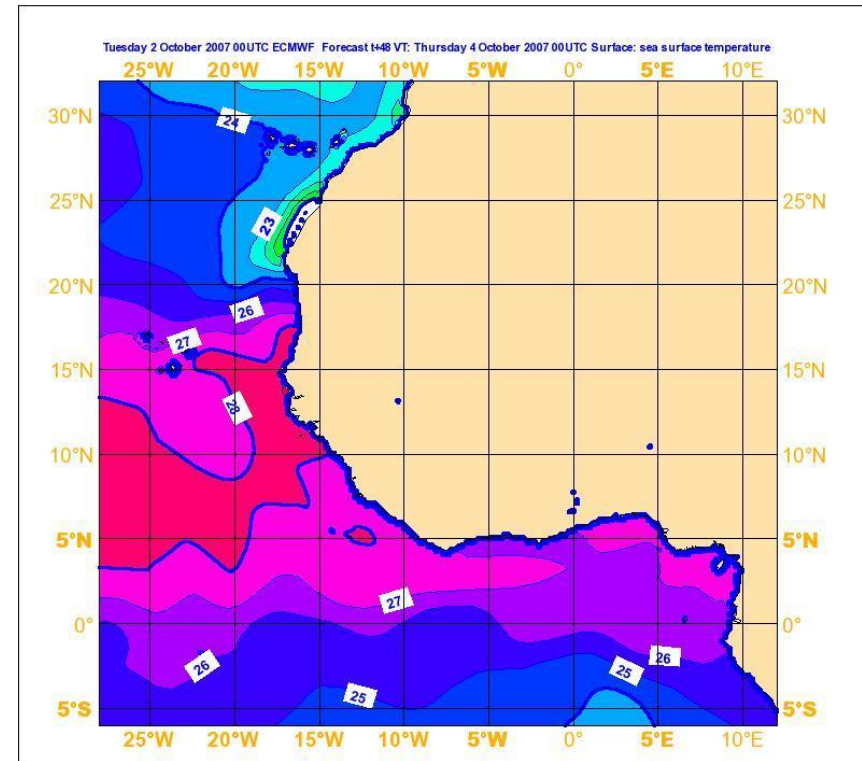
Phase 2: Improve the system performance

(18 months) Move to a core system based on NEMO 1/36°

Present Marine forecasting products disseminated by the INM

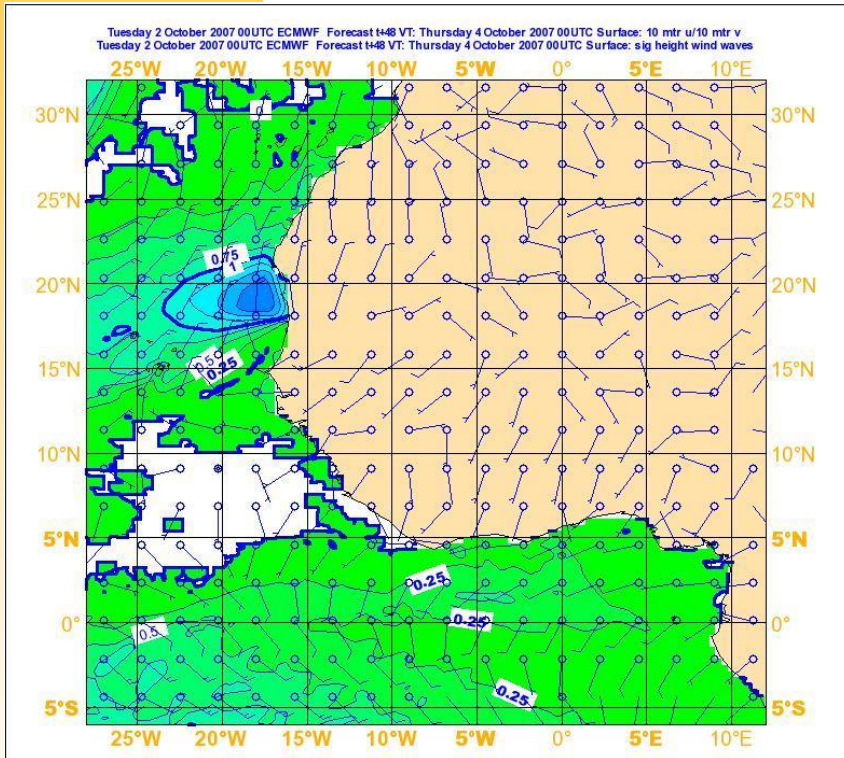


Significant wave height forecasting

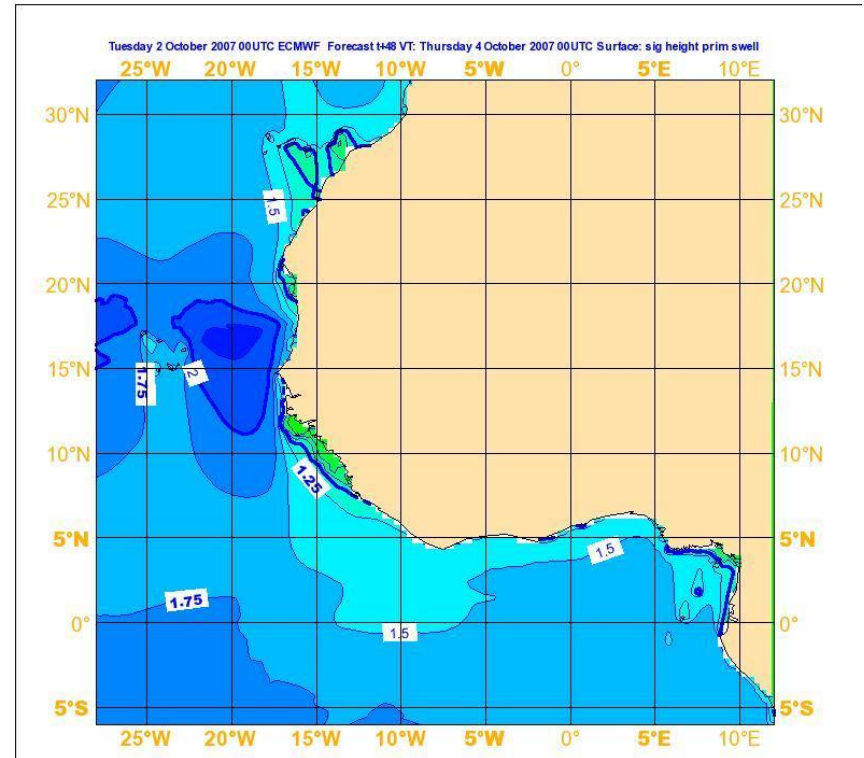


Sea surface temperature (SST) forecasting

Present Marine forecasting products disseminated by the INM



10m wind speed and significant height wind waves forecasting



Significant height primary swell forecasting

Part II: Marine meteorology in the Canary Islands

SEASnet

Survey of the Environment Assisted by Satellite

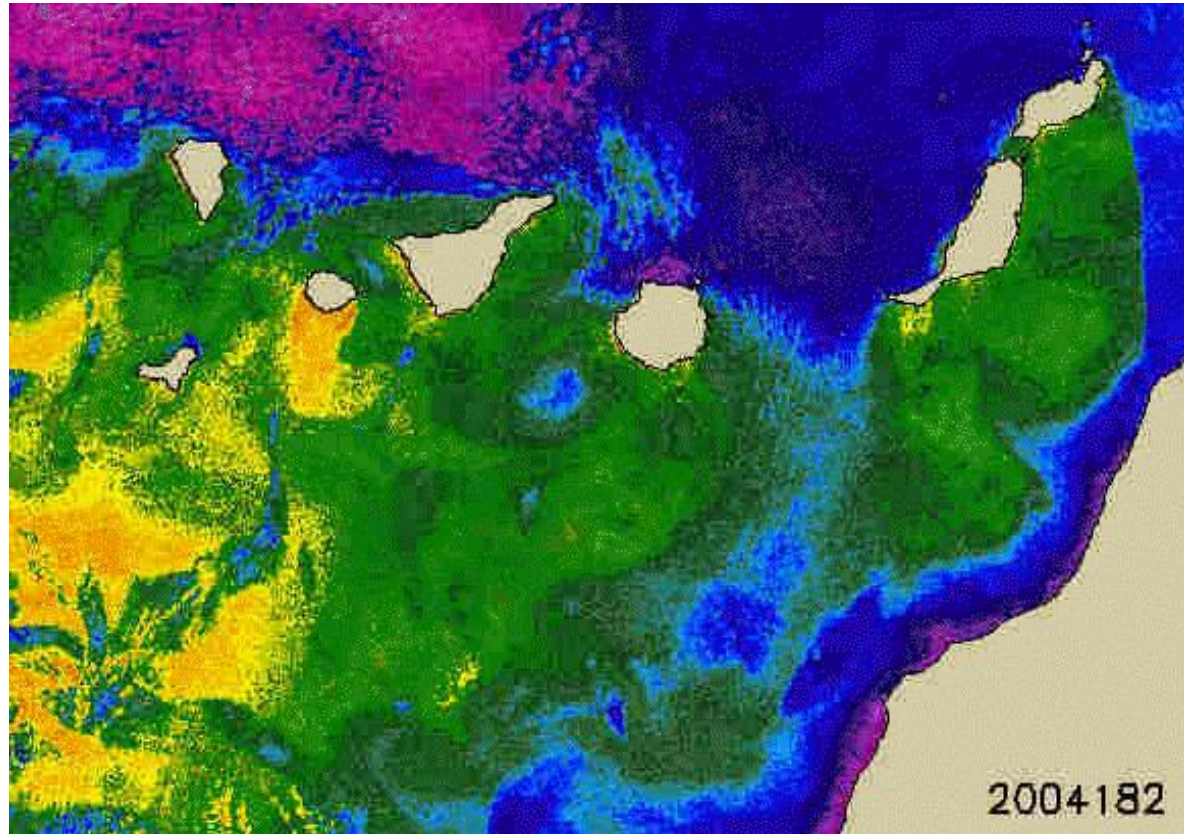
Surveillance de l'Environnement Assistée par Satellite

Servicio de Ecología Asistido por Satélite



SeaSNET

www.seasnet.org



Dr. Antonio González RAMOS (ULPGC)
Team leader. SeaSNET

aramos@pesca.gi.ulpgc.es



SeaNET. Band L Ground segment

Reunion Island, 1990



Canary Islands, 1996



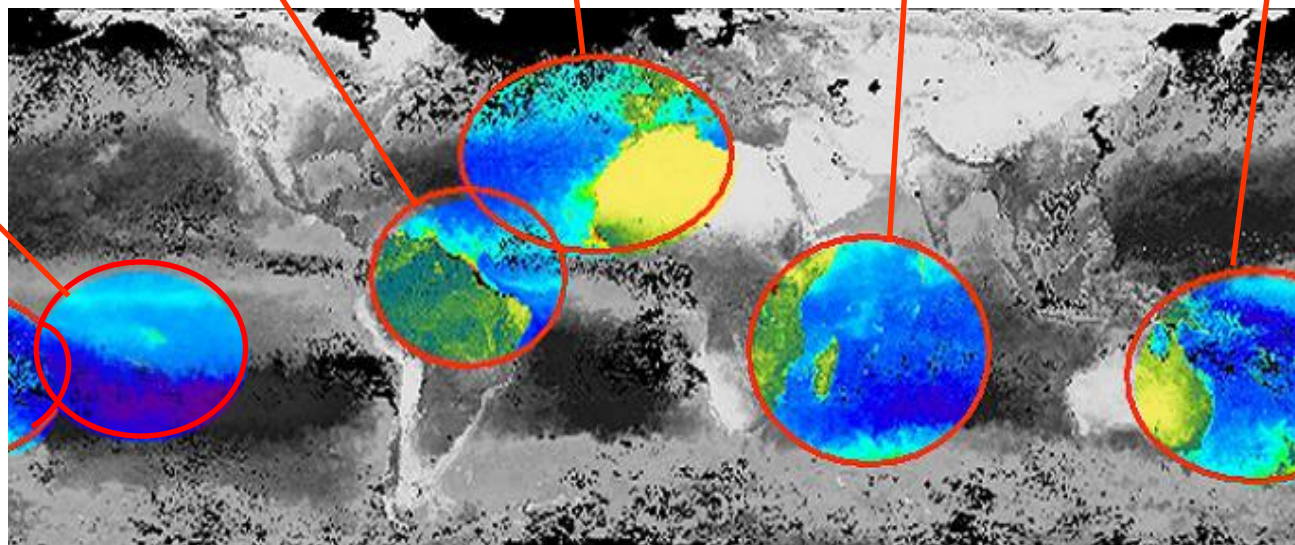
New Caledonia, 1997



French Guyane, 1998



French Polynesia, 2004





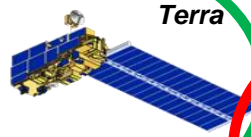
SeaSNET. Satellites and instruments

Wind scatterometers

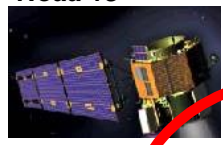
QuikScat



Terra

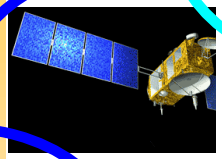


Noaa 18



Multispectral IR

Altimeters



GEOSAT F1



Noaa 12



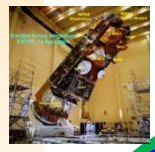
Noaa 15

JASON



Noaa 16

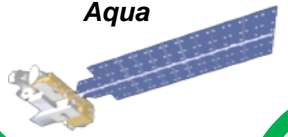
ENVISAT



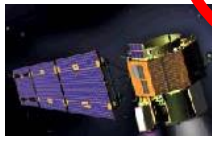
Noaa 17



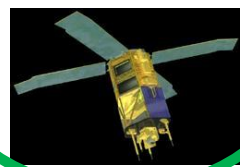
Aqua



METOP



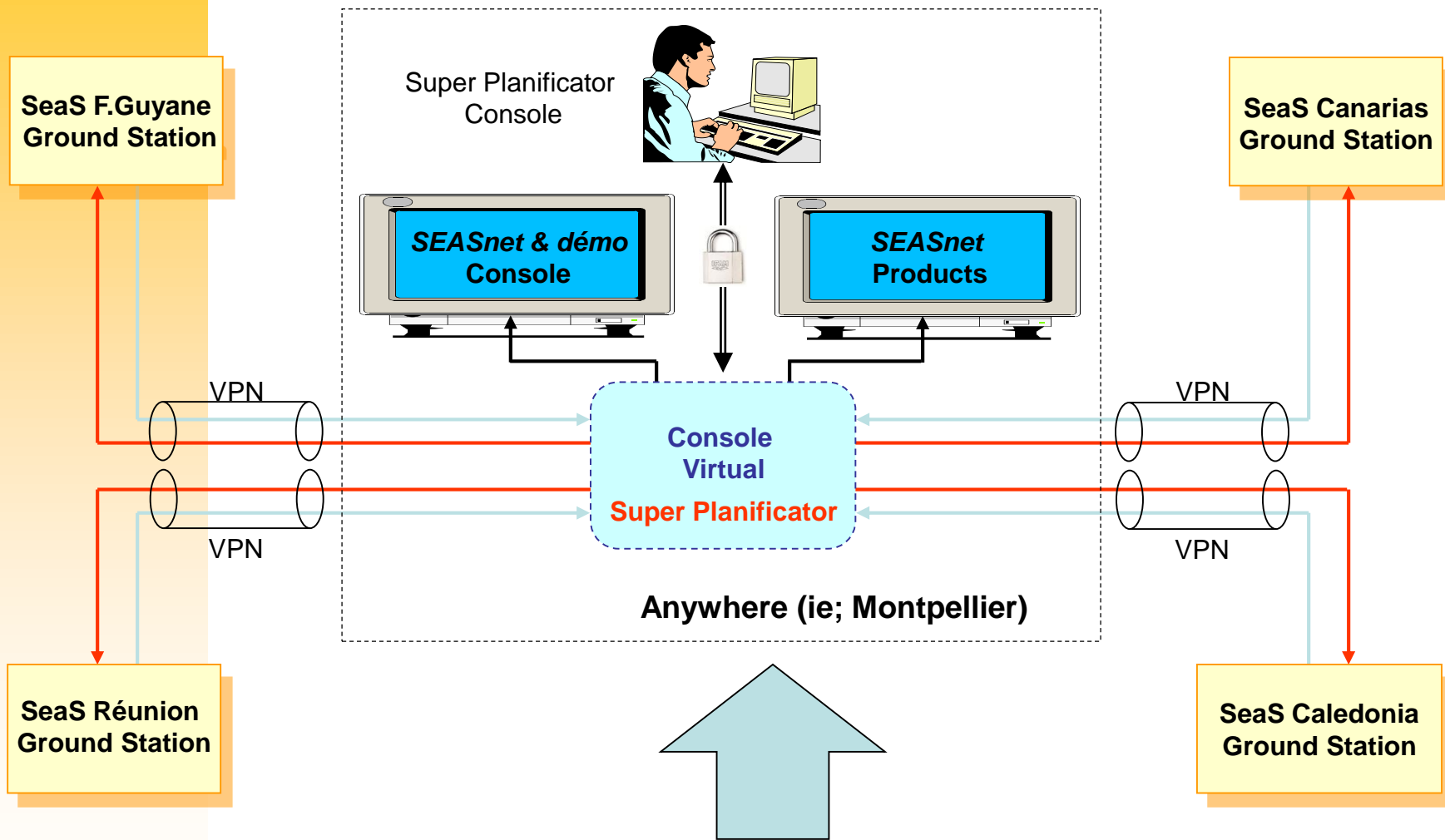
SeaWiFS



Multispectral VIS



Ground segment. Data set AVI INTRANET flux



West Africa NHMSs



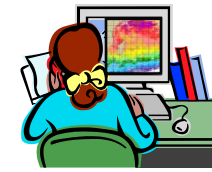
Data sets. Products

- SST
- Clor a
- Current
- SLA
- SST front
- Clor a front

Products

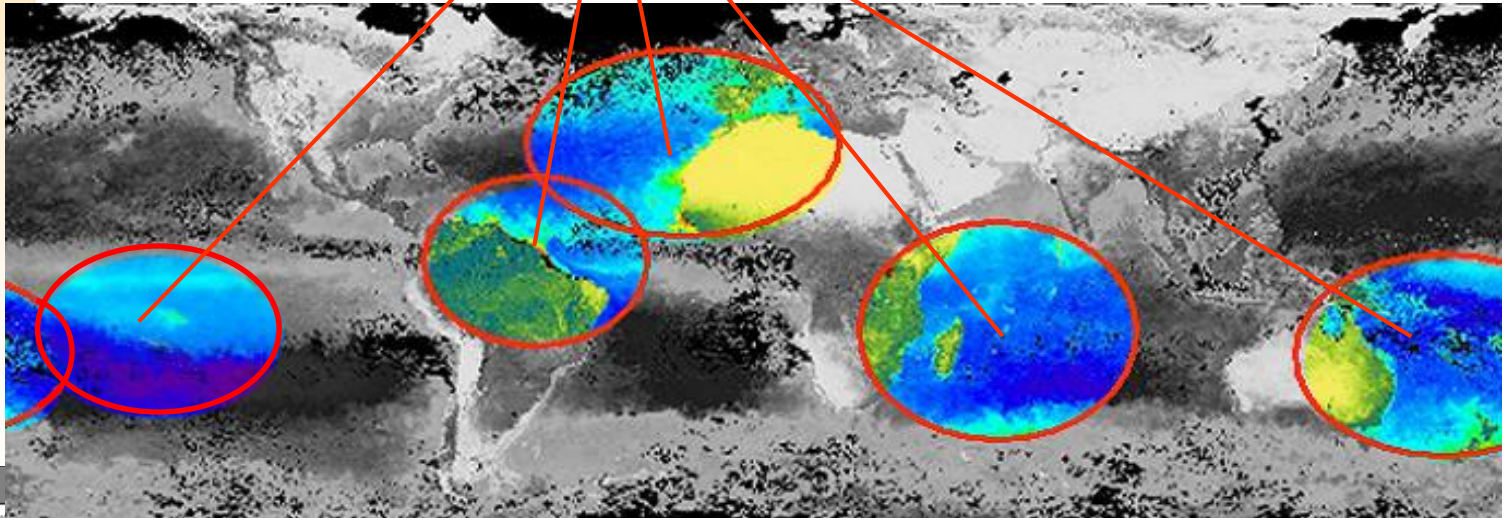


Users

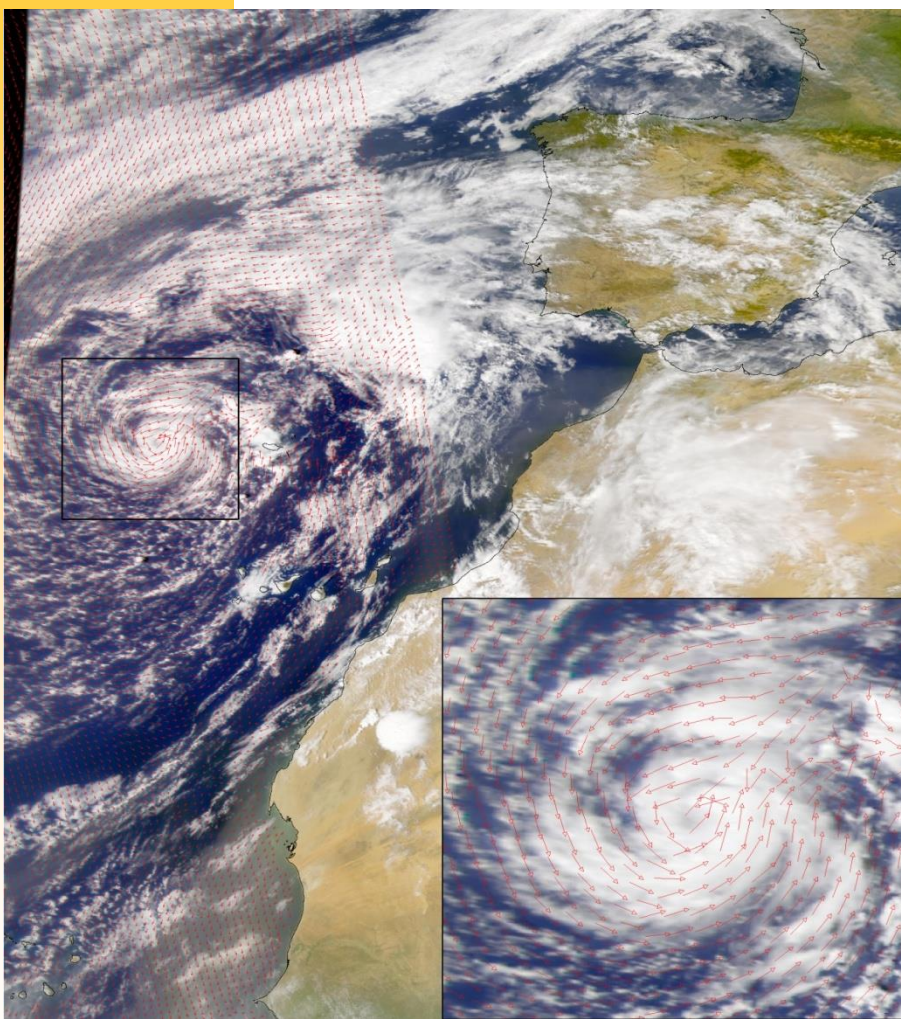


Local Reception
(LAC)

Internet
intranet



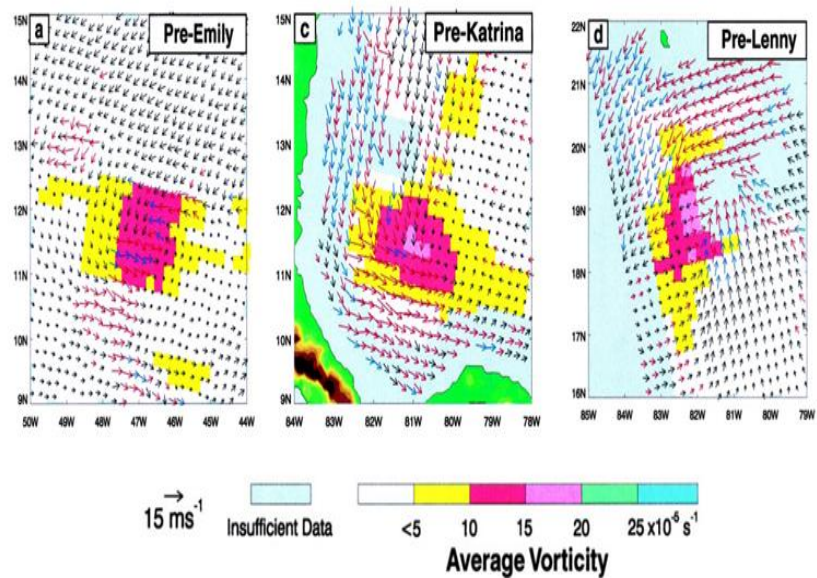
Monitoring of tropical storms and hurricanes



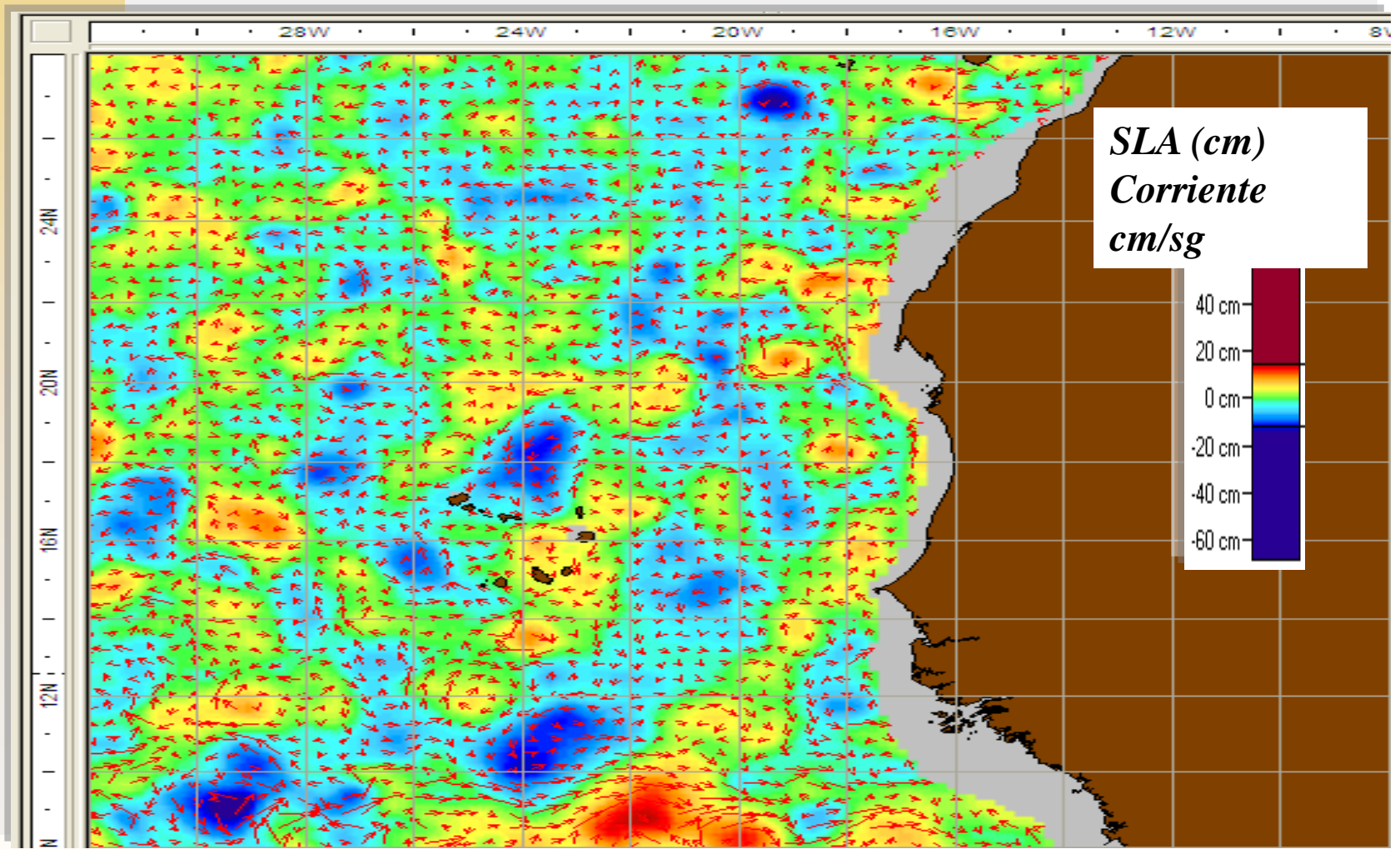
SeaWiFS /OrbView -2

Seawinds /Quiksat (NASA)

- Tropical storm VINCE
8 oct 2005

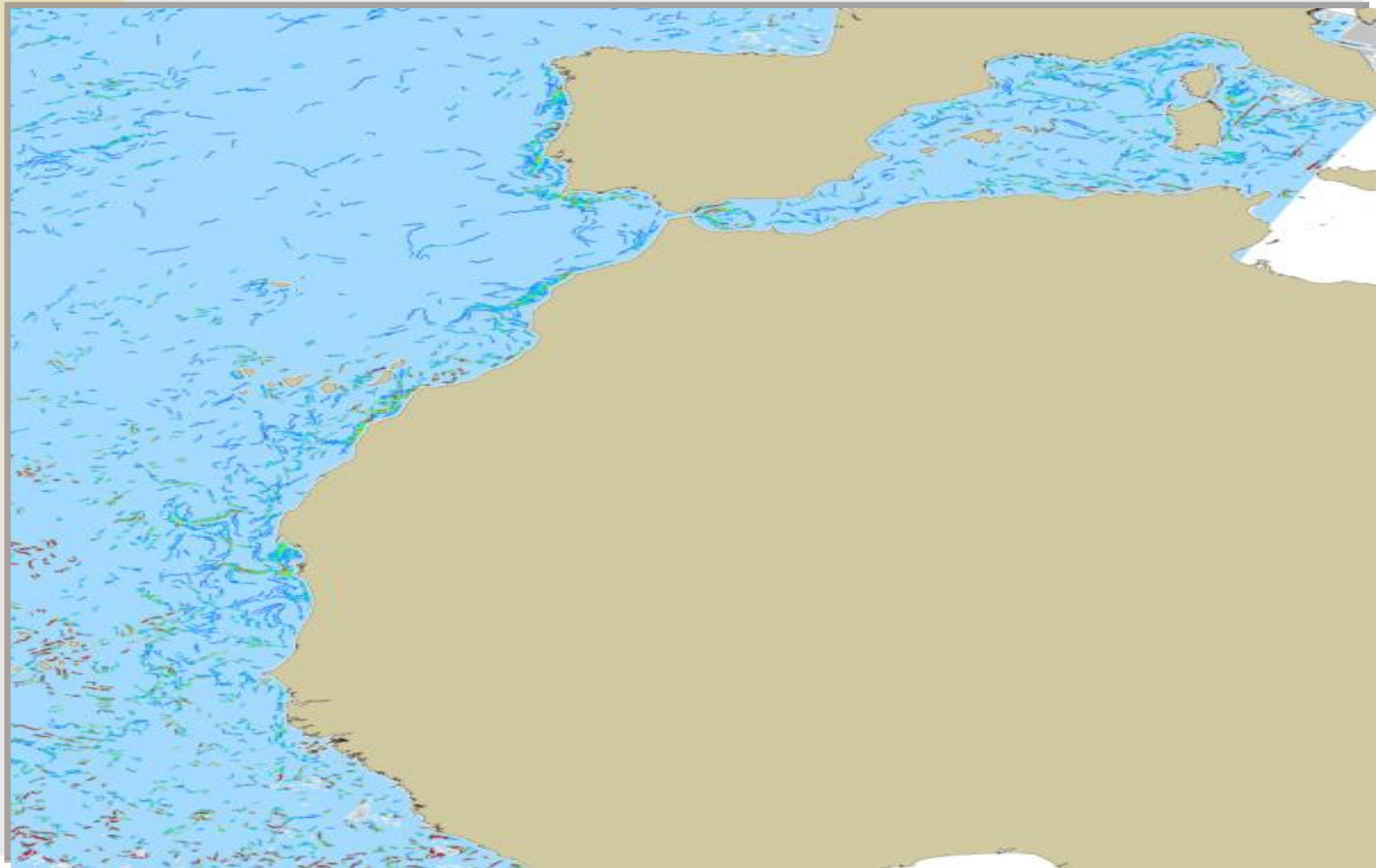


Sea level anomalies and currents



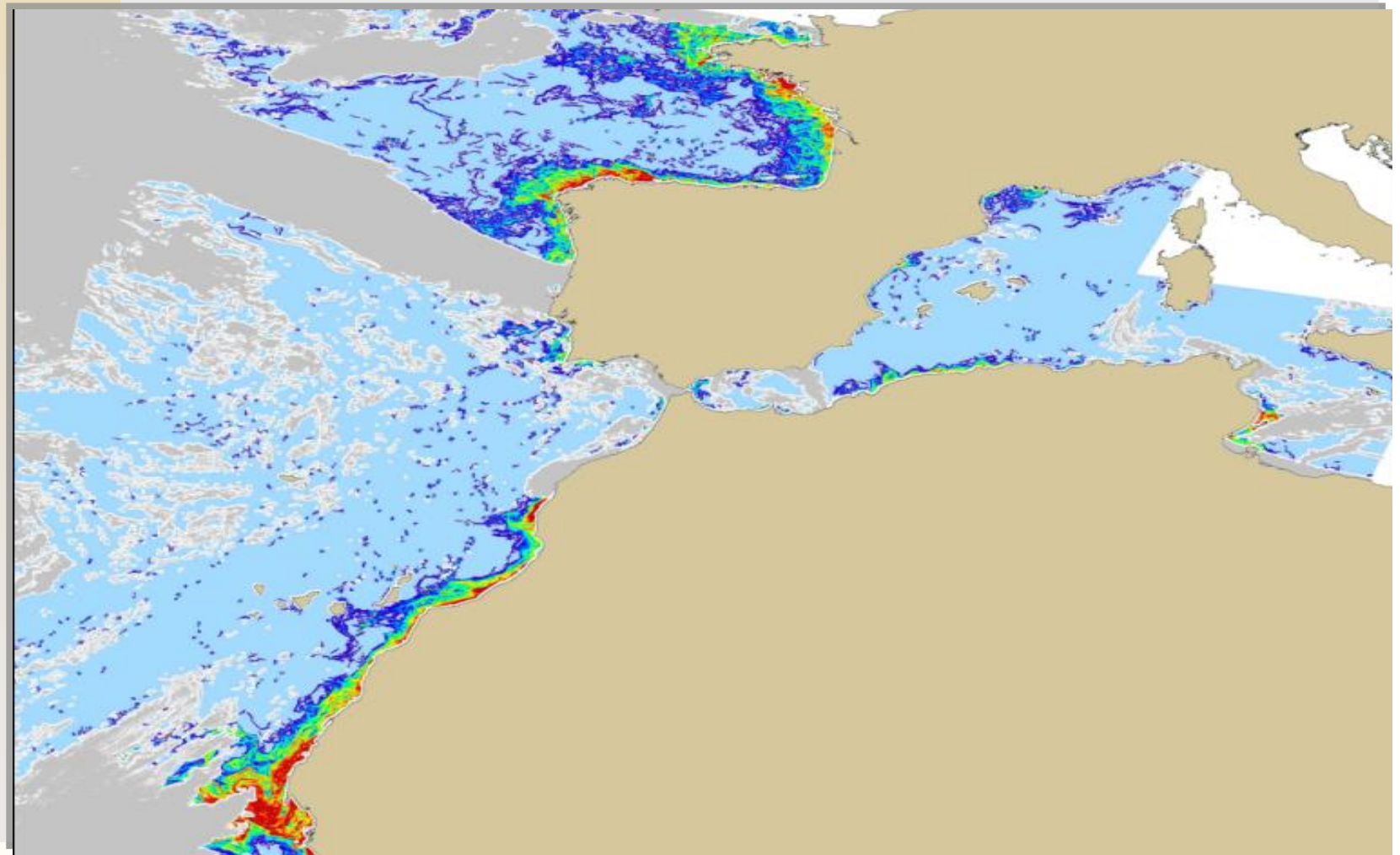


Sea Surface Temperature fields and fronts



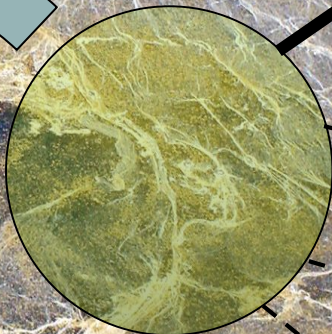
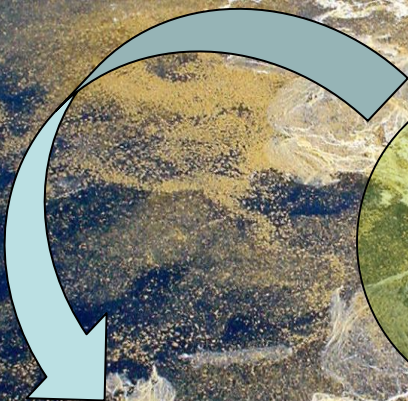


Plankton fields and fronts



Harmful Algae Blooms

August 2004. NW african coast



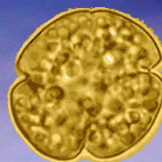
PROCARIOTS (98%)

Trichodesmium

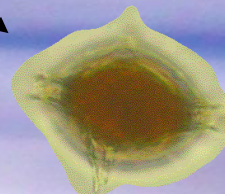


EUCARIOTS (3%)

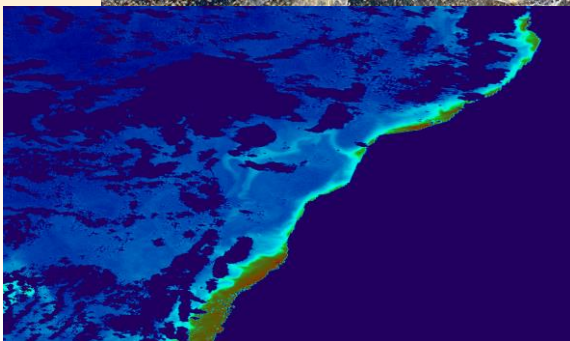
Ostreopsis



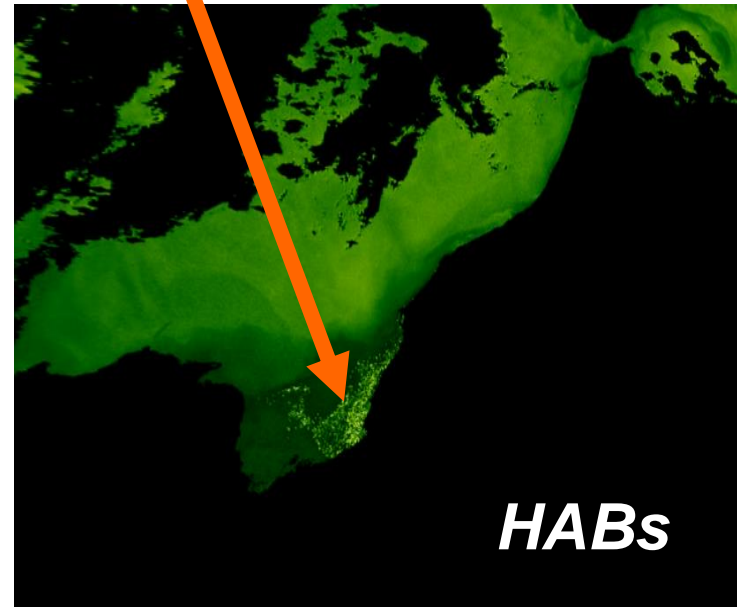
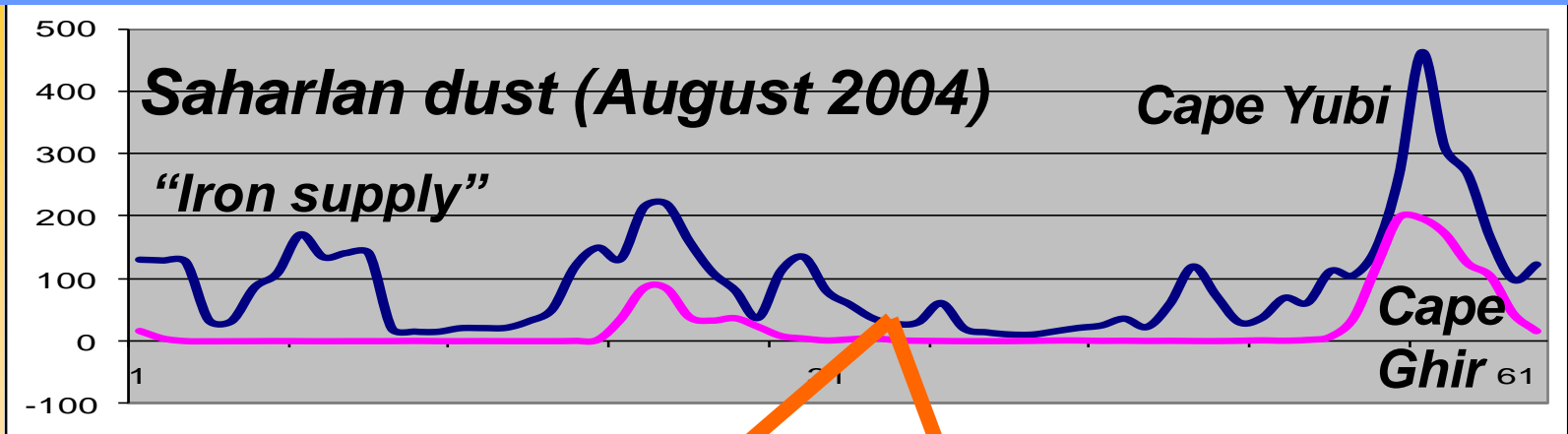
Gymnodinium



Zygabikodinium



Harmful Algae Blooms





SeASAP Canarias Servicio Asistido por Satélite de Ayuda a la Pesca en Canarias



Gobierno
de Canarias

Consejería de Agricultura,
Ganadería, Pesca y Alimentación



Meteorología

Altimetría

Clorofila

SST



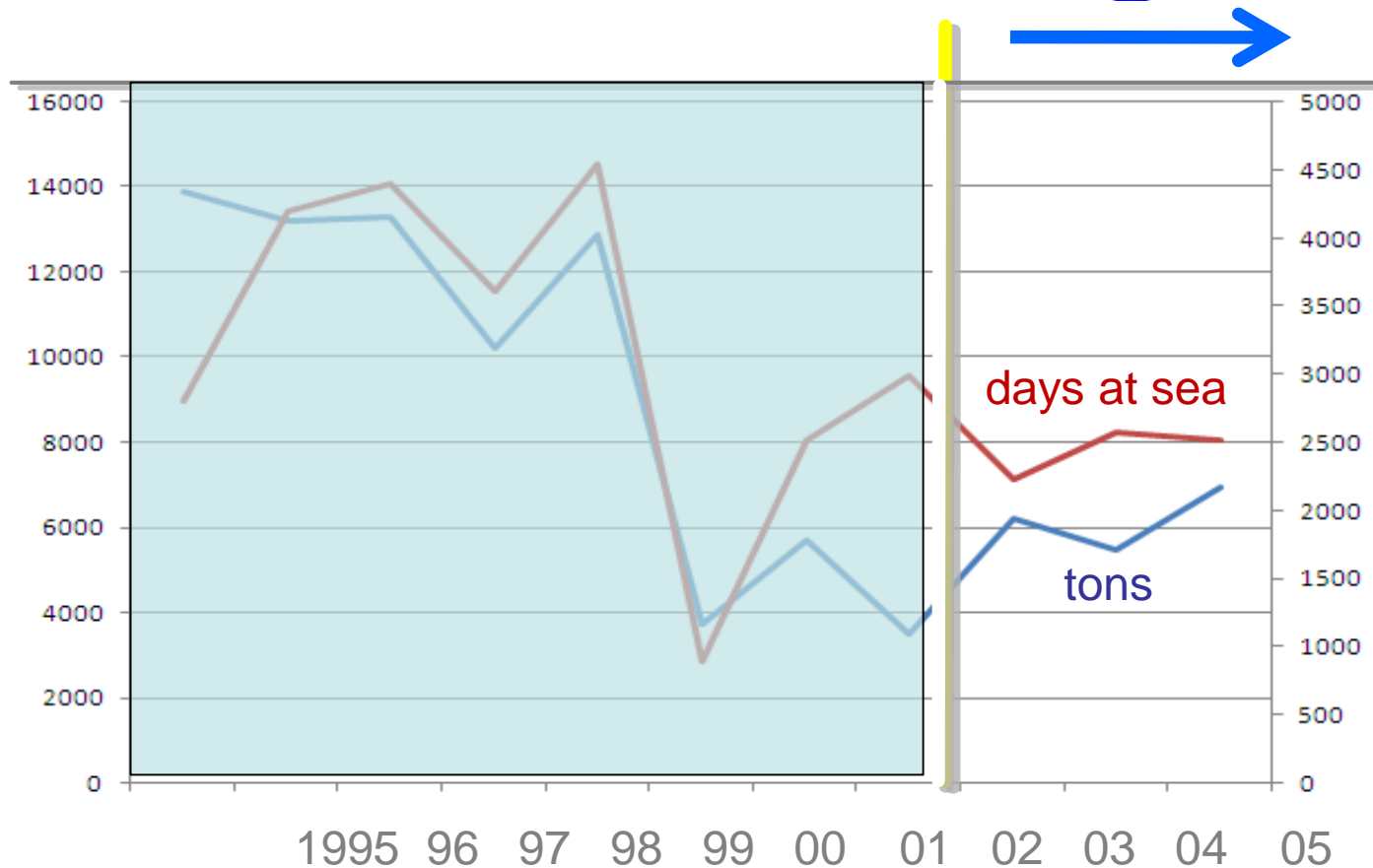


SeASAP Canarias Servicio Asistido por Satélite de Ayuda a la Pesca en Canarias

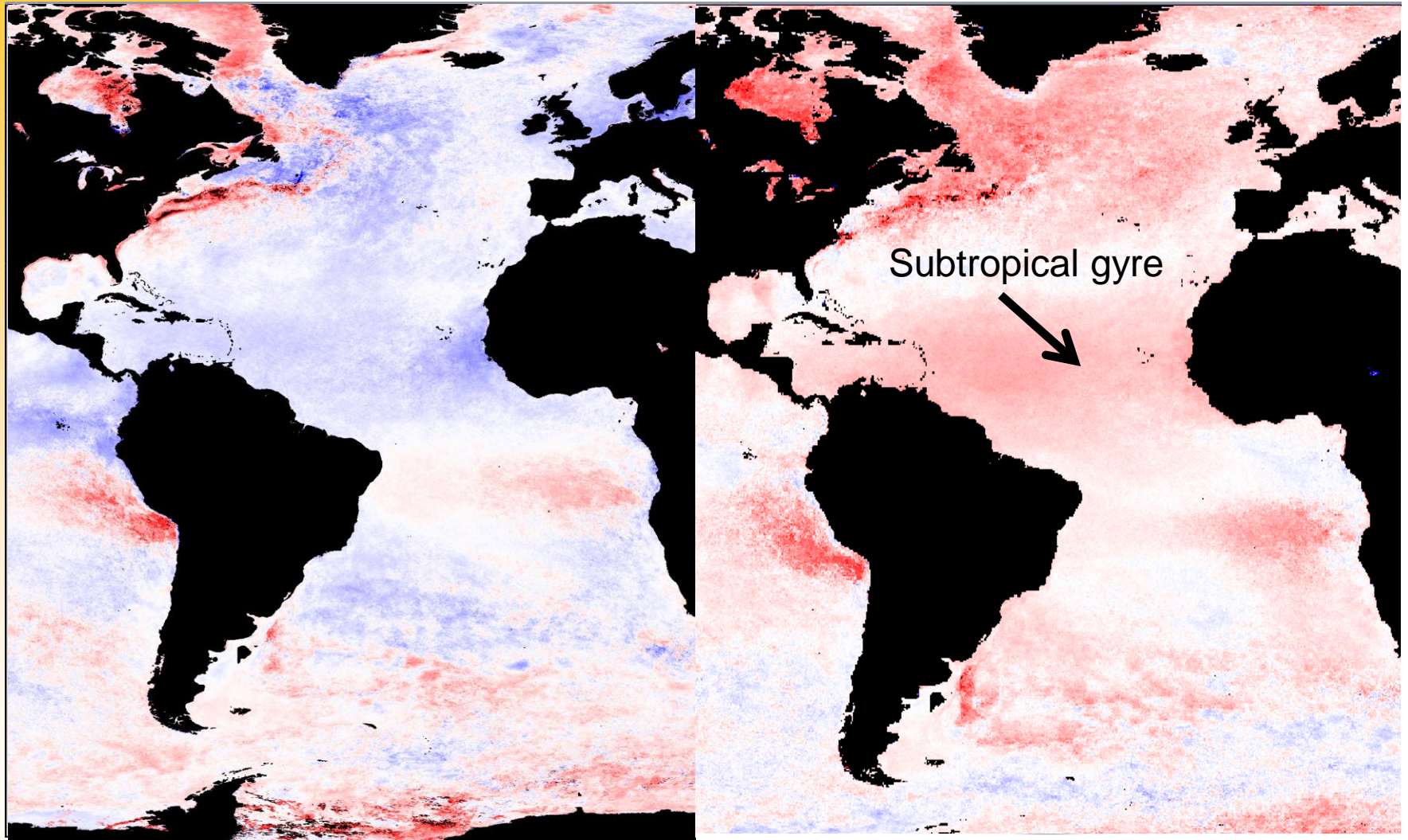


Gobierno de Canarias

Consejería de Agricultura, Ganadería, Pesca y Alimentación



Ocean global warming. SST



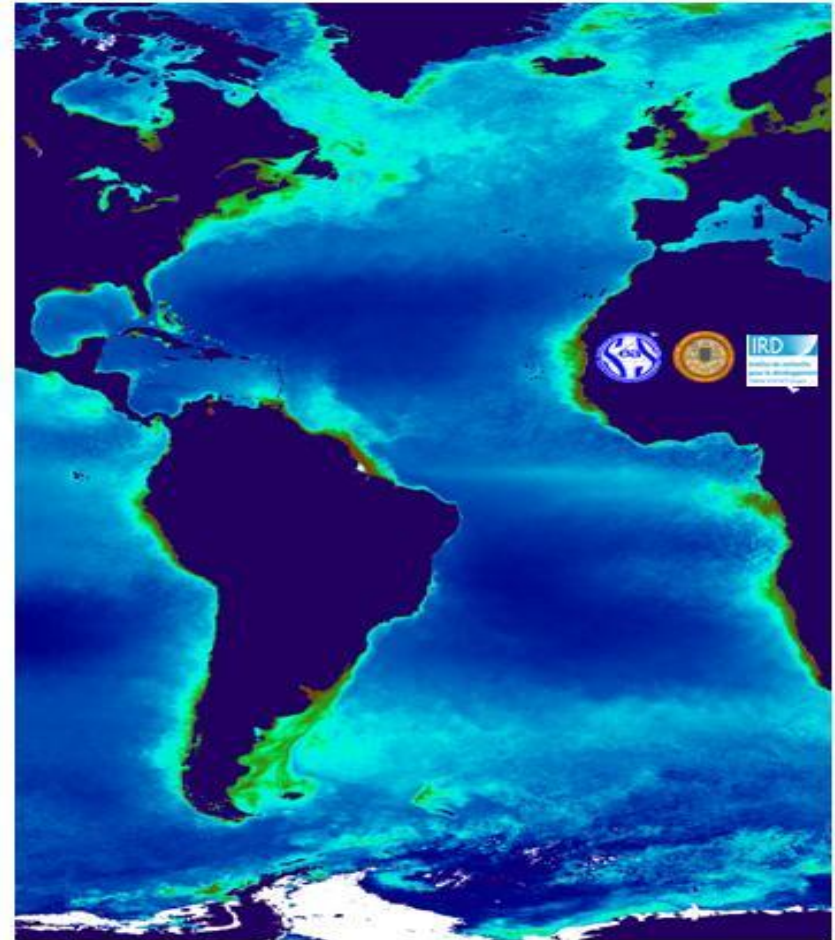
GLOBAL WARMING. SST ANOMALY
(1985 left - 2005 right) (> 1 C red)

Ocean global warming. Desertization

1998. Satélite SeaWiFS/Orb-view2

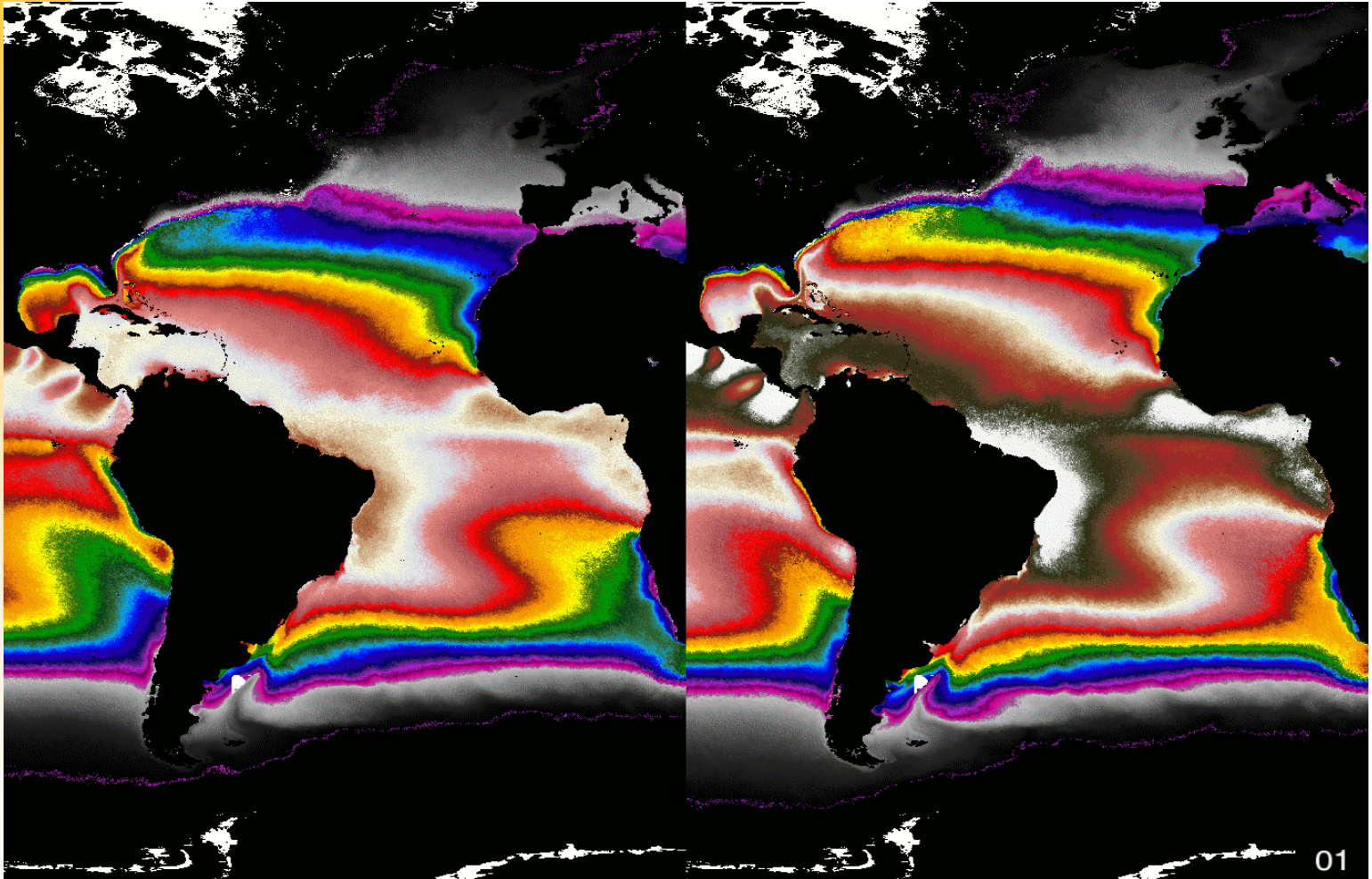


2006. Satélite SeaWiFS/Orb-view2



GLOBAL WARMING. Clor a fields. 1998 (left) and 2006 (right).

Ocean global warming



(1985-2005)

(2025-2045 ? + 2° C)

**Part III:
Multidisciplinary Marine Meteorology and
Remote Sensing System for West Africa
The challenge...**




Motivation

WMO

Enhancing Marine Multi-hazard Early Warning System in West African Countries for Improved Marine Safety

 A good part of the population of West African countries lives in coastal cities, with their economic activities in the coastal zones.

 A WMO survey in those countries revealed a lack of expertise in marine meteorology in their national meteorological services, as well as an absence of an effective warning and disaster mitigation strategy.

Geographical domain

Morocco



Cape Verde



Mauritania



Senegal



Gambia



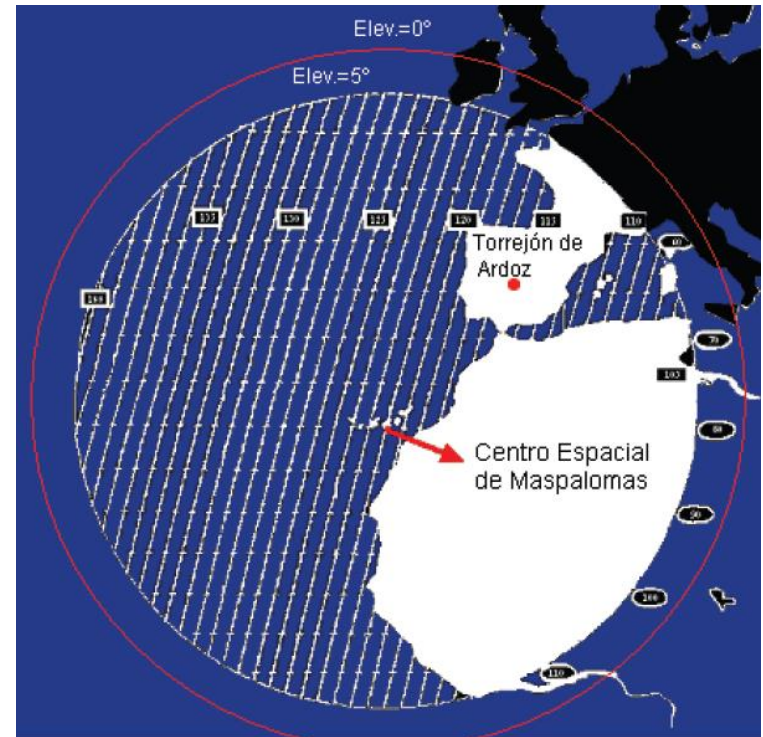
Guinea Bissau



Guinea



A shared oceanic domain !



+ Spain



The Objective

To develop marine meteorological services in the region in order to provide:

- Marine monitoring for sea state characterization;
- Marine forecasts and Warnings;
- Issuing, preparing and disseminating (broadcasting) Marine Bulletins to be used by stake-holders;
- Reliable marine meteorological information and remote sensing products to specific users (transportation, port authorities, fisheries...), in an appropriate user-oriented format;
- Reinforced national capacity building to facilitate the utilization of marine meteorological information, developing capacities to create new added-value products;

The partnership



MINISTERIO
DE MEDIO AMBIENTE

INSTITUTO NACIONAL
DE METEOROLOGÍA



UNIVERSIDAD DE LAS PALMAS
DE GRAN CANARIA

West Africa NHMSs

Contributors



AGENCIA
ESPAÑOLA DE
COOPERACIÓN
INTERNACIONAL



MINISTERIO
DE DEFENSA



Main components

End-user products: marine forecasting and monitoring

Modeling:

INM
ECMWF
My Ocean

Satellite monitoring:

Las Palmas University (SeasNet)
INTA (CREPAD-Maspalomas)
Eumetsat (Ocean & Ice SAF)

Capacity building

Modeling products
satellite products
Data reception/management
New product developments

Data dissemination:

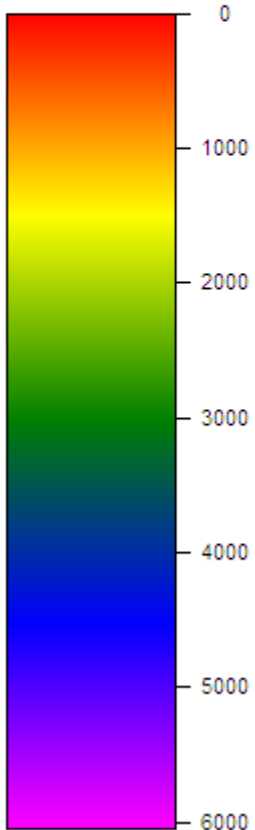
WMO's GTS
GeoNetCast
Restricted-access web site
ACMAD
AECI's technical offices ?

End-user products: marine forecasting and monitoring

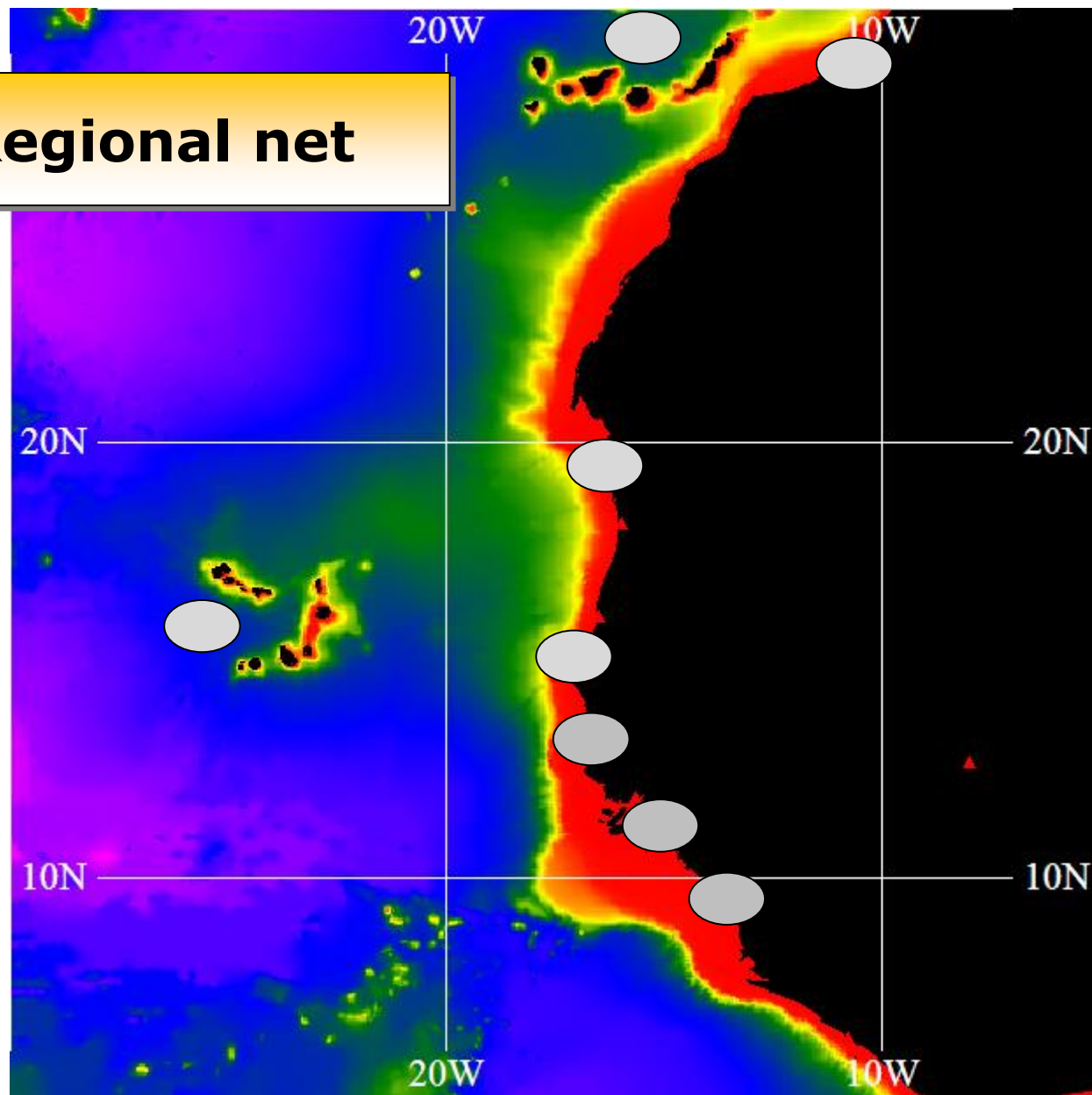
Land



Depth in Metres



Regional net





Cooperation Program for sustainable development of fisheries in Africa



Potential benefits

- Reduction of loss of lives and property;
- Reduction of damage to infrastructure;
- Provision of data for safe Navigation;
- Disaster prevention and preparedness;
- Improved fishing activities;
- Increased scientific and technical capacity;
- Improved knowledge of marine meteorology and ecology in West Africa and their relation with global change;



Shukran
Merci
Thank you
Gracias