

EuroSITES
European Ocean
Observatory Network



**European Ocean Observing network:
FP7 EuroSITES project.**

Richard Lampitt, Kate Larkin and the EuroSITES Consortium


Partner institutes:

1. NERC-NOCS (coordinator); 2. UiB; 3. HCMR; 4. OGS; 5. CNR-ISSIA;
6. IFM-GEOMAR; 7. UNIABN; 8. CNRS; 9. IFREMER; 10. Océanopolis-SOPAB;
11. ICCM; 12. INDP; 13. ULPGC.

In order to monitor and understand the marine system we need to make sustained multidisciplinary observations at appropriate temporal resolution.

Importance of episodic events

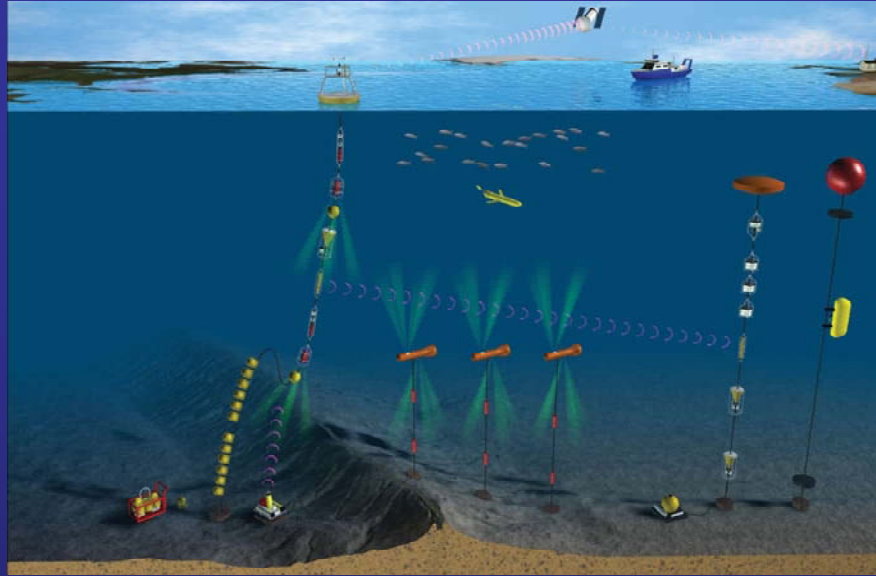
Operational and research

1. Introduction to EuroSITES 
2. What is the current status (data collection)?
3. What is the current status (data management)?
4. How are the data being used?
5. What are the demands for the future?

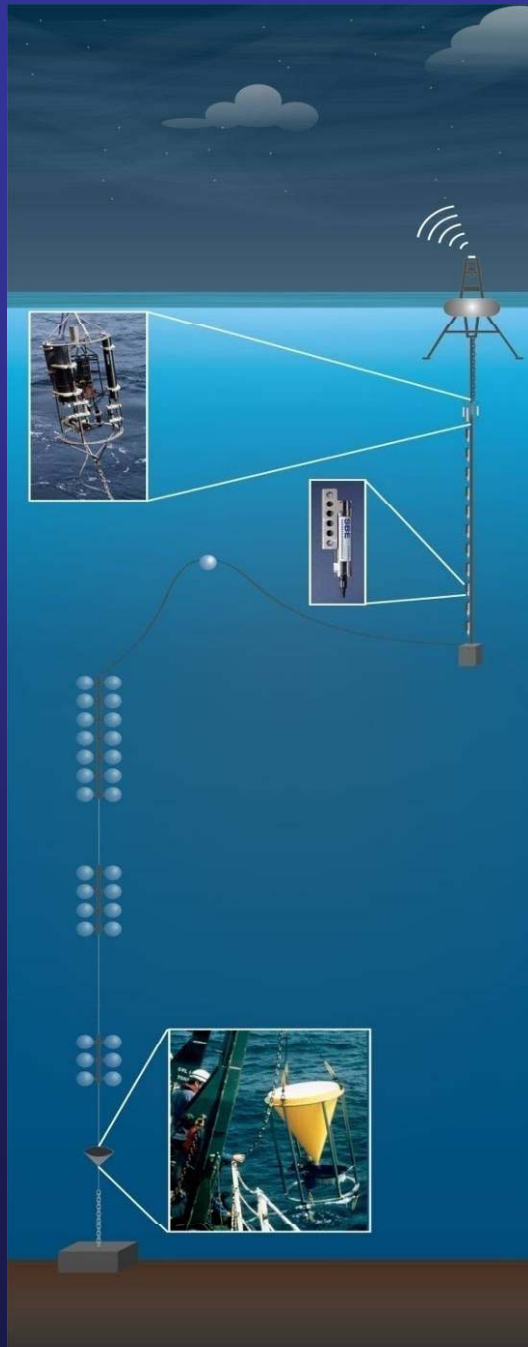
1. Satellite remote sensing
2. Gliders
3. Floats
4. Ships of Opportunity
5. Research cruises
6. Eulerian observatories ←
7. Computational models

All approaches have strengths and weaknesses

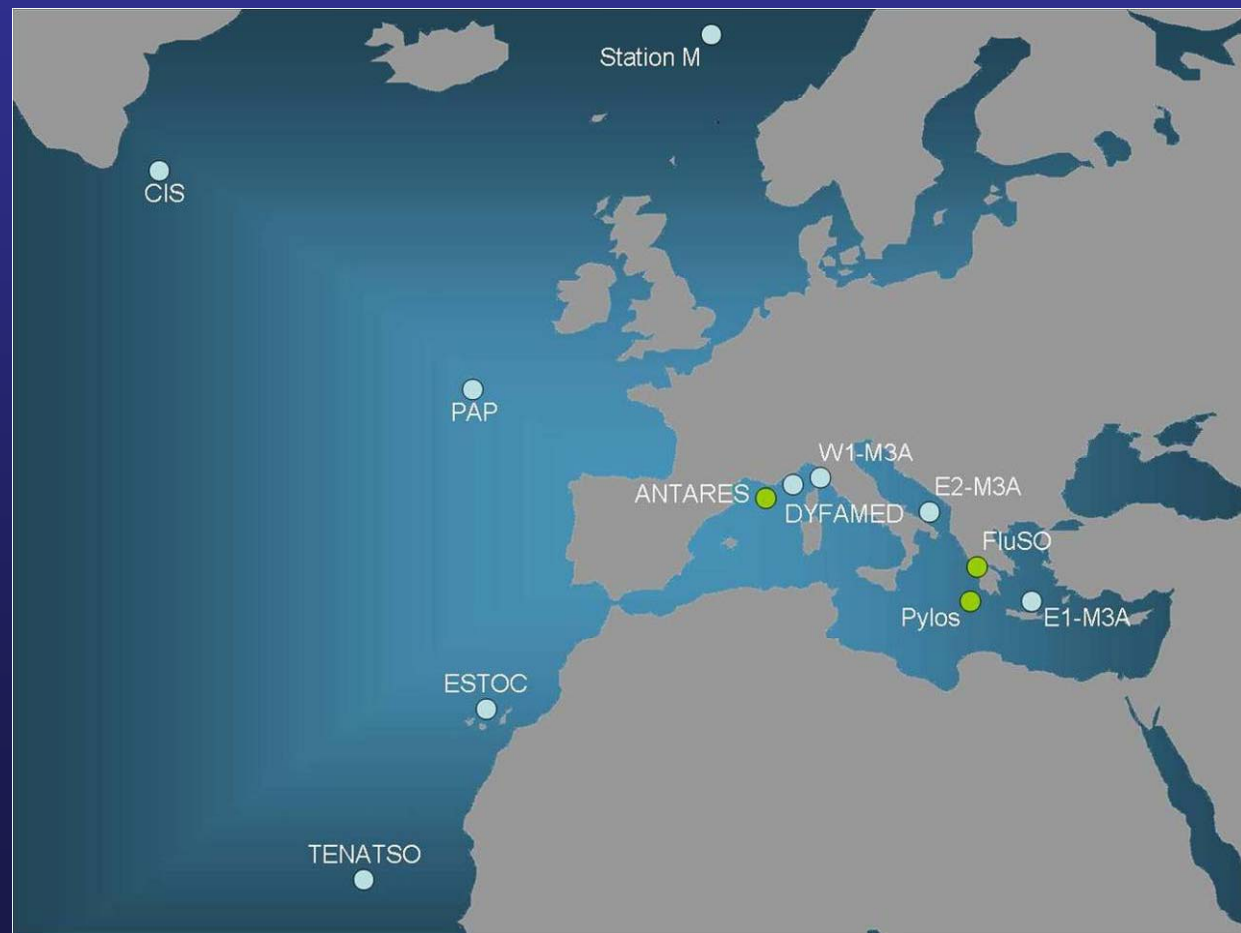
Unique strengths of Eulerian Observatories

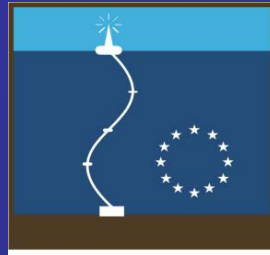


1. Sensors which are large or power-hungry
2. Real-time sub-surface data supply
3. Repeated site-specific sample collection (Water, biota, particles)
4. High frequency, un-aliased data, such as for reference data.
5. Deep ocean location (below maximum depth of floats and gliders)



EuroSITES integrates and enhances the 9 existing deep ocean (>1000m) fixed point observatories.





EuroSITES
European Ocean
Observatory Network

- EU FP7 Collaborative Project
- 3 years: April 1st 2008 - March 31st 2011
- Coordination: NOC, UK
- 13 partners (8 countries)
- International Oversight Committee
- Open ocean (>1000m)
- Full depth, *in situ*: Ocean interior, seafloor and subseafloor

Dual function of funding:

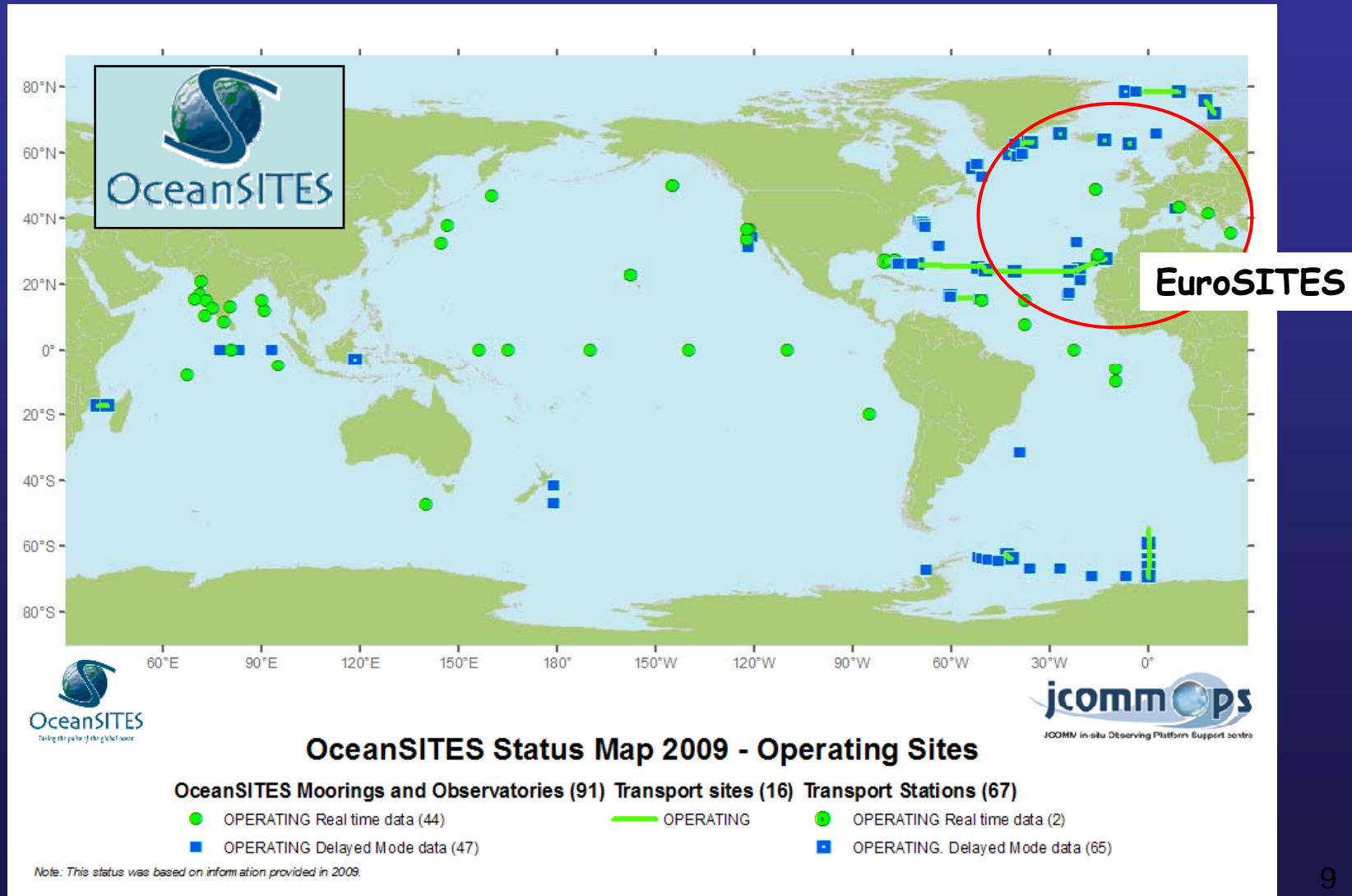
1: Observatory support

- Staff
- Equipment

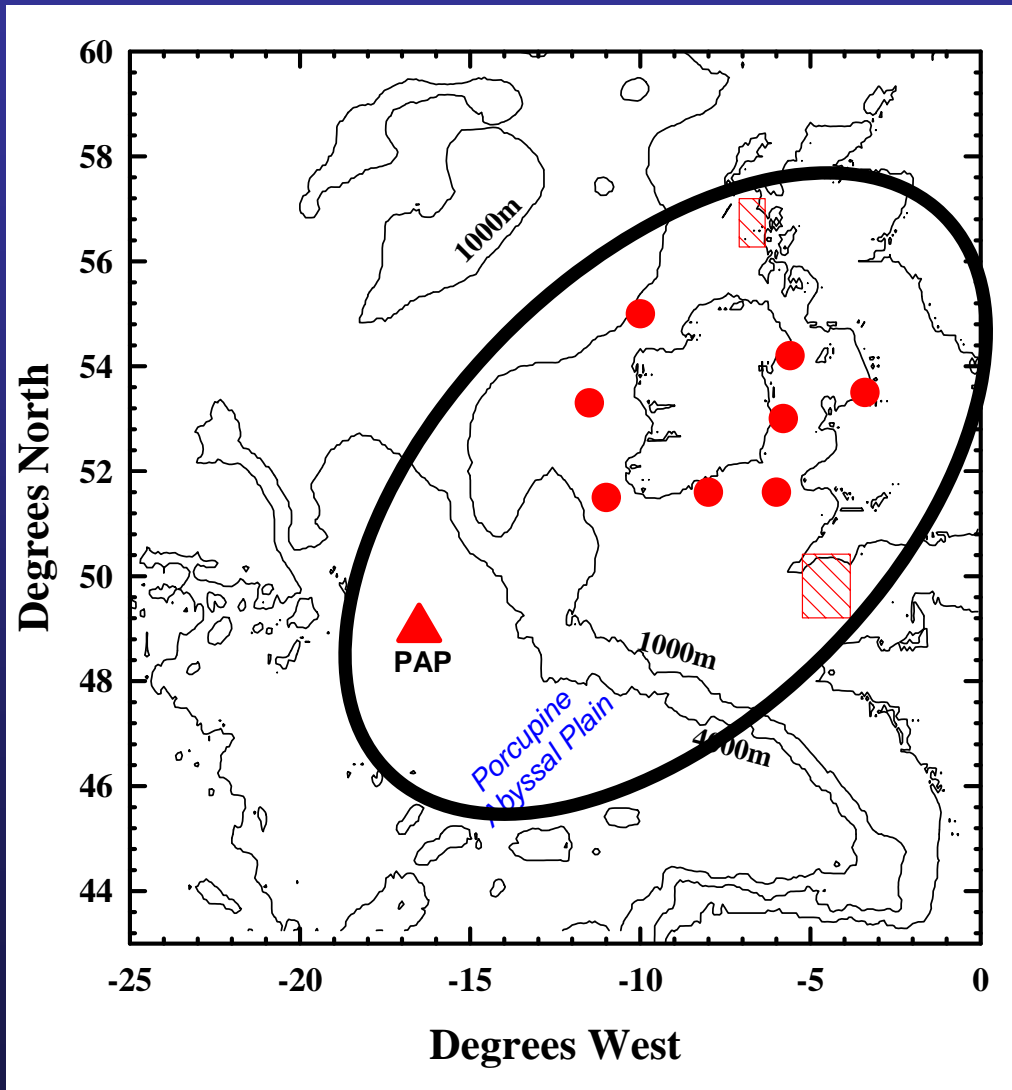
2: Glue

- Efficiency of operation
- Enhanced national funding
- Outreach & knowledge transfer
- Effectiveness

OceanSITES: Global network. An essential component of GOOS.



Links to shelf networks



The Western Shelf
Observatory

<http://www.noc.soton.ac.uk/pap/>

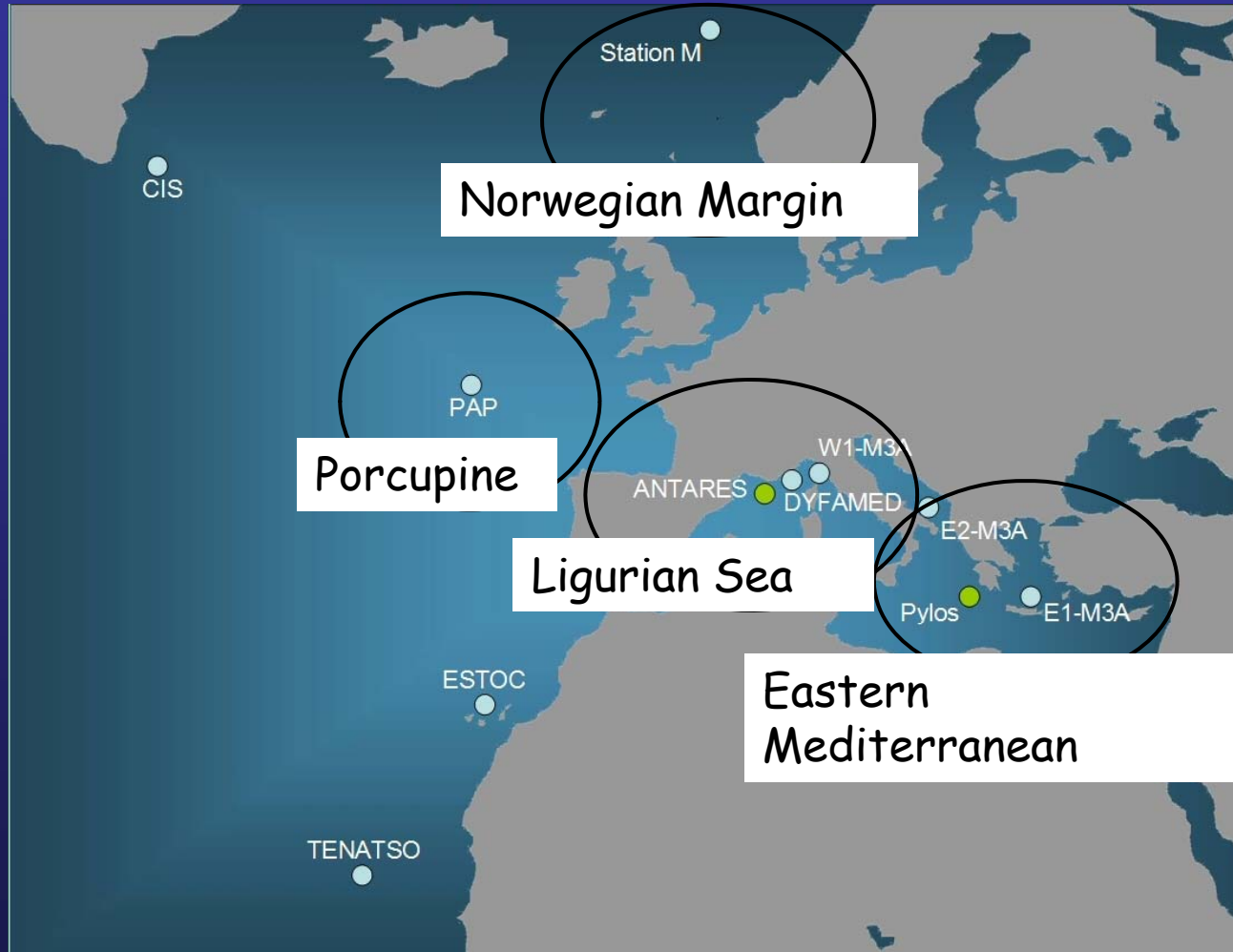
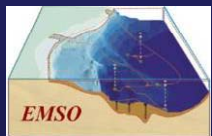
Links to shelf networks



The UK Met Office
ODAS buoy array

From May 2010 this
includes PAP ★

Regional, collaborative science



EuroSITES and ESONET/EMSO: 4 Common regions



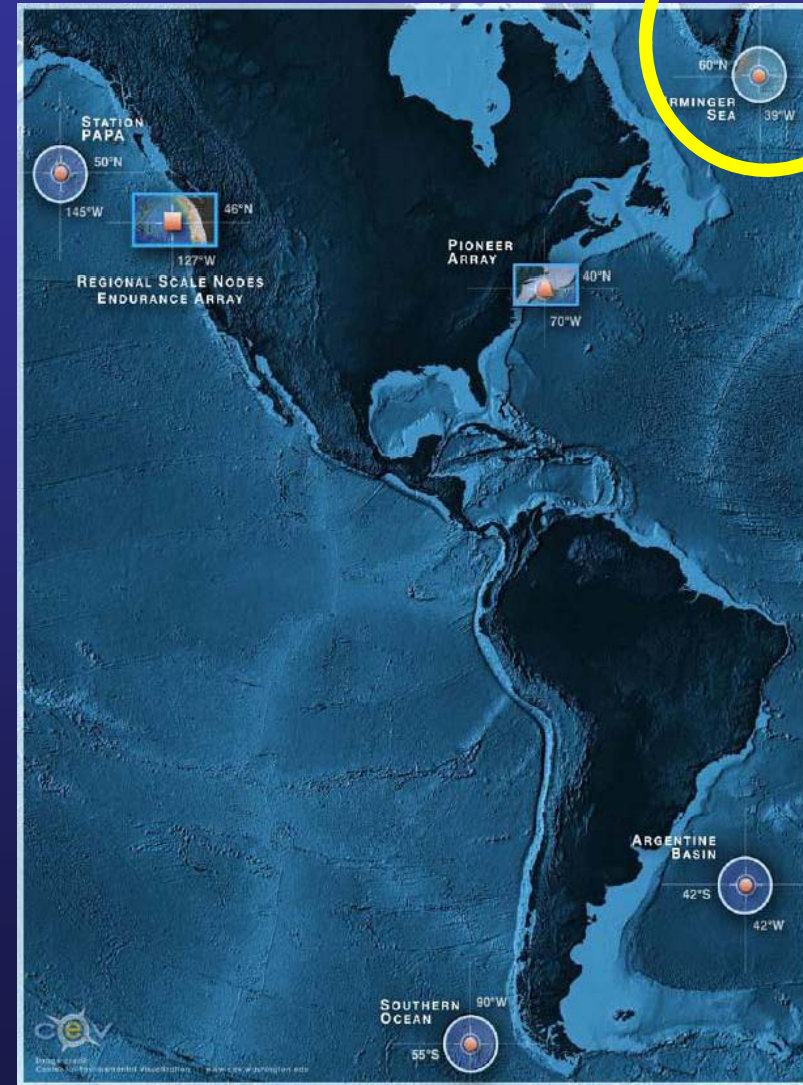
Connection to international ocean observation initiatives


Connection to other international initiatives



Ocean Observatories Initiative

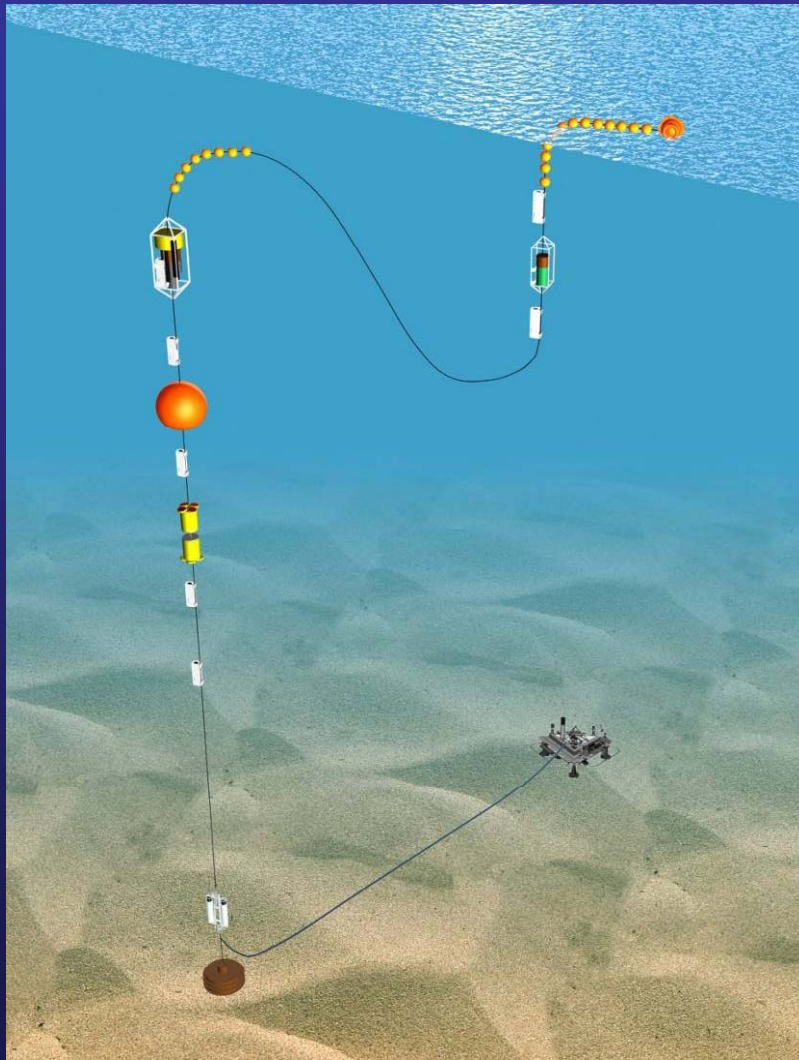
5 of the EuroSITES oversight committee are key players in OOI



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Multidisciplinary time-series

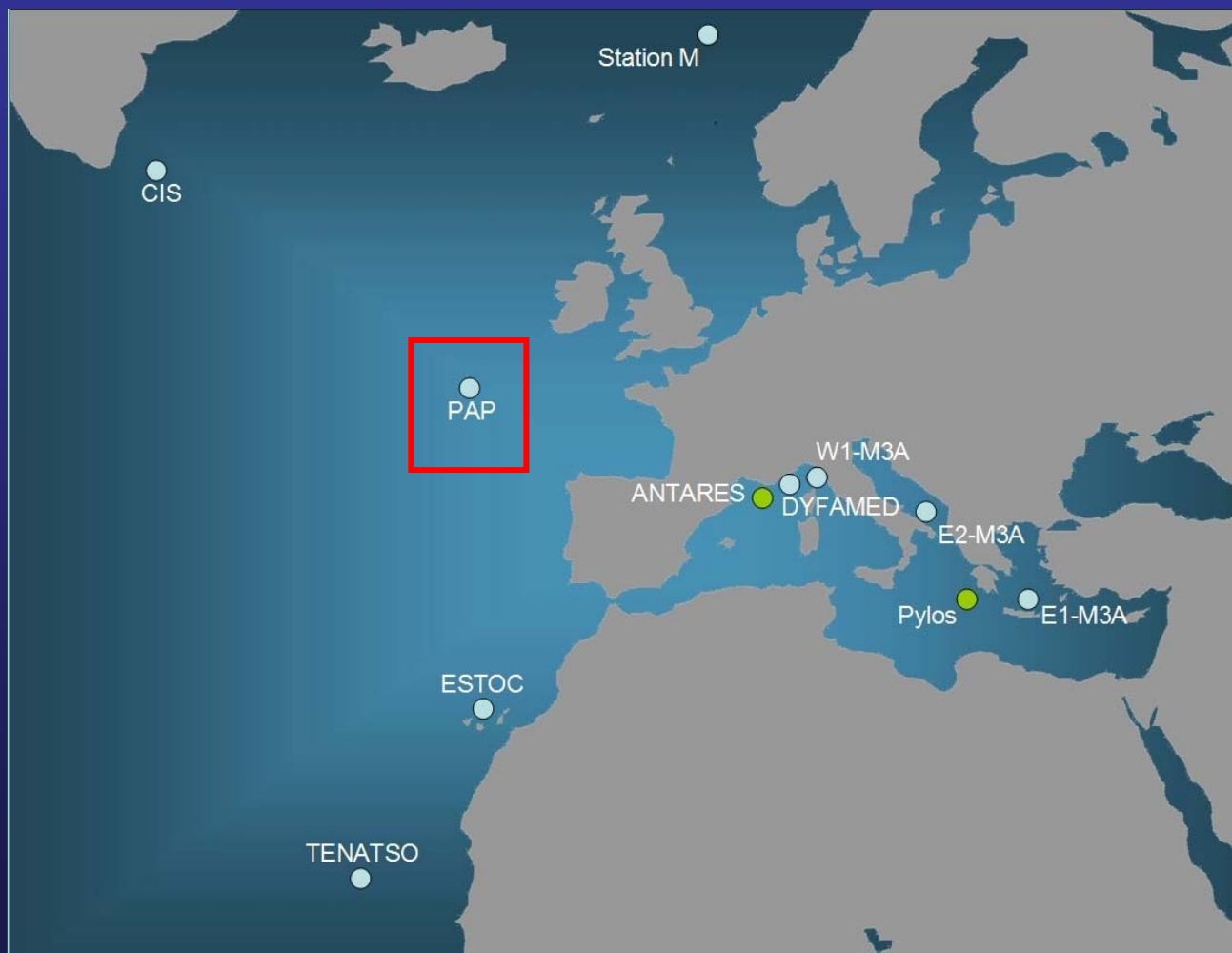
Vertical coverage: Surface to seafloor



- Temperature
- Salinity
- Currents
- Nutrients
- Chl-a
- CO₂
- O₂
- Particle flux
- Benthic components

Real-Time Telemetry

Porcupine Abyssal Plain (PAP)

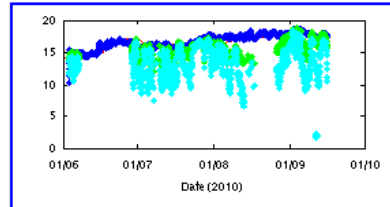


Meteorology

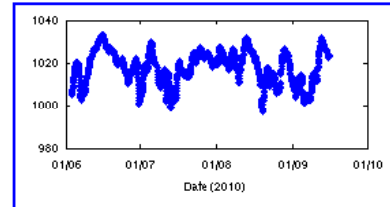


Wednesday 15th September
2010 1945h UTC

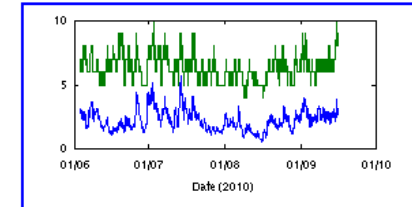
Temperatures



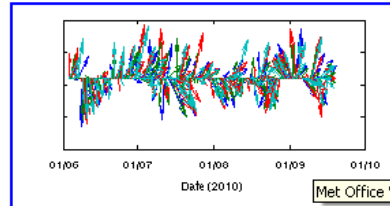
Air Pressure



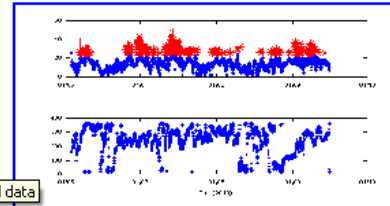
Waves



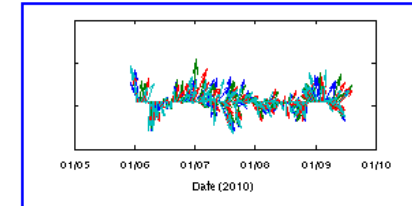
Wind



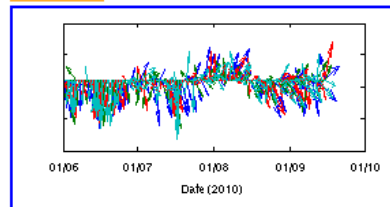
Wind



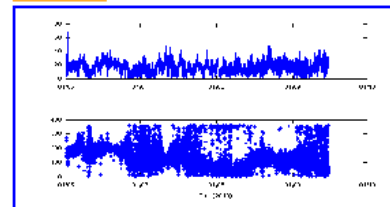
NCEP Wind



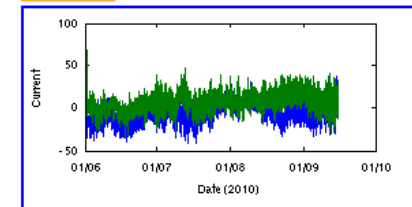
Current



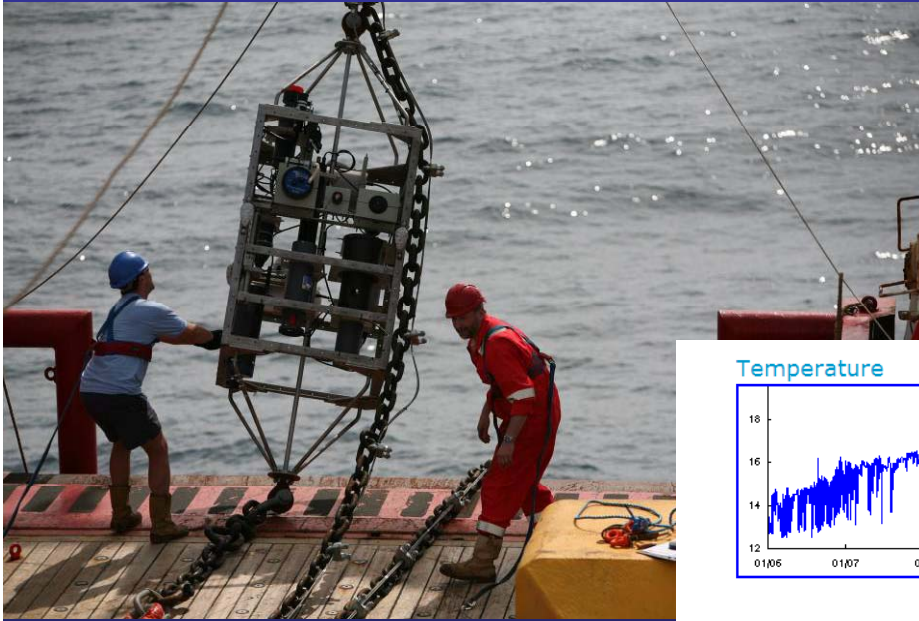
Current



Current

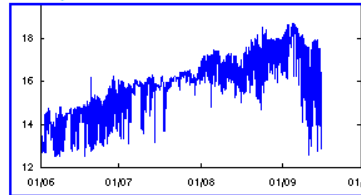


Upper Ocean biogeochemistry

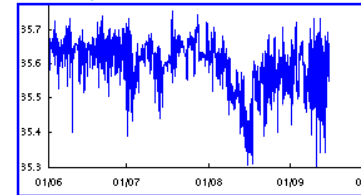


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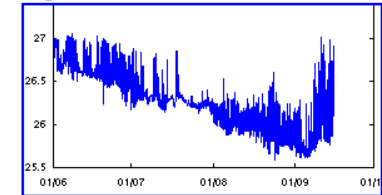
Temperature



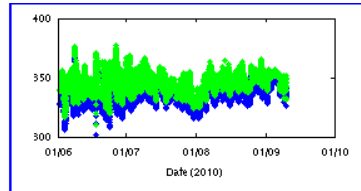
Salinity



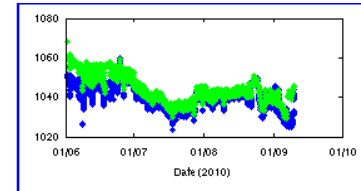
Sigma-t



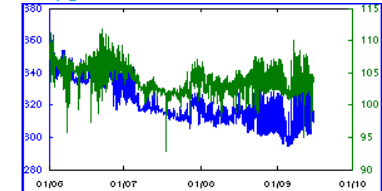
Carbon Dioxide



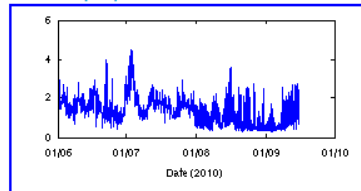
Pro-oceanus Pressures



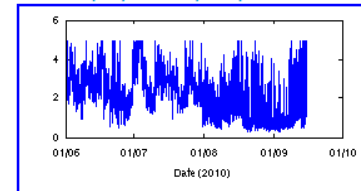
Oxygen



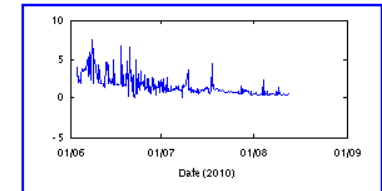
Chlorophyll-a Wetlabs



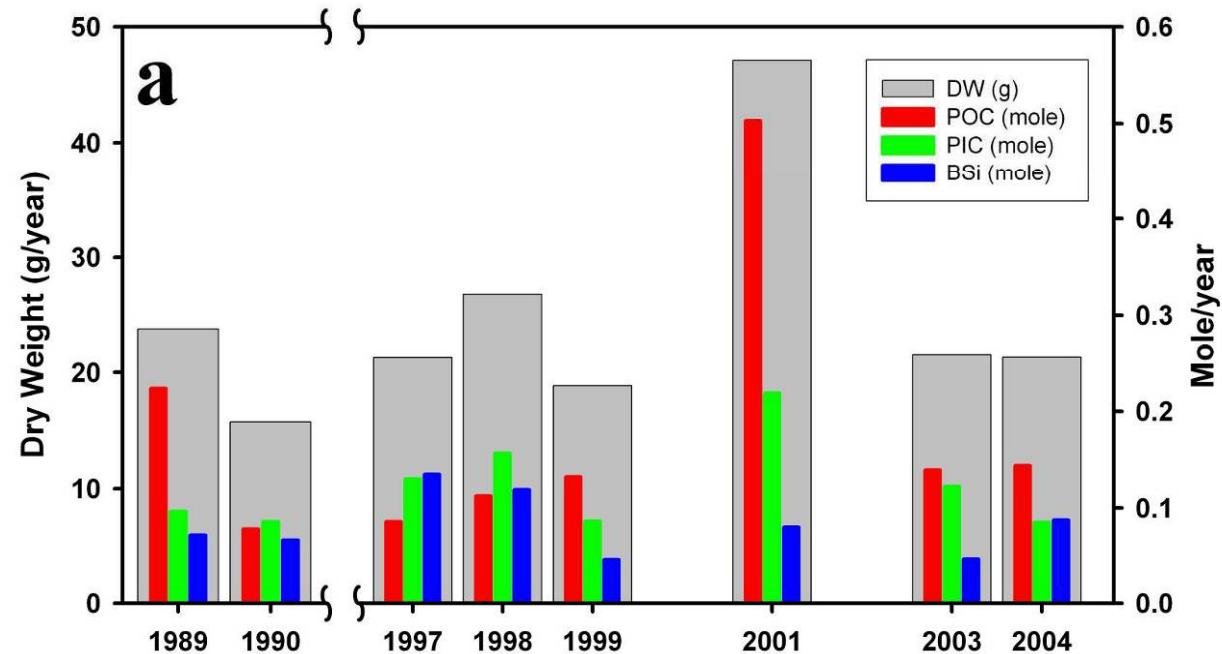
Chlorophyll-a Cyclops



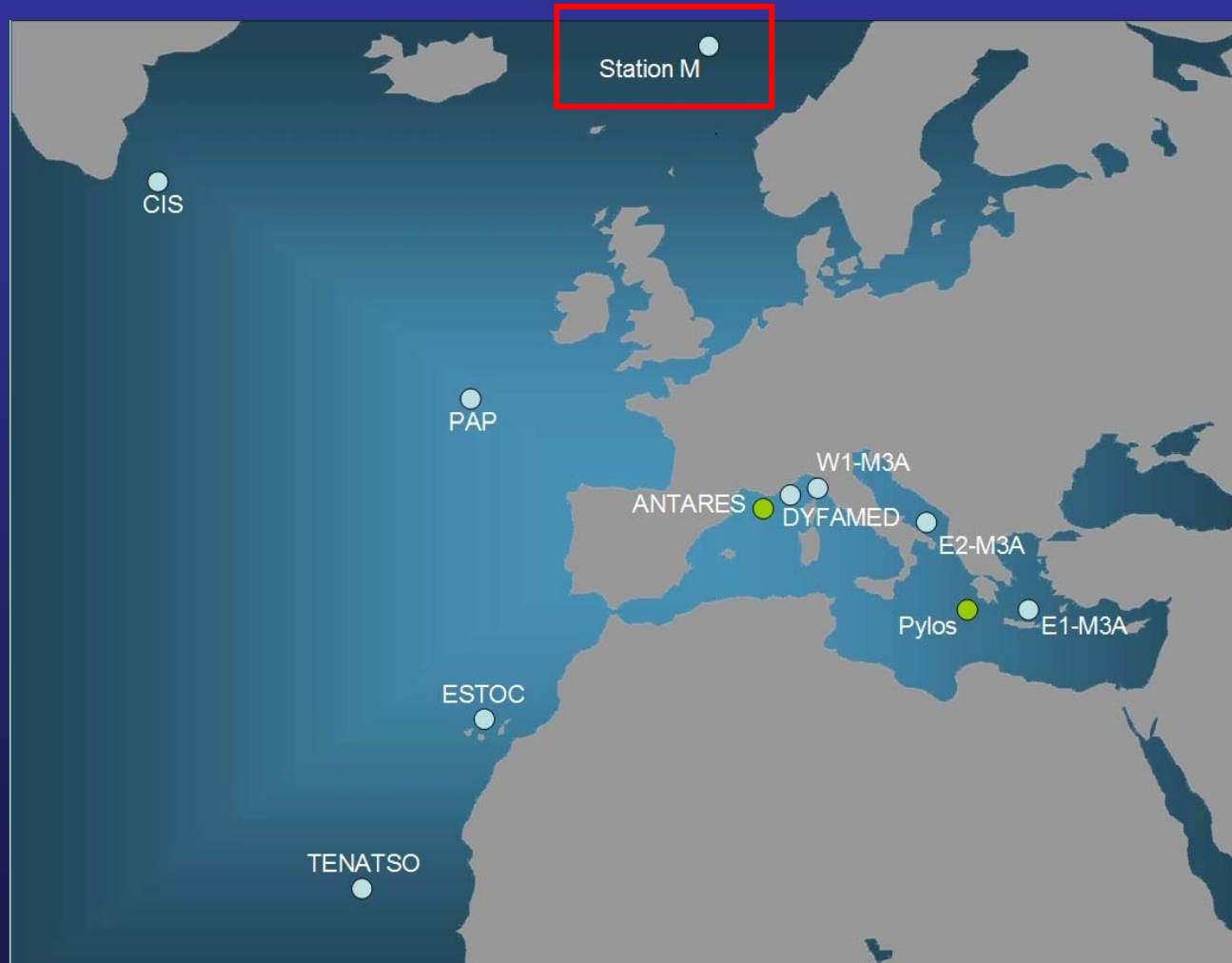
Nitrate : NAS



Downward particle flux at 3000m depth

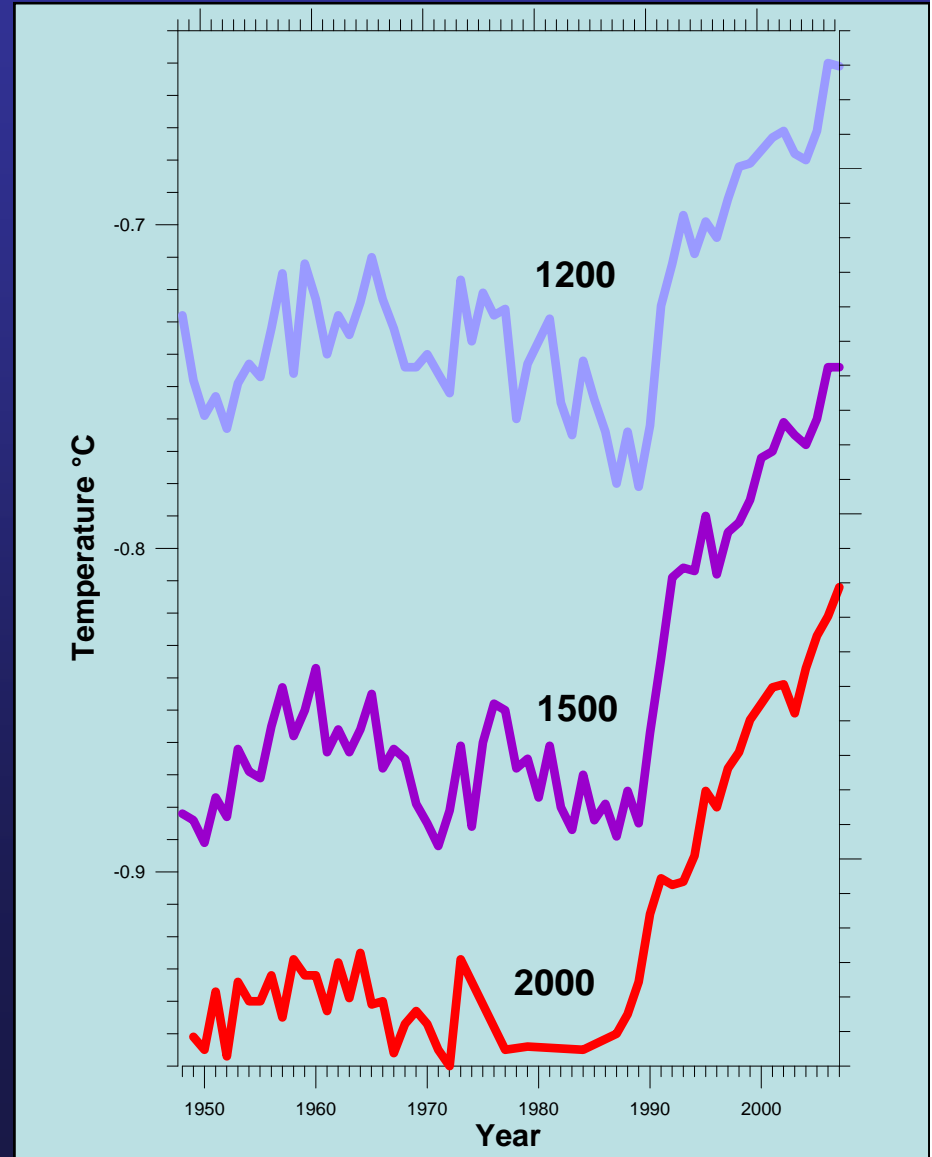


Station M, Norwegian Sea

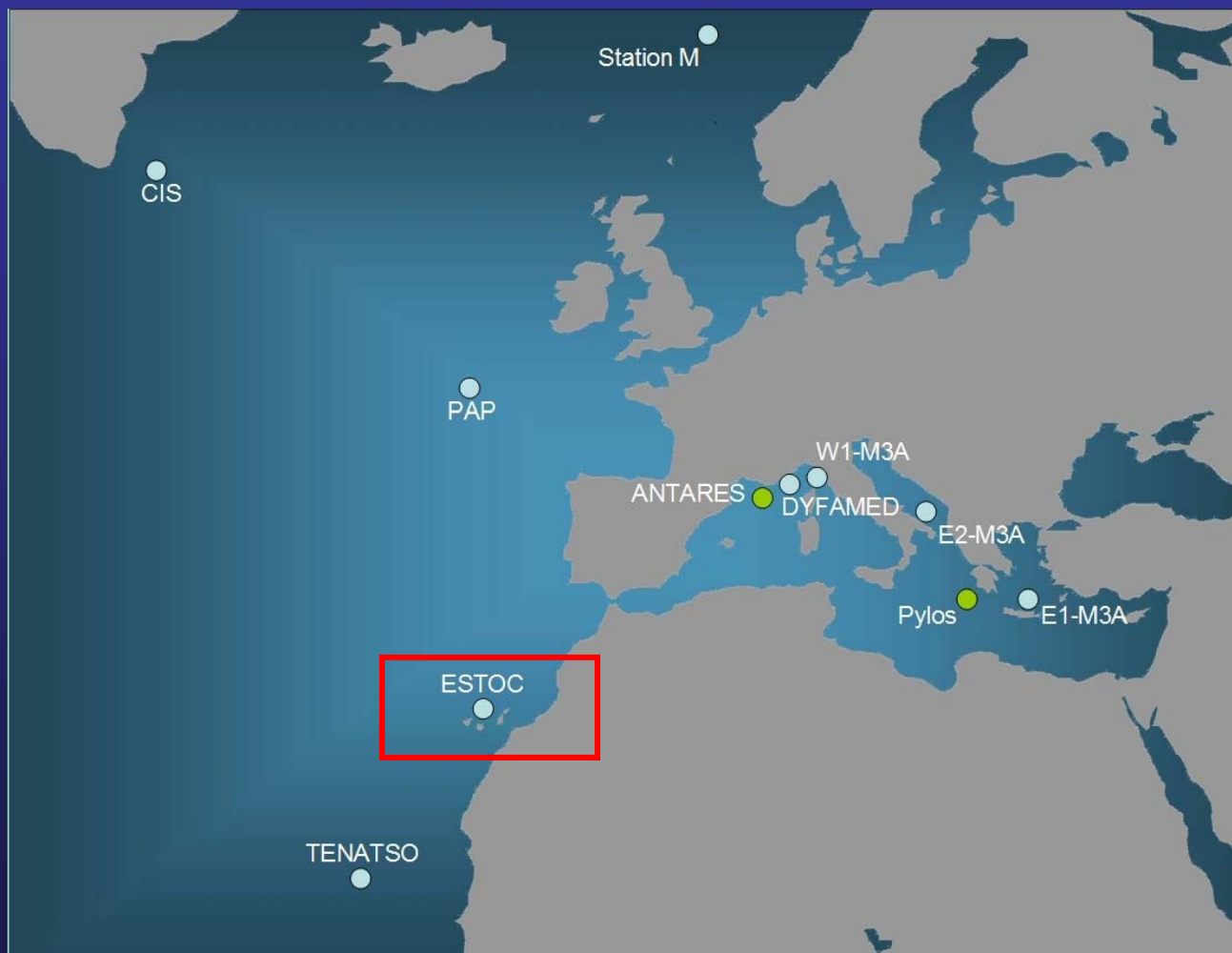


Station Mike

Dramatic deep water temperature increase



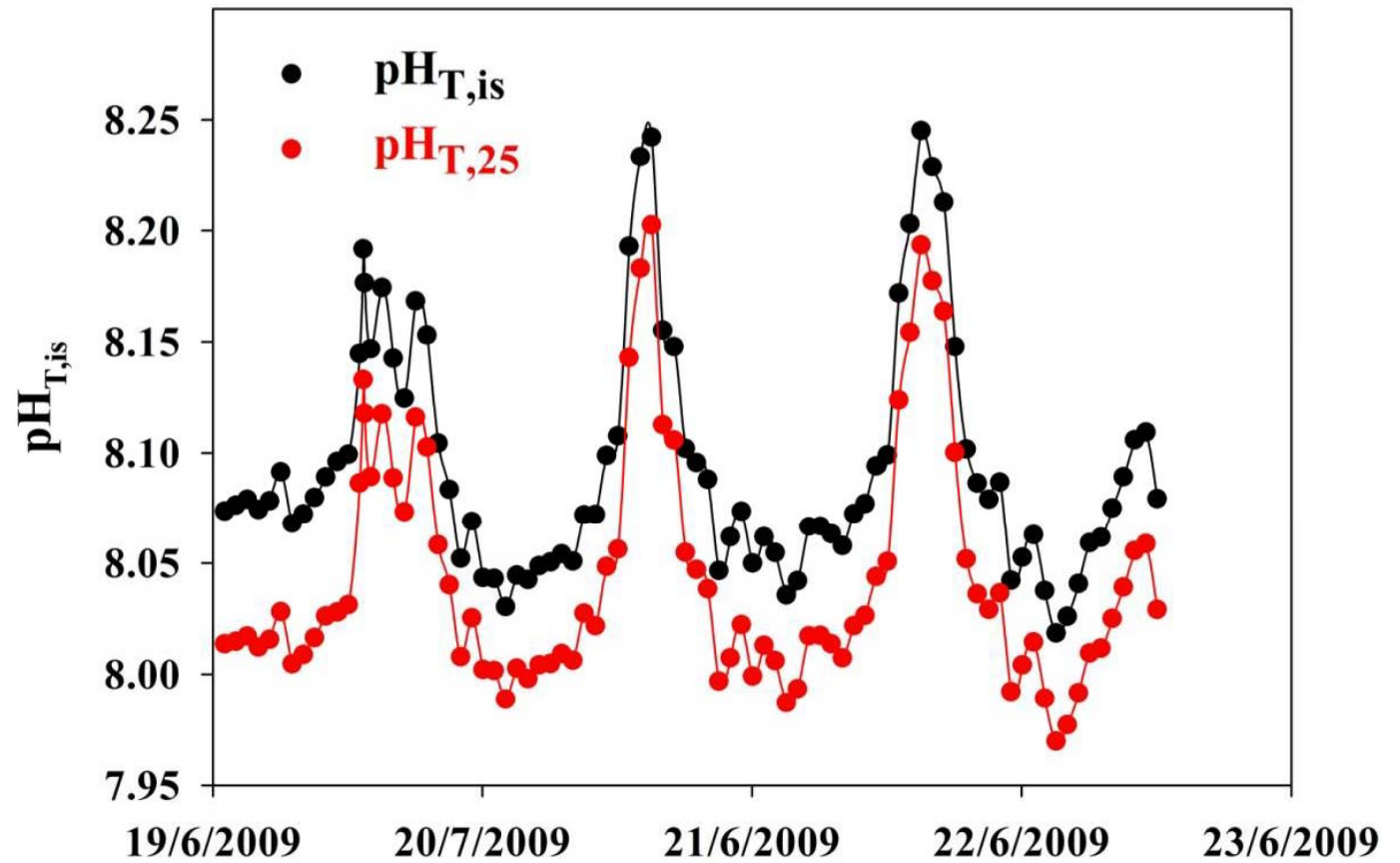
ESTOC



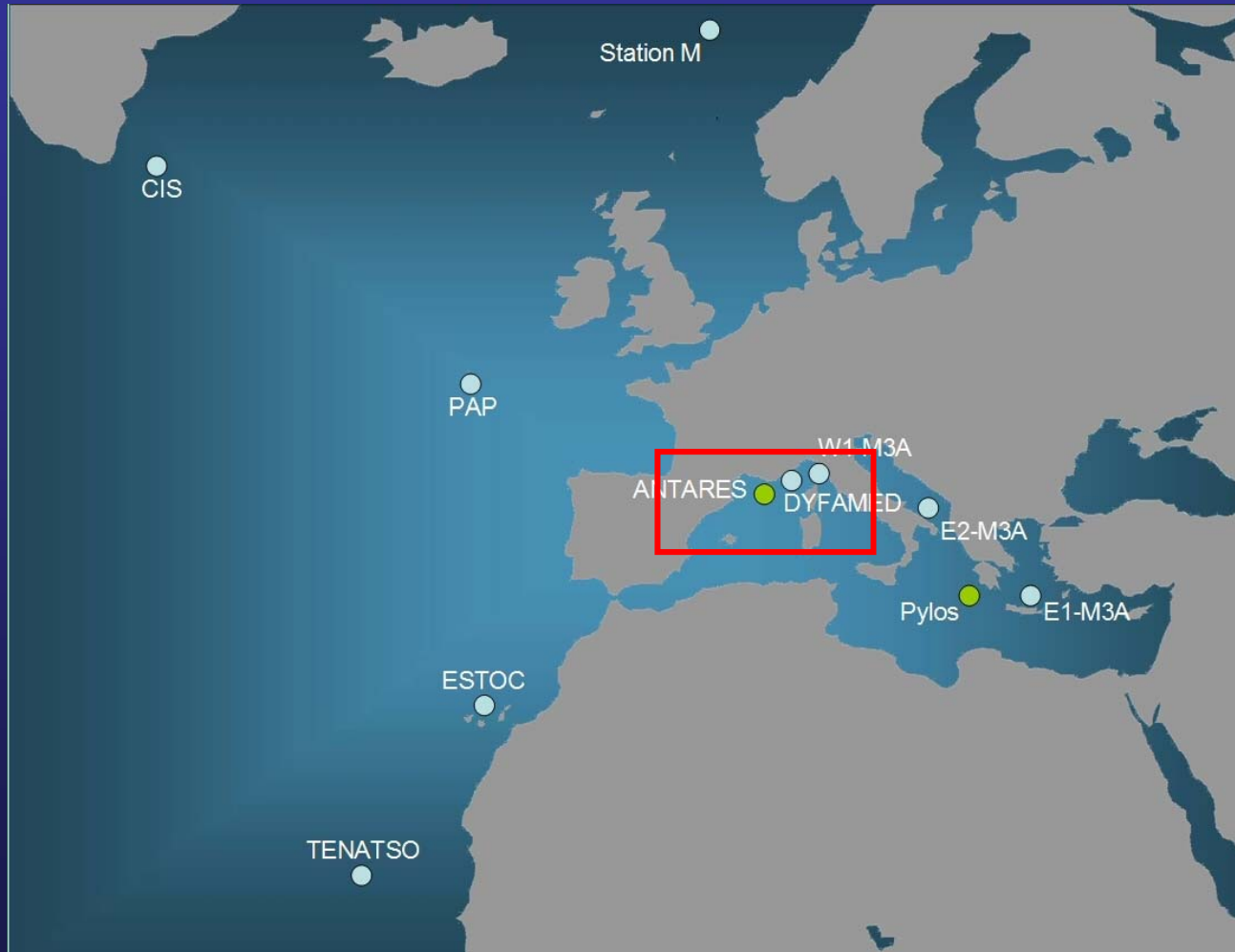
Ocean acidification

-autonomous pH time-series sensor

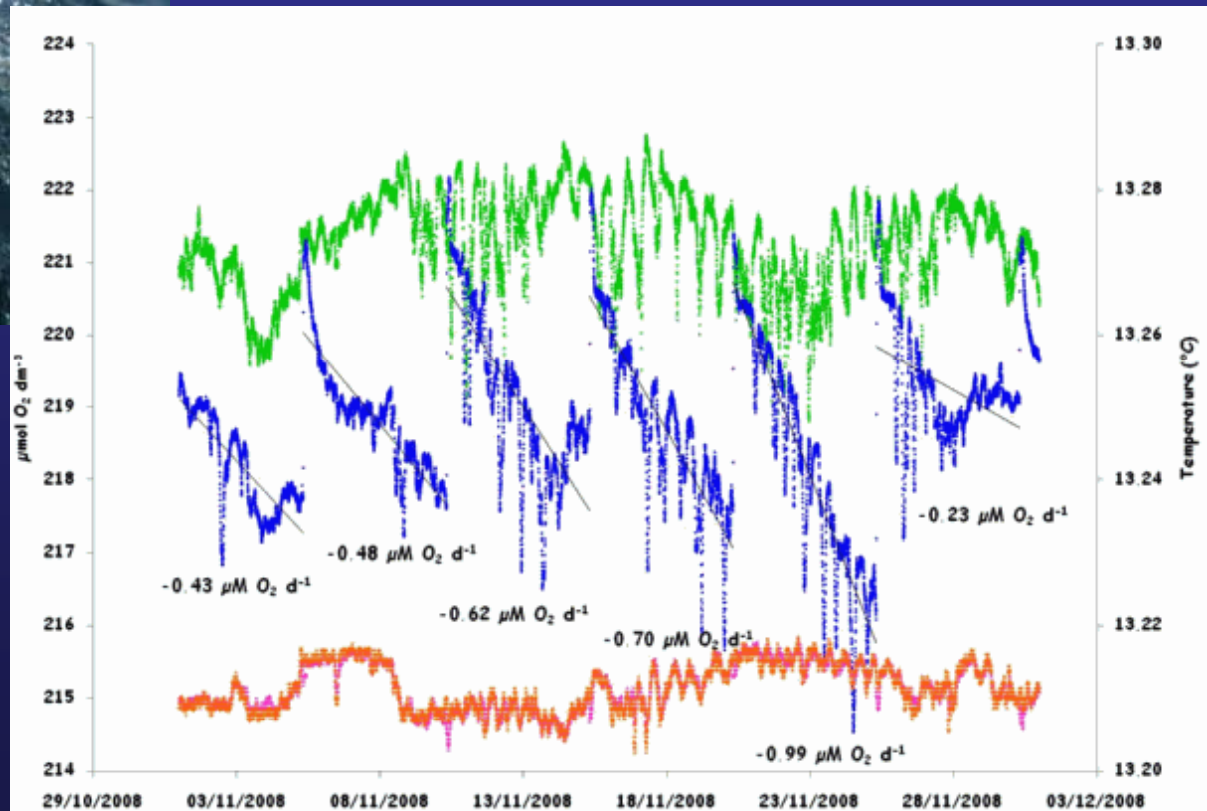
- Links with EPOCA and CARBOOCEAN



Western Mediterranean



Deep ocean oxygen consumption - *in situ* measurement



O₂ concentration inside and outside of IODA chamber

Eastern Mediterranean

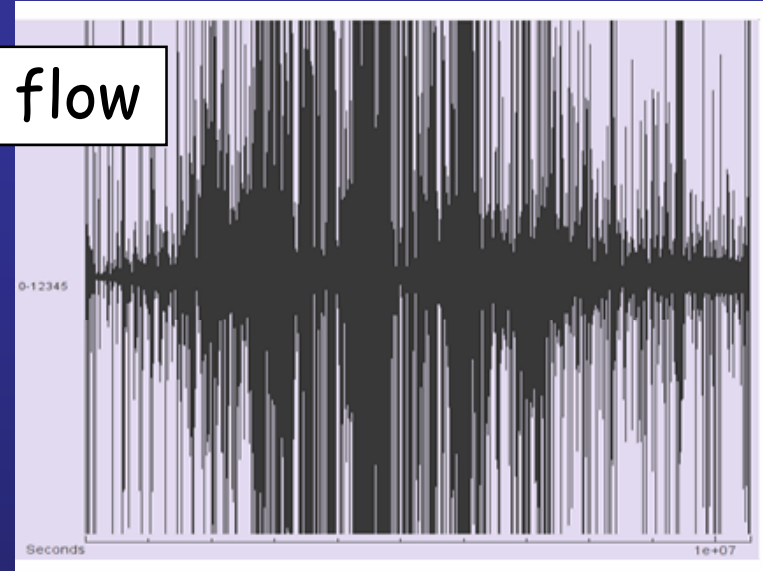


Earthquake and subsurface fluid migration

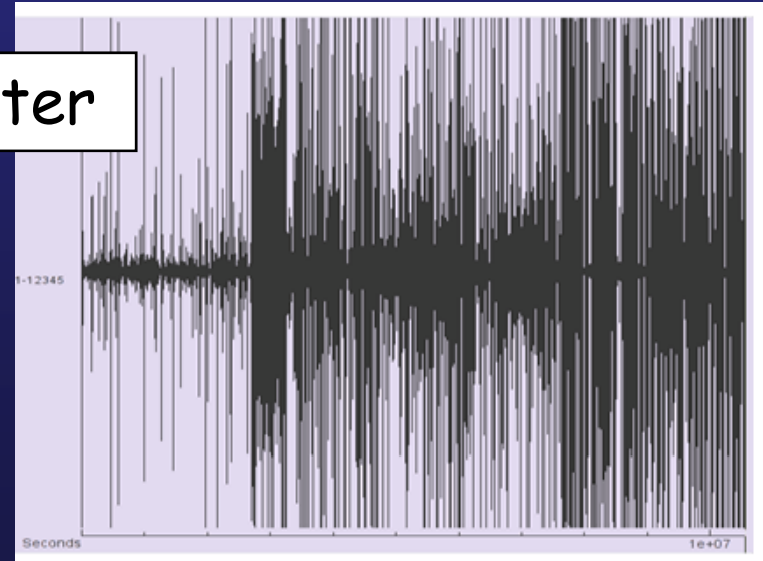
-ESONET-EMSO: Eastern Mediterranean node



Pore water flow



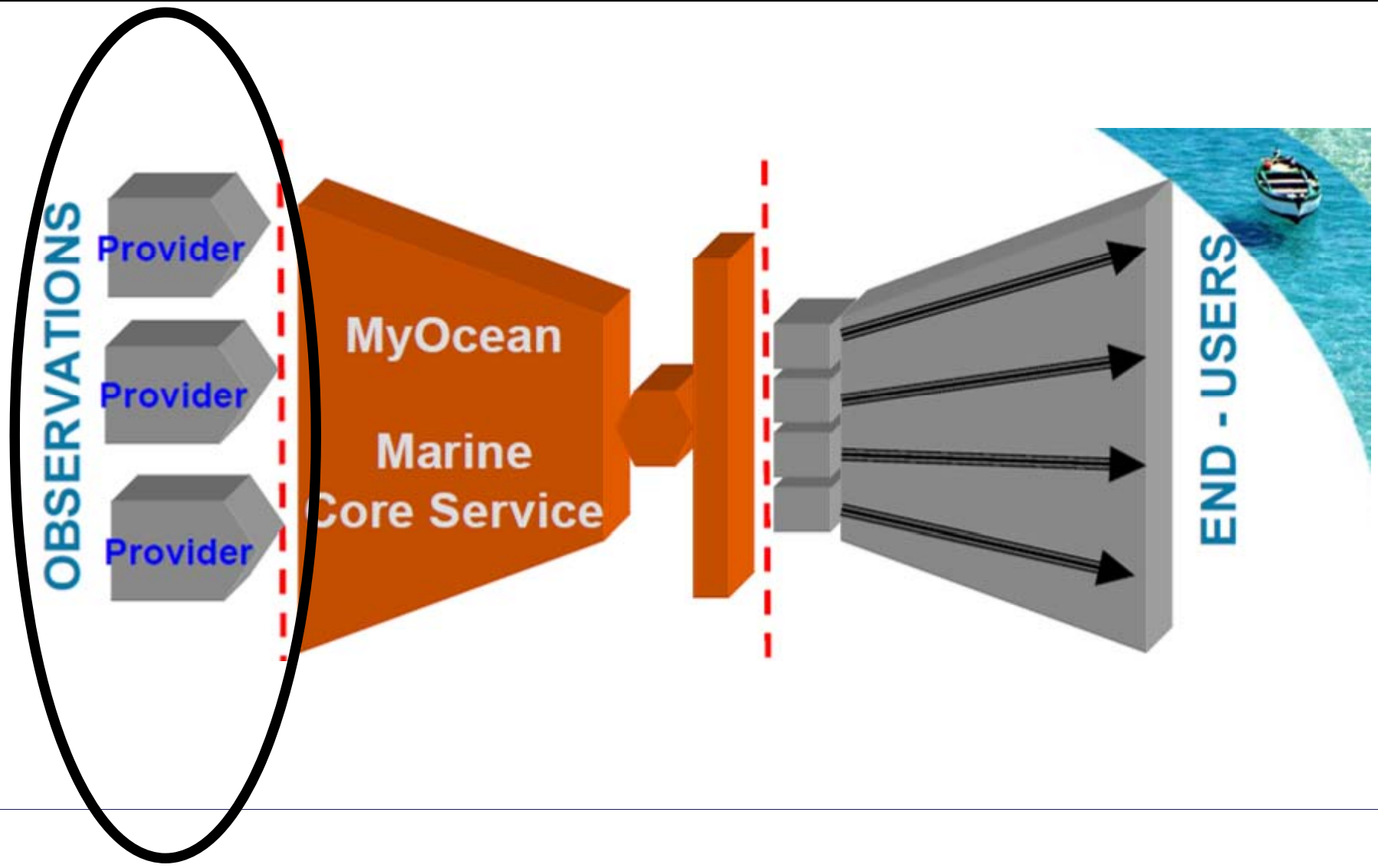
seismometer



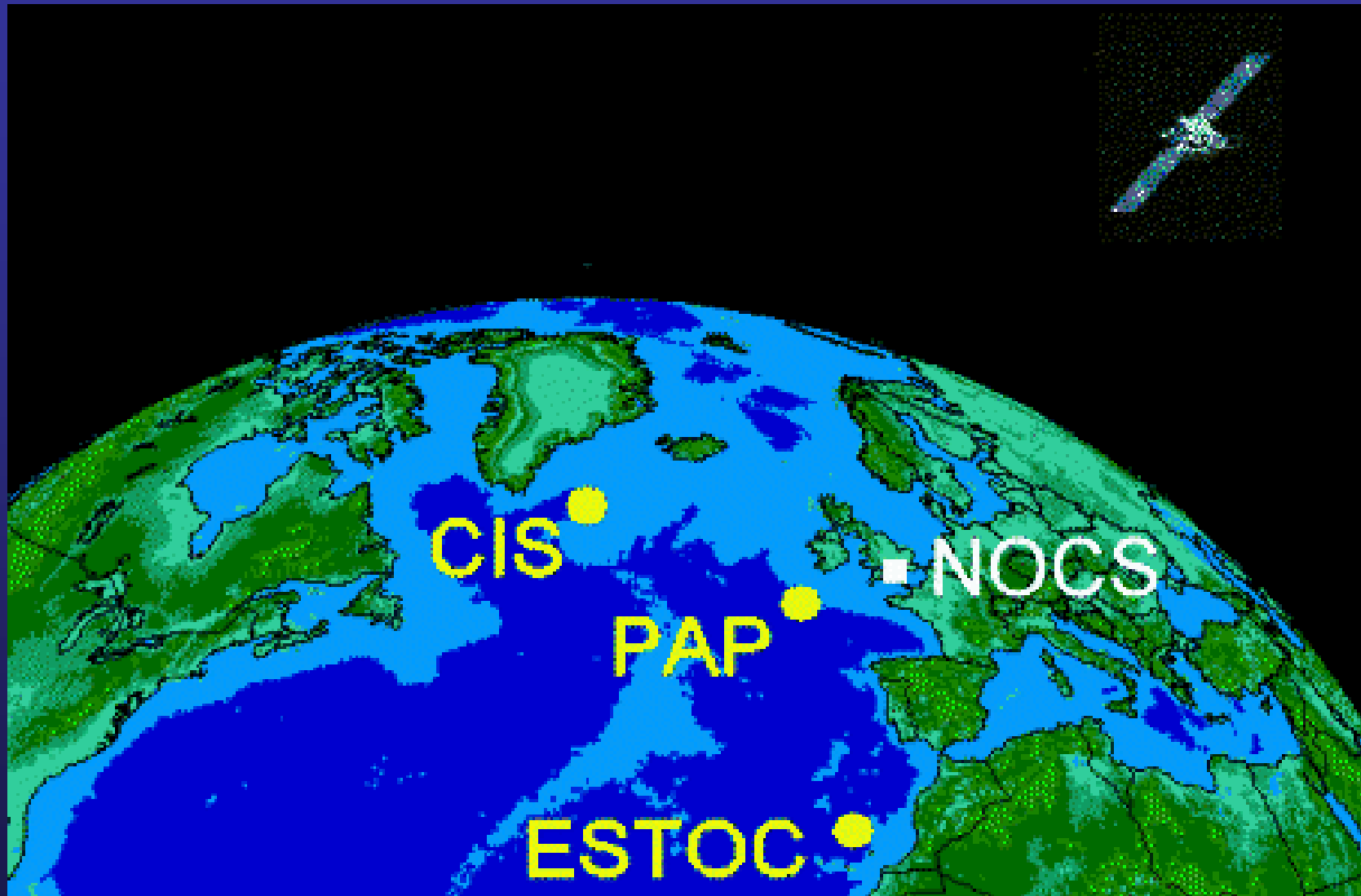
Time (4 months)

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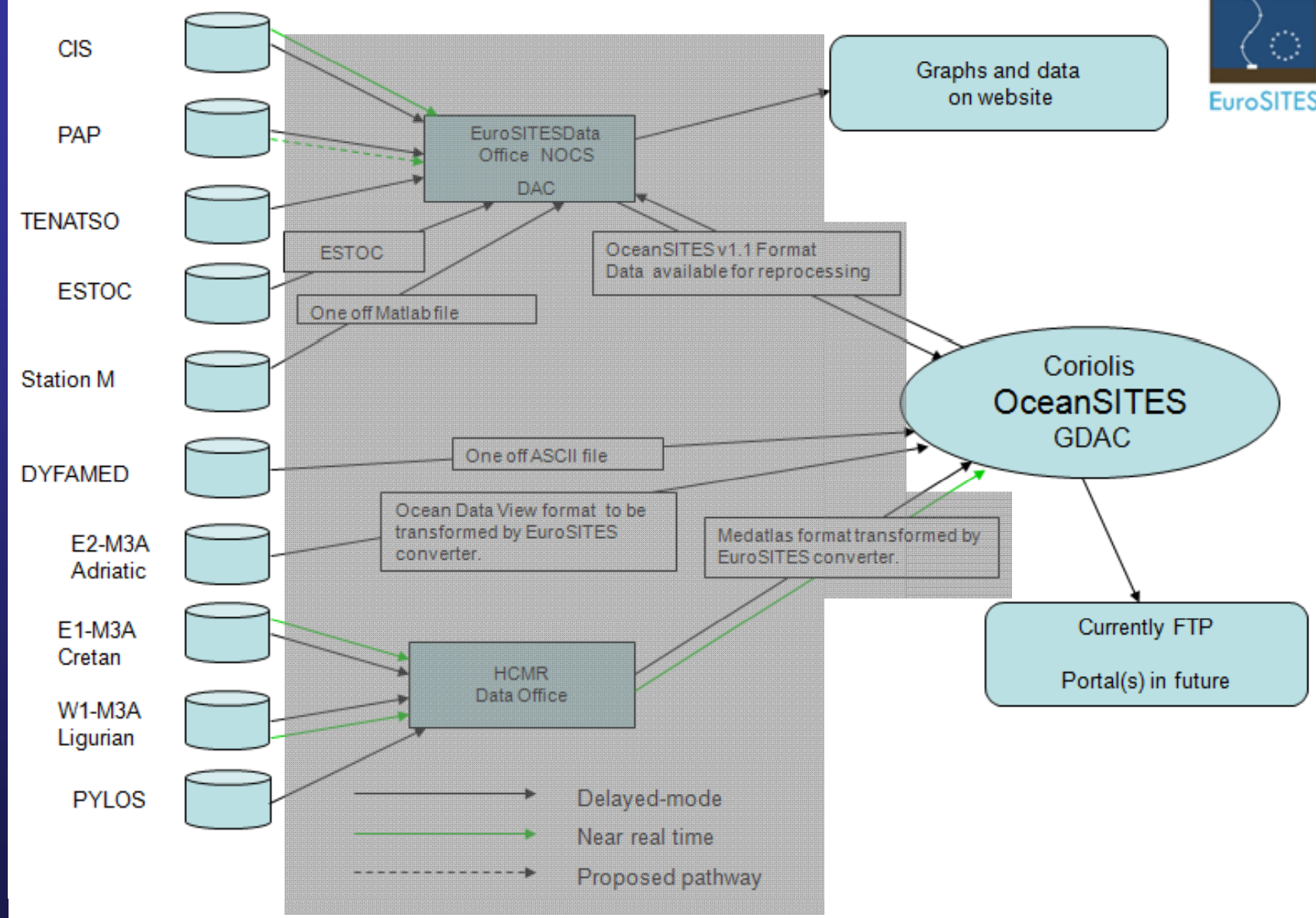




The vision of MyOcean




Real-time and delayed-mode



Data Processing

Data:

- freely available to all immediately after collection and QC (Website, ftp & GTS)
- Associated metadata
- Using internationally agreed protocols and formats

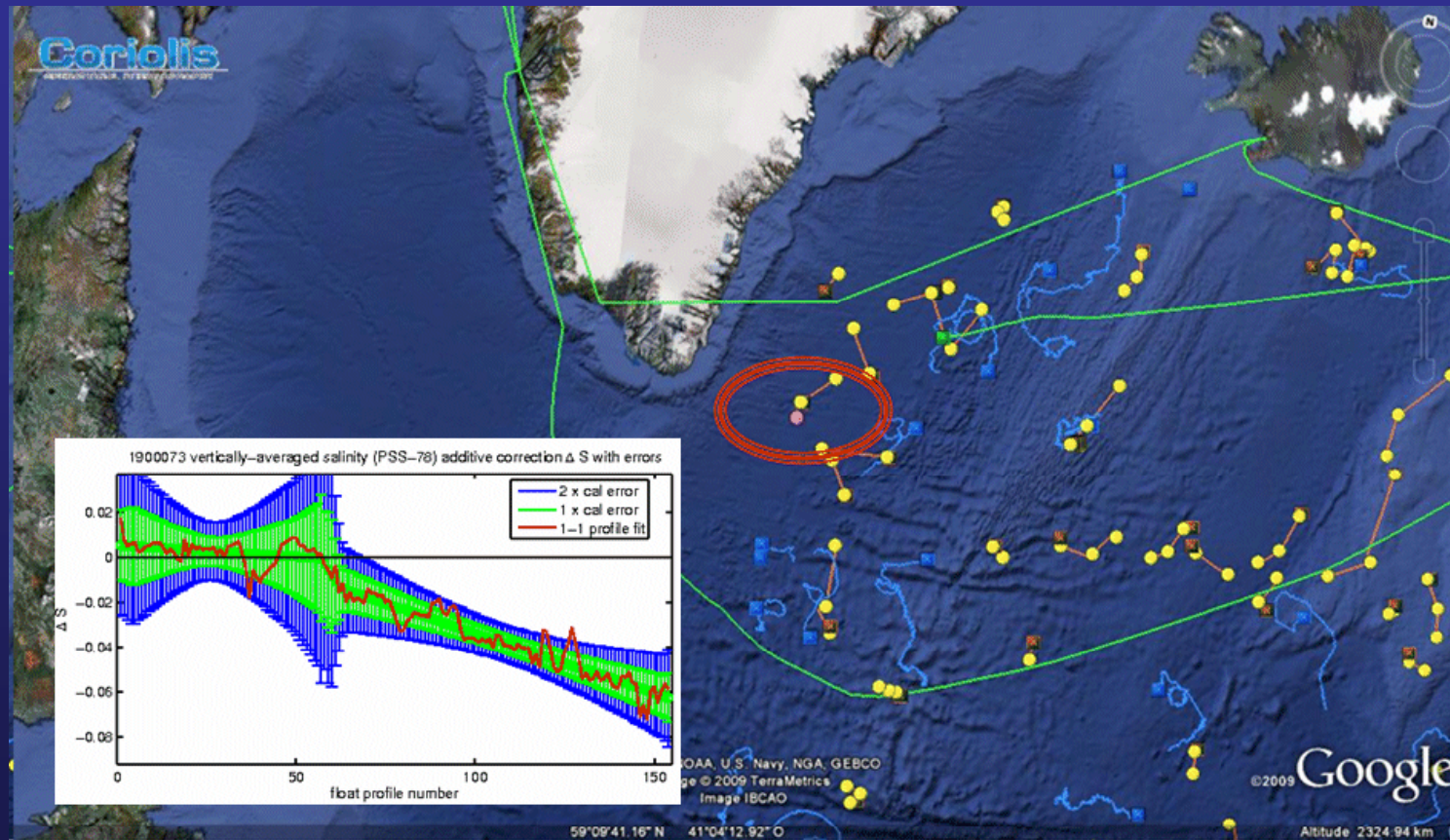
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EuroSITES: essential reference stations



Calibration for Euro-Argo <http://www.euro-argo.eu/>

e.g. salinity: CIS as a reference station



CLIVAR connection through CCHDO

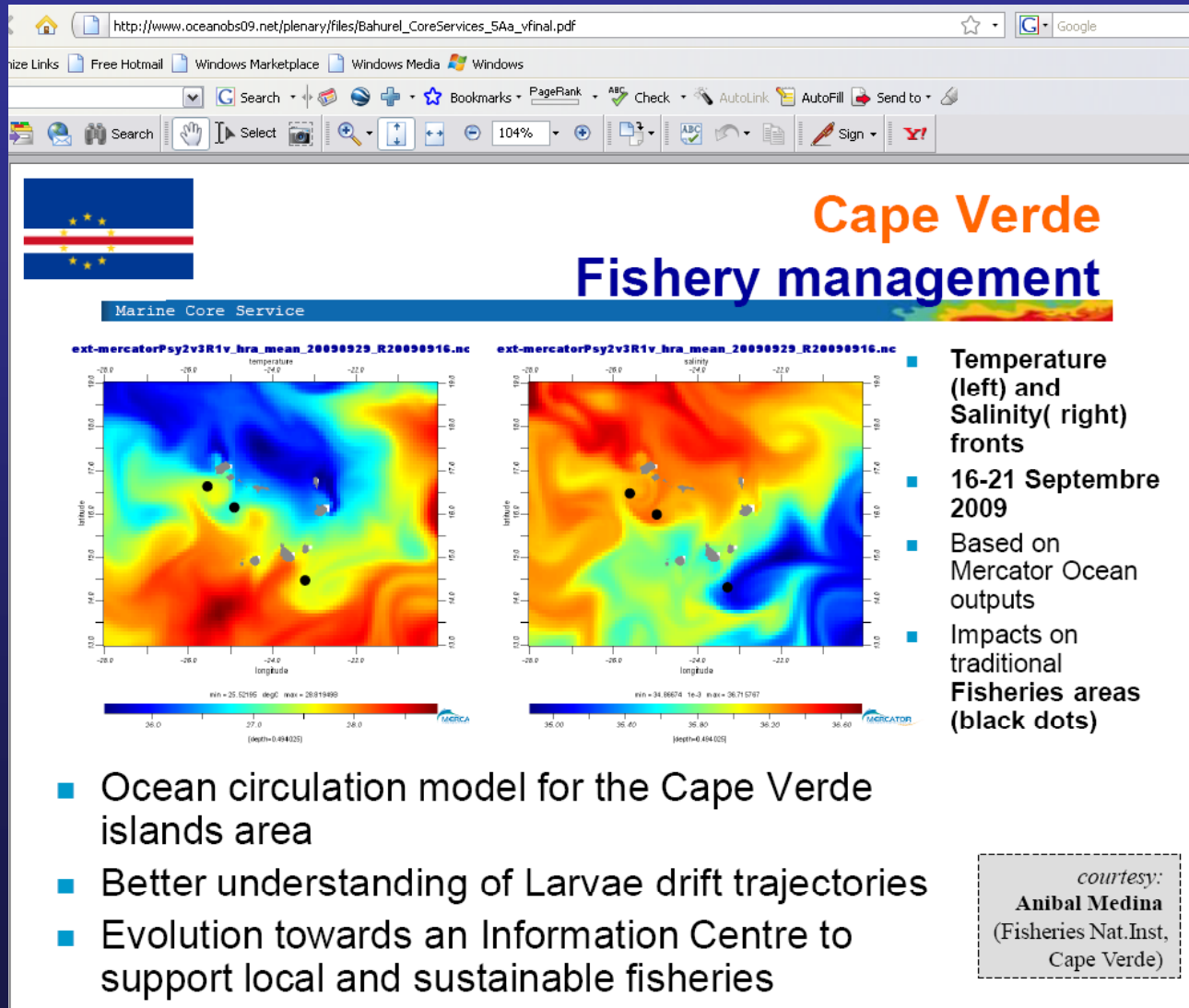
-CTD time-series: contribution to deep water reference station datasets



EuroSITES is registered to sub-task AR-09-03c
'Global Ocean Observing System'
(led by GOOS, POGO, IEEE)

Data provider to MyOcean

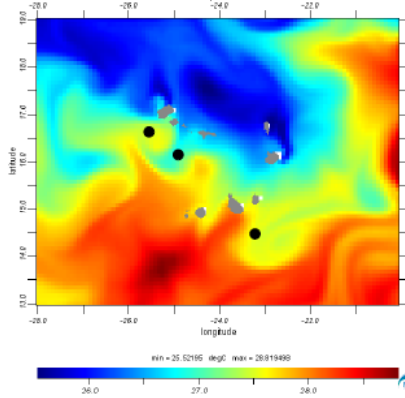
e.g. Marine Resources. Cape Verde physical variables



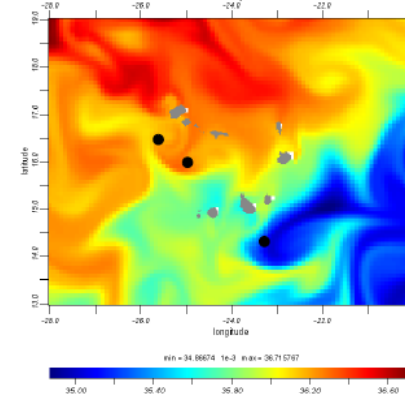
The screenshot shows a web browser window with the URL http://www.oceanobs09.net/plenary/files/Bahurel_CoreServices_5Aa_vfinal.pdf. The slide content includes the European Union flag, the title "Cape Verde Fishery management", and the "Marine Core Service" logo. Two maps show temperature and salinity fronts, with black dots indicating traditional fisheries areas. A list of bullet points is on the right, and a list of key messages is on the left.

Cape Verde Fishery management

Marine Core Service



ext-mercatorPsy2v3R1v_hra_mean_20090929_R20090916.nc



ext-mercatorPsy2v3R1v_hra_mean_20090929_R20090916.nc

- Temperature (left) and Salinity(right) fronts
- 16-21 Septembre 2009
- Based on Mercator Ocean outputs
- Impacts on traditional Fisheries areas (black dots)

- Ocean circulation model for the Cape Verde islands area
- Better understanding of Larvae drift trajectories
- Evolution towards an Information Centre to support local and sustainable fisheries

courtesy:
Anibal Medina
(Fisheries Nat.Inst,
Cape Verde)



Slide from
Pierre Bahurel:

Venice
25/9/09

Connection to modelling
initiatives and communities
such as met offices.

EuroSITES dissemination:

Outreach and Knowledge Transfer

- Website
- Fact Sheets
- On-line Cruise diaries
- Film

www.outreach.eurosites.info



European Ocean
Observatory Network



« PAP Cruise : Friday 17th July 2009 PAP Cruise : Monday 20th July 2009 »

PAP Cruise : Saturday 18th July 2009
Measuring Bioluminescence at the PAP site



Filtration setup and data logger

Some small plankton species are able to produce flashes of light which can be seen in the water at night. These organisms are said to be bioluminescent. As part of the scientific work happening here on the RRS Discovery we are taking measurements to estimate the amount of bioluminescence which can be stimulated in the surface water and to identify which organisms are creating it. This is done using an instrument named Glowtracka.

To make measurements with the Glowtracka we take samples of surface water collected from the niskin bottles on the CTD and because we like to take samples during the night it means staying up very late or waking up very early in the morning. The water collected is placed into a blacked out holding chamber attached to the instrument. The water sample is then left for a set amount of time in the dark before it is allowed to run from the holding chamber and through a mesh grid which stimulates any bioluminescent organism in the water to glow.



Glowtracka



Example of

The flashes of light emitted by the bioluminescent organisms are detected by a sensor called a photodiode and the signal is recorded on a computer. We then take samples of the water which can be analysed in the lab when we get back to shore and from these we hope to identify which organisms created the bioluminescent signals recorded.

From a piece of equipment called Flowcam we have already identified that there are some bioluminescent organisms called dinoflagellates present in the water column.





EuroSITES
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Our global Ocean is a changing environment. Long-term monitoring provides essential data to improve our understanding of changes and trends in oceans in response to climate change.

EuroSITES is an European project integrating and enhancing 9 open ocean observatories across Europe.

Moored at key locations in the ocean these observatories measure physical, chemical and biological seawater properties from the sea surface all the way down to the sea floor.

Observing the Oceans : Why?

The global Ocean is a powerful force in regulating our climate and often has a greater influence than dry land. Observing the oceans is therefore one of the most fundamental ways to understand the global climate system.

Carbon cycle

The global Ocean is an important regulator of climate change as it absorbs carbon dioxide from the atmosphere. Some of this carbon is locked away in deep sea sediments for long periods of time. Observations are vital to give us clues about how much carbon dioxide the waters can hold, and for how long.

Ocean acidification

The amount of carbon dioxide dissolved changes the acidity of the oceans, which then affects the distribution and abundance of phytoplankton and zooplankton particularly those with calcareous exoskeletons.

Currents and circulation

Measuring the physics and chemistry of the oceans allows scientists to track individual water masses. These move both vertically and horizontally through the global Ocean forming a complex circulation system. Monitoring currents and circulation patterns is key to understanding how climate change is affecting heat (energy) and nutrient transfer around the planet.

Ecosystems

Monitoring environmental change in the oceans (e.g. temperature, salinity, pH, nutrients) is vital as this will effect the distribution and functioning of all marine organisms from phytoplankton to whales. Huge population changes can occur in deep-sea animals e.g. holothurians (sea cucumbers). This is related to the availability and quality of food arriving on the seafloor (e.g. marine snow).

For more details about the EuroSITES science and outreach visit our website: <http://outreach.eurosites.info/> or contact us - education@eurosites.info



EuroSITES
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Observatory Network



The 9 EuroSITES open ocean observatories are moored off-shore in waters deeper than 1000 metres. The locations are chosen far from the coast to reduce the influence of land (e.g. river input) and human activity (e.g. pollution). A diverse range of sensors record changes in the physical, chemical and biological properties of the ocean, such as temperature, salinity, nutrients and currents from the sea surface to seabed.

The surface buoy completes the data required by the ocean sensors and sends the data via satellite to scientific ashore.

Strong mooring wire extends from the sea surface down to the sea floor. Sensors are attached to monitor the ocean properties at different depths. The equipment remains submerged for months on end autonomously collecting time-series of data. Buoyancy is also attached to aid recovery.

Observing the Oceans : How ?

SUNLIT ZONE

The sunlit (euphotic) zone is an important region for the cycling and exchange of dissolved gases (e.g. oxygen and carbon dioxide) between the atmosphere and ocean. Phytoplankton use carbon dioxide and sunlight in this zone to capture energy through photosynthesis. A knowledge of how these processes and nutrient cycles are changing is crucial to understand how the atmosphere and ocean interact to regulate our climate.

Sensors in this zone measure the temperature and salinity together with biological and chemical properties of the seawater (e.g. chlorophyll-a, nutrients and dissolved gases).

TWILIGHT ZONE

The twilight zone is the transition between the sunlit and the dark deep ocean, and forms a large proportion of oceanic waters. Only organisms adapted to the dark and the high pressures can survive. Food is available as marine snow particles sinking from the sunlit zone (e.g. dead organisms, shells, dust particles and faeces). Many animals also migrate upwards at night where the food is more abundant. They then retreat back to the darker twilight zone in the daytime to avoid predators. Scientists monitor this environment to study the carbon cycle and transport of carbon to the deep seafloor. This is also a key region for monitoring variations in water masses and circulation patterns.

Sediment traps collect sinking marine snow particles. Physical sensors measure temperature, salinity, current speed and direction. Oxygen sensors and respiration chambers measure biological activity.

SEA FLOOR

The seafloor reaches depths of several thousand of metres. Most species living here feed on the flux of marine snow sinking from surface layers. Changes in this flux profoundly affect these species. Climate variability at the surface impacts deep-sea biological communities 5000 metres underneath!

A sensor deployed as deep as 3000 metres on the sea floor acts as a platform for environmental sensors e.g. time-lapse cameras, seismometers, pressure sensors and others.

EuroSITES data sets are used to understand key ocean processes at both short-term and longer-term time-scales. EuroSITES contributes to the International Global Earth Observation System of Systems (GEOSS) which aims to understand the current climate and ocean system and to predict future change.

For more details about the EuroSITES programme and the educational activities carried out, visit our website: <http://outreach.eurosites.info/> or contact us: education@eurosites.info



European Ocean
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OUTREACH HOME

POLICY

EDUCATION

EUROSITES OPEN OCEAN OBSERVATORIES

- Station M
- CIS
- PAP
- DIFAMED
- W1-M3A
- E1-M3A
- E2-M3A
- ESTOC
- TENATSO

GALLERY

NEWS

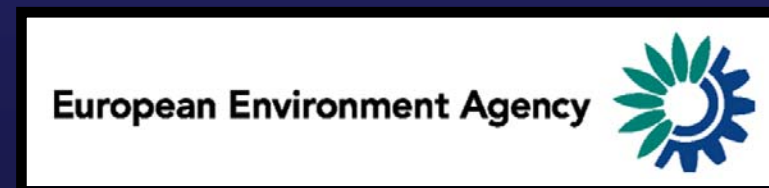
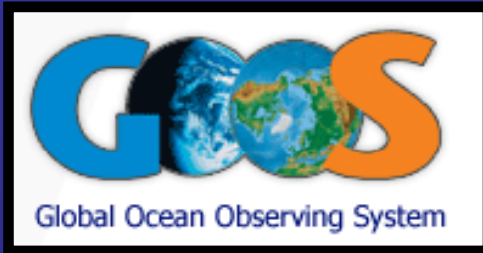
CONTACT

EuroSITES Open Ocean Observatories

Visit the observatories and learn more about them!



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<http://gisc.ew.eea.europa.eu/>

Objective of GISC:

To stimulate open access to in-situ data for operational GMES.

Principle activities:

- Engage networks and stakeholders
- Evaluate in-situ requirements
- Determine approaches to sustainable solutions
- Undertake case studies and quick-wins

Dual function of funding:

1: Observatory support

- Staff
- Equipment

2: Glue

- Efficiency of operation
- Enhanced national funding
- Outreach & knowledge transfer
- Effectiveness

EuroSITES ends in March 2011

The Future



Urgent requirement to develop a coordinated and sustained network from the lower atmosphere to the seafloor.

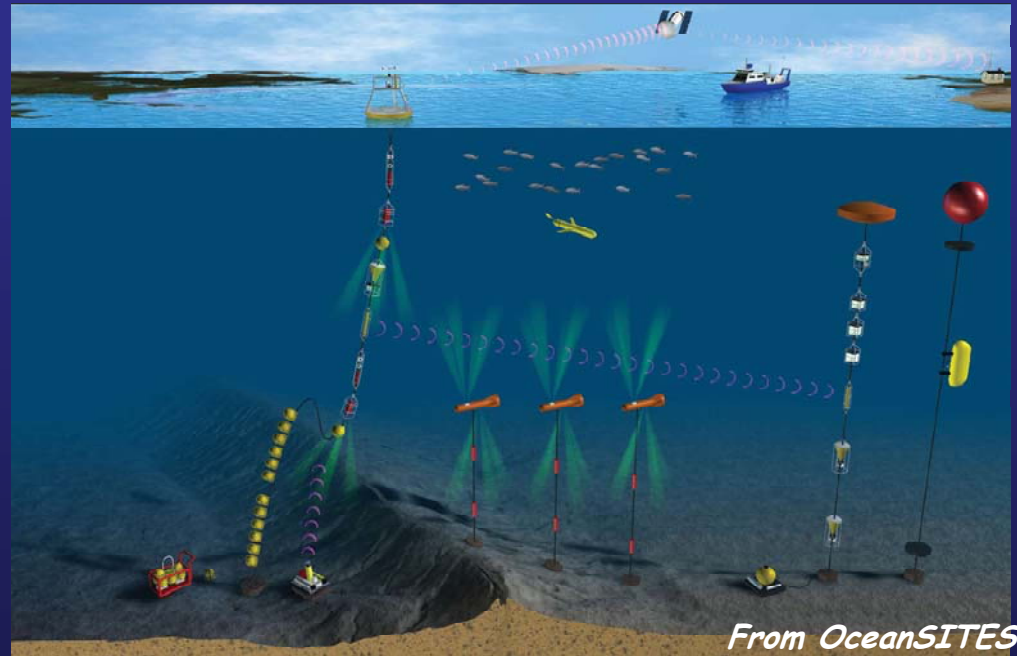
The "Sustained Open Ocean Frontier Initiative"

Requirement to expand the EMSO PP in order to develop an integrated lower atmosphere, water column and seafloor observatory ESFRI proposal.

Thank you

Coordinator: Richard Lampitt: rs1@noc.soton.ac.uk

Project manager: Kate Larkin: kel1@noc.soton.ac.uk



www.eurosites.info