



Copernicus

EU-China Blue Year Event
Brussels, 1 June 2017

Richard Gilmore
European Commission
DG GROW/Copernicus programme



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Introducing the Copernicus Programme

- ★ History, main components
- ★ Marine-relevant aspects

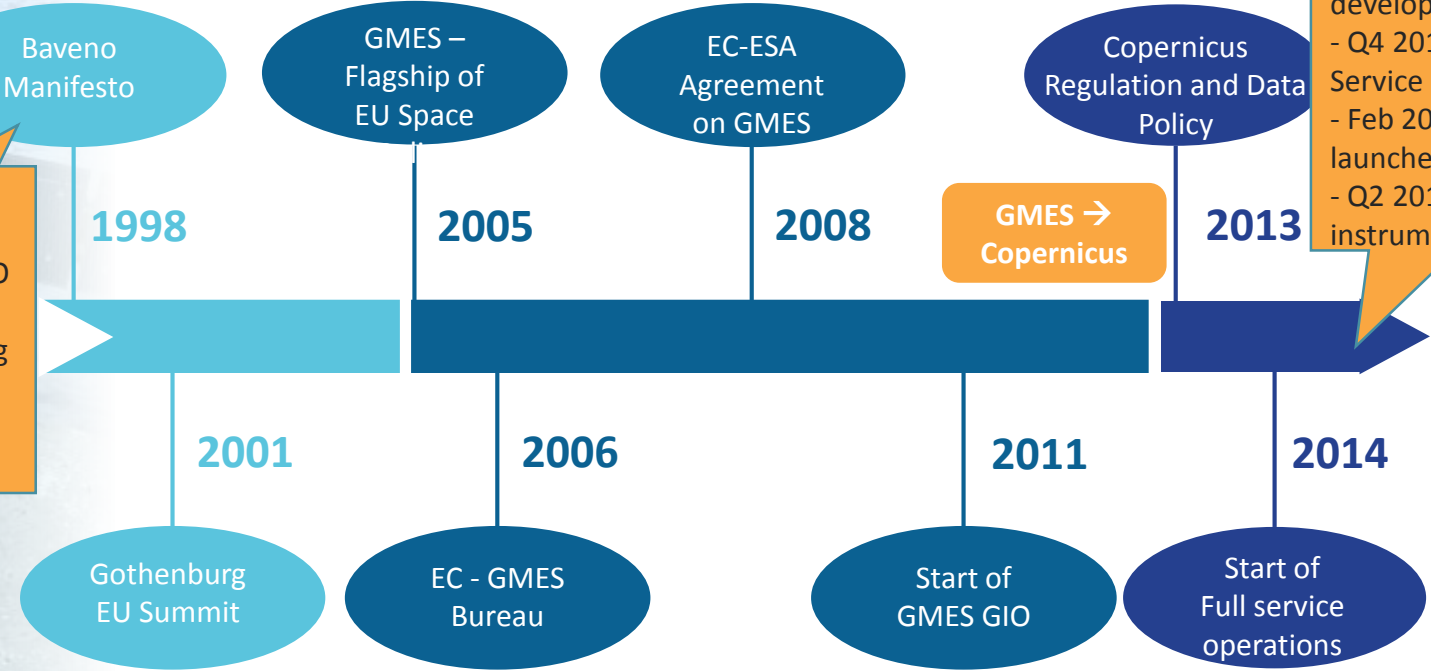


Space Component

COPERNICUS HISTORY

Long-term commitment to develop EO env. monit. services using & developing European skills & tech.

Recent marine-relevant developments:
- Q4 2015: Marine Service starts
- Feb 2016: Sentinel 3a launched
- Q2 2017, OLCI instrument operational



GIO = GMES Initial Operation



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COPERNICUS FUNDING

From research to operations

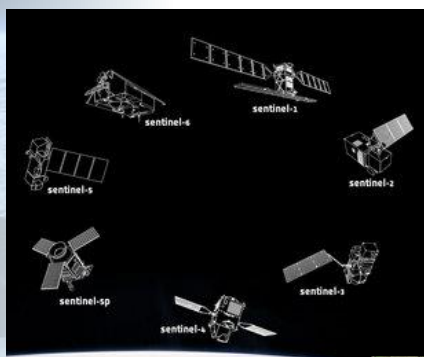




Space Component

COPERNICUS ARCHITECTURE

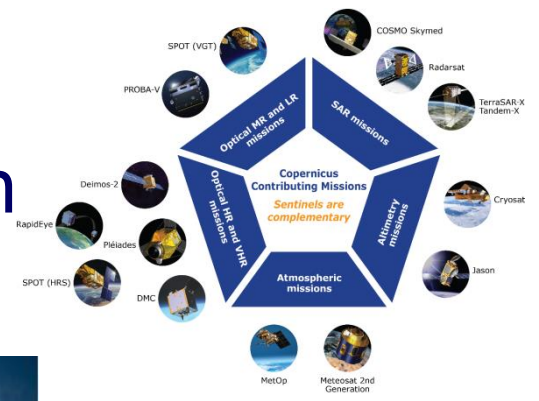
6 services use Earth Observation data to deliver ...



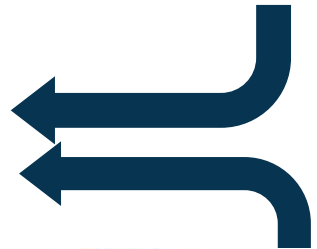
Sentinels



...added-value products



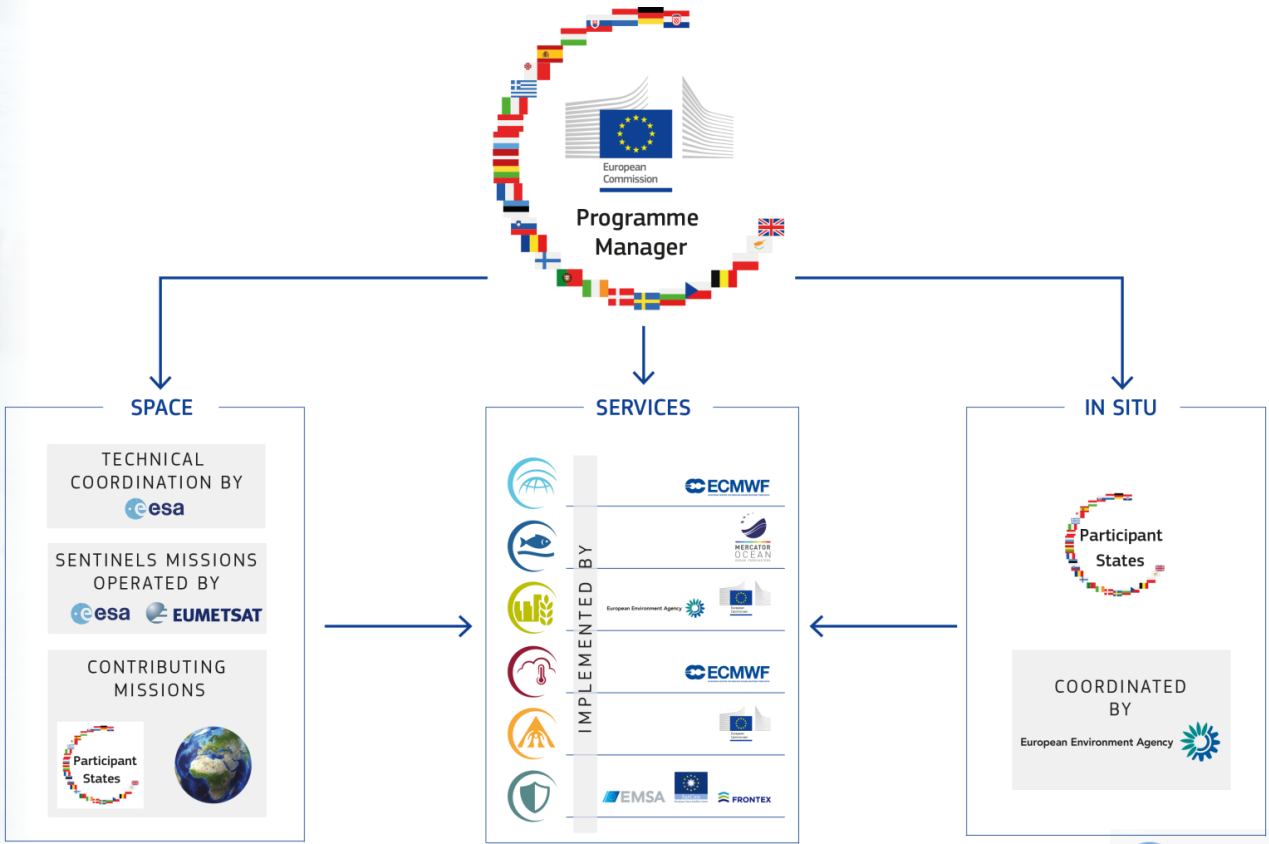
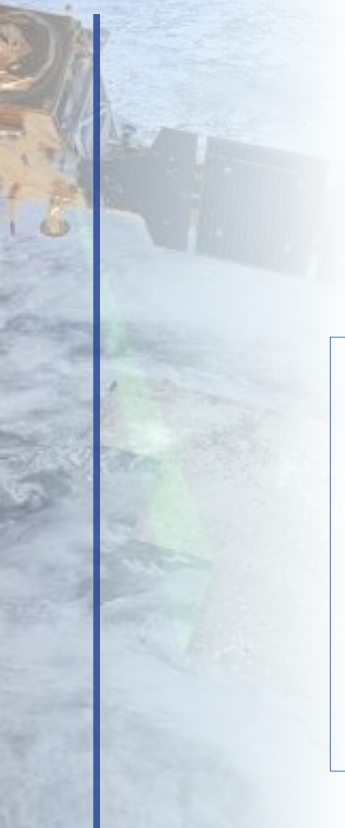
Contributing missions





COPERNICUS GOVERNANCE

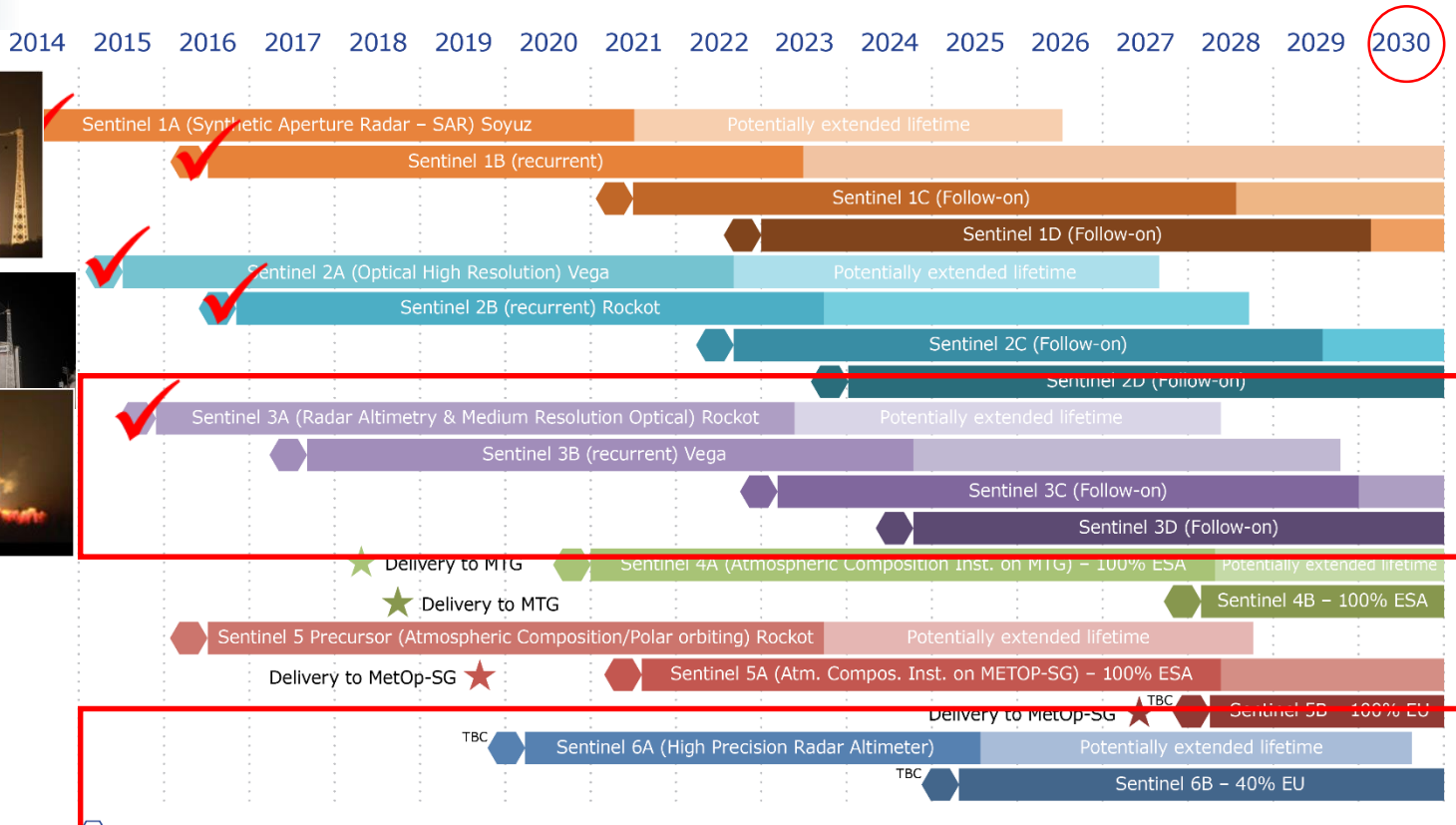
Space Component





Space Component

SENTINEL FAMILY DEPLOYMENT SCHEDULE



Legend: ⬢ Flight Acceptance Review



Space Component

The Six COPERNICUS SERVICES

FULL, FREE AND OPEN

Monitoring the State of the Earth System Environment ...

ECMWF

Atmosphere Monitoring

✓

Marine Environment Monitoring

✓

Land Monitoring

✓ ✓

JRC EUROPEAN COMMISSION

Emergency Management

✓ ✓

ECMWF

Climate Change

✓

FRONTEX EMSA

Security

✓ ✓ ✓

✓ = operational
✓ = in ramp up

... Six cross-cutting Thematic Services



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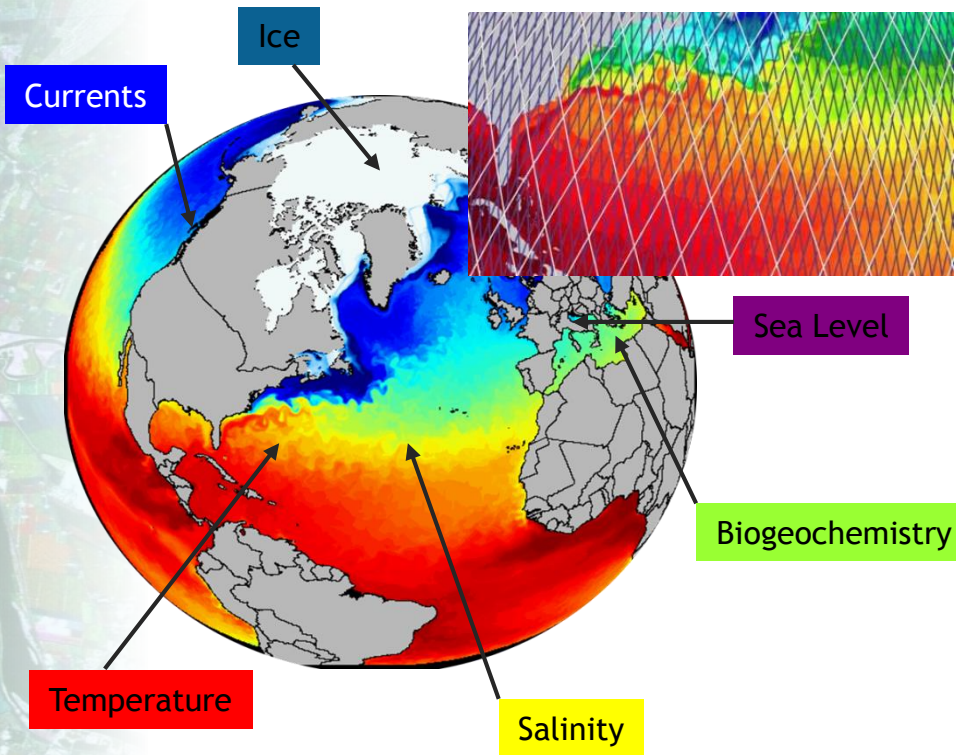
Why is the marine sector so important?

- ★ “Blue Economy”, 5 million jobs, gross added value almost €500bn/year
- ★ 90% of international trade is maritime
- ★ Half of the world's population lives within 100 km of coast
- ★ EU coastline (where many human and economic activities take place) is 7 times longer than US, 4 times longer than Russia
- ★ Global potential ocean energy resources exceed present and projected future energy needs
- ★ The ocean plays a critical role in the climate system
- ★ Therefore a major policy priority (International Ocean Governance, Blue Growth, Marine Strategy Framework Directive, EU Water Framework Directive, UN Sustainable Development Goals...)



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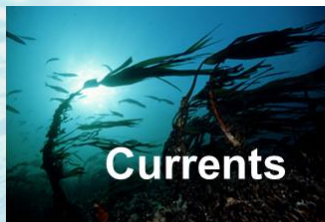
Marine Environment Monitoring Service



- 1. Global
- 2. Arctic
- 3. Baltic
- 4. NWS
- 5. IBI
- 6. Med Sea
- 7. Black Sea

- **Global and Regional**
- **Real time and Reanalyses**
- **Satellite & In Situ obs. and Models**

A 3D and consistent estimation of the ocean

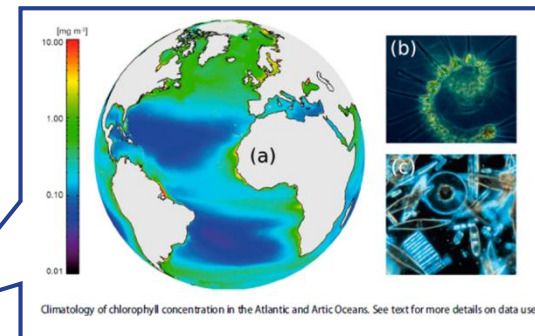




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Marine Service, key milestones

- CMEMS is fully operational since 2015, builds on the MERSEA/MyOcean research & pre-operational development heritage
- Copernicus Entrusted Entity: Mercator Océan
- Currently V3 running, 152 products, new release on 19 APR with waves
- V4 in preparation (in particular will bring improvements to biogeochemistry parameters, inclusion of Ocean Monitoring Indicators)
- Close to the 10k user mark
- Mainly EU, but also strong international use (America 16%, Asia 16%)
- 1st Ocean State Report published this year, will now be published annually (e.g., global chlorophyll):

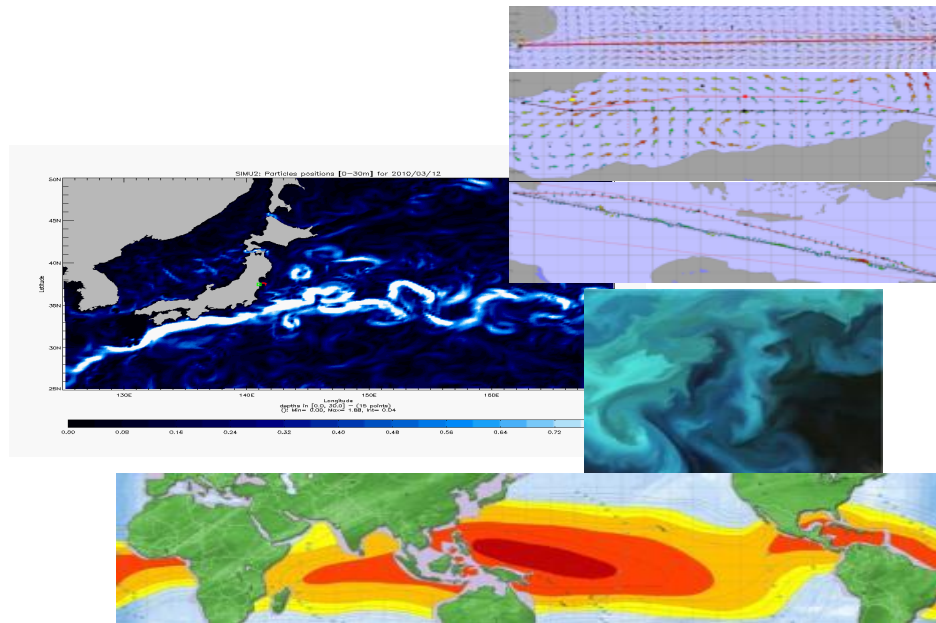




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Examples of Marine application areas

- Ship routing
- Support to offshore activities
- Coastal management
- Oil-drift forecasting
- Sea-ice forecasting
- Search and rescue
- Fisheries
- Algae bloom
- Water-quality management
- ...



But also Climate Change...

- ★ Sea-level rise (one of the main indicators for Climate Change)
- ★ ...

Saving Fuel / Shipping Company

To reduce fuel consumption for ecological & economical reasons

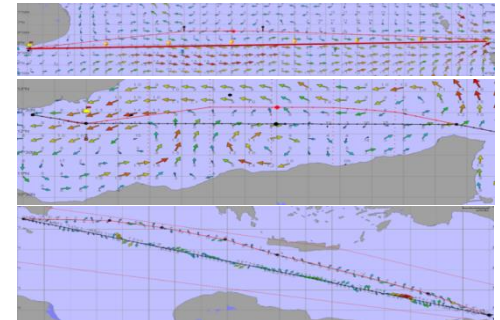
3 options:

- ✓ Optimize engines, propellers, hulls...
- ✓ Improve organization...
- ✓ Take benefit of Meteorology/ Operational Oceanography (**current observations and forecast**)

0.4% = Average thanks to "current routing"

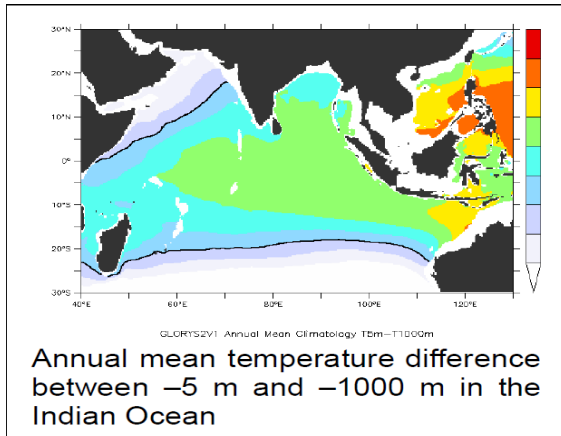
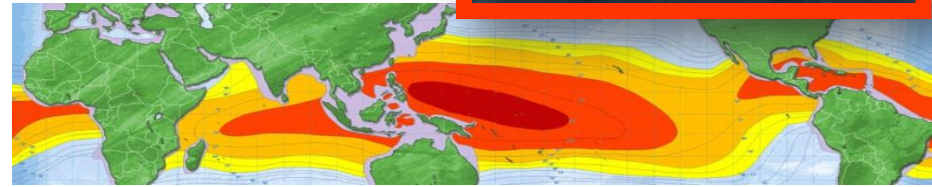
(Line Europe-China Q2 2015)

Target: Save 1% thanks "current routing" (current forecast reliability) would lead to 60,000t fuel saving for the whole CMA-CGM fleet > 180,000t CO₂.

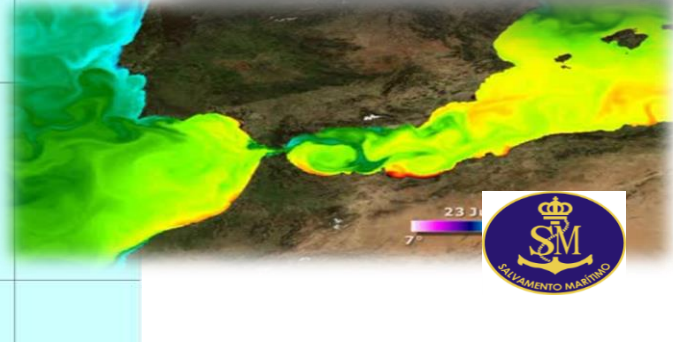
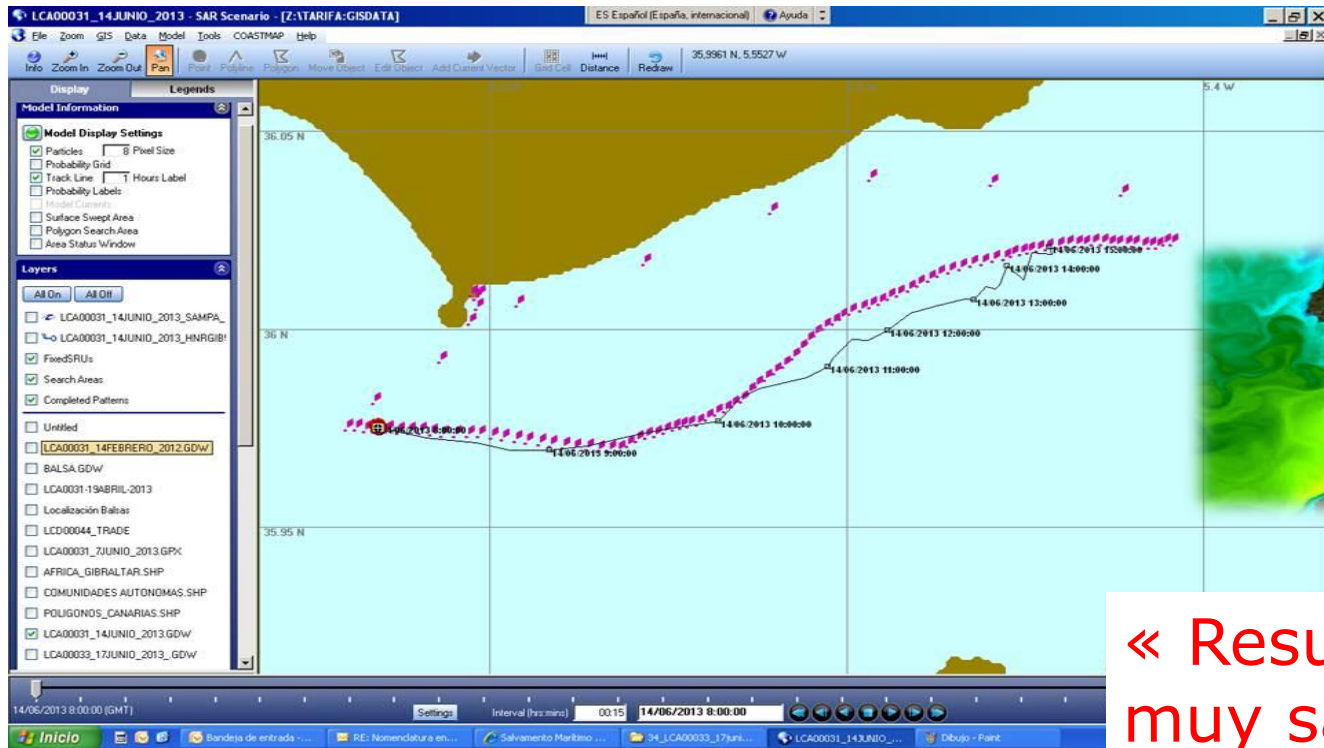


Exploring new sources of energy: OTEC

Ocean Thermal Energy Conversion (OTEC) exploits the difference in temperature between warm surface waters and cooler deep water. To be economically feasible there must be a difference in temperature of more than 20°C between the water at the surface and at depth. OTEC brings value in tropical regions.



Search & Rescue in the Gibraltar Straits



« Resultados muy satisfactorios ! »

José C. Maraver Romero ,
SaseMar controller in Tarifa

Reliability assessment of Copernicus Marine Service
Forecast during a SAR exercise

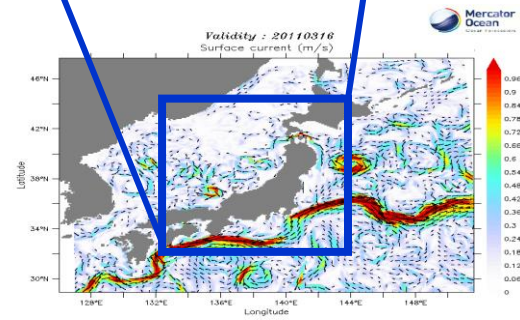
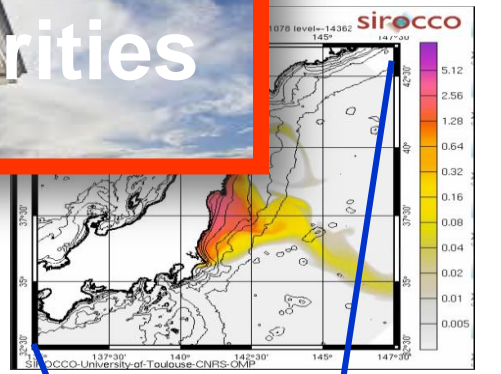
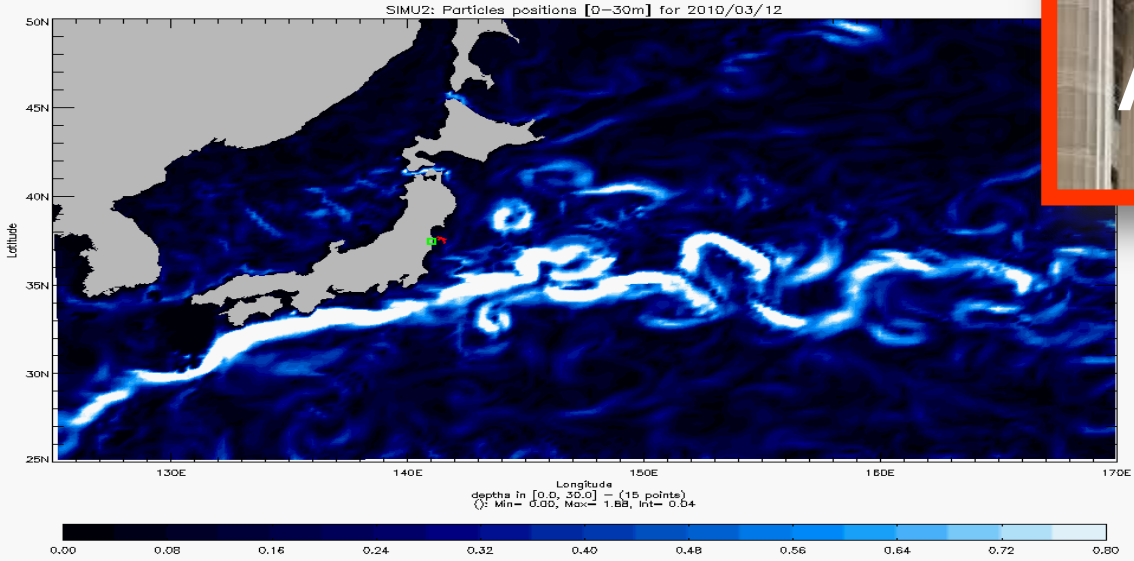


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Contributing to Risk Mitigation Plan (Fukushima)

Immediate overview of the pollution drift



Combatting Marine Litter and plastic pollution

Drift computation based on CMEMS reanalysis over 10 years help the expedition optimize and finetune the itinerary in order to detect the potential pollution convergence areas in the North Atlantic.



**EXPÉDITION
7^e CONTINENT**

Name of the event.

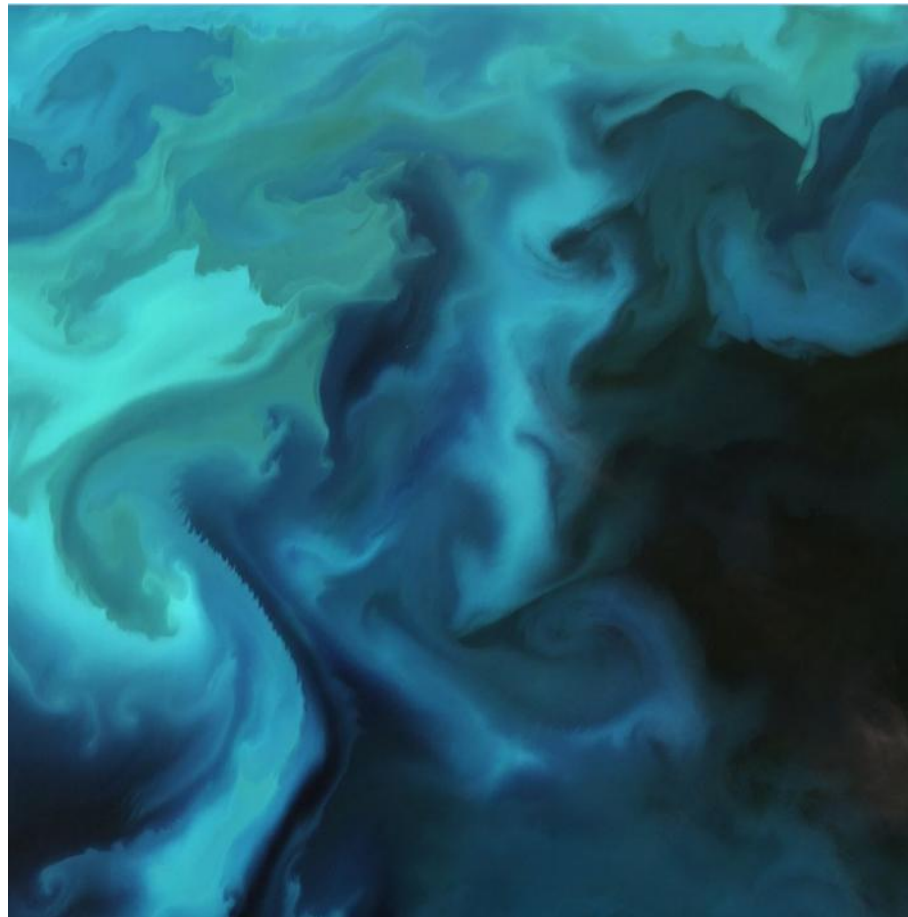
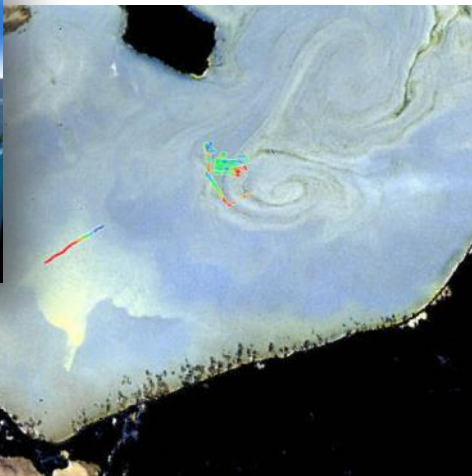
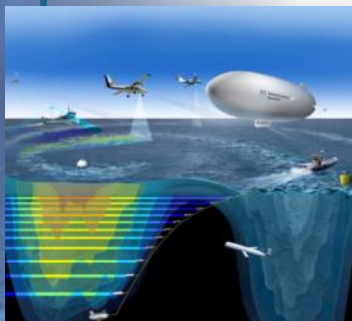




Marine
Monitoring

Understanding algal bloom dynamics

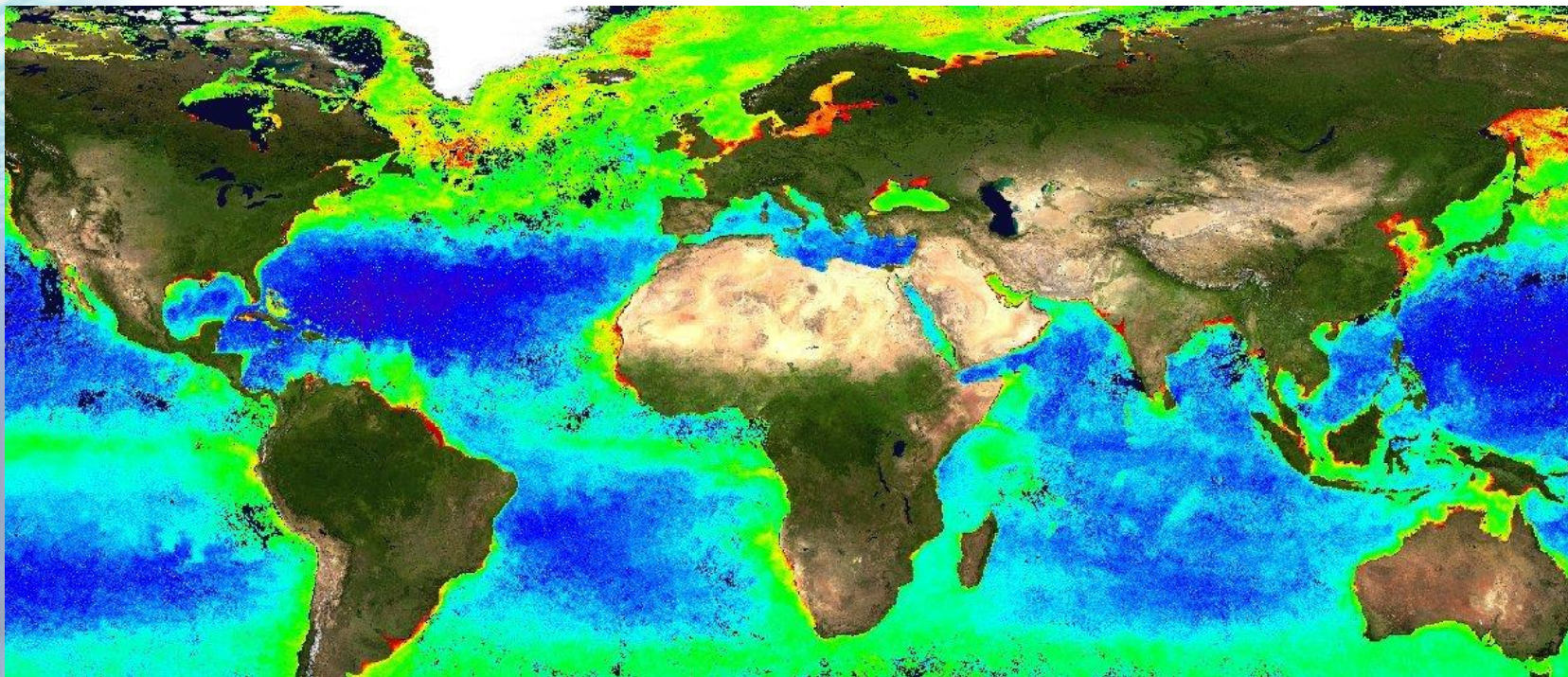
- Algal bloom in Baltic sea as seen by Sentinels
- Swirls correspond to algae concentrations, suspended matter and chlorophyll
- Key to understand ocean productivity and fish stocks
- Eddies form and collapse in few hours
- Observed structures interlock with ocean currents and scale down to submesoscale of only few km
- Heavily influence ocean circulation and energy transport





Marine
Monitoring

Sentinel 3 – global Chlorophyll a concentrations



© Provided by Ewa Kwiatowska

Sentinel-3 OLCI chlorophyll-a concentration (mg/m³): The dark blues have the lowest concentrations, followed by the light blues, then greens, yellow, and finally red which has the highest concentration of Chlorophyll a.



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Europe's eyes on Earth



Thank you
for your
attention