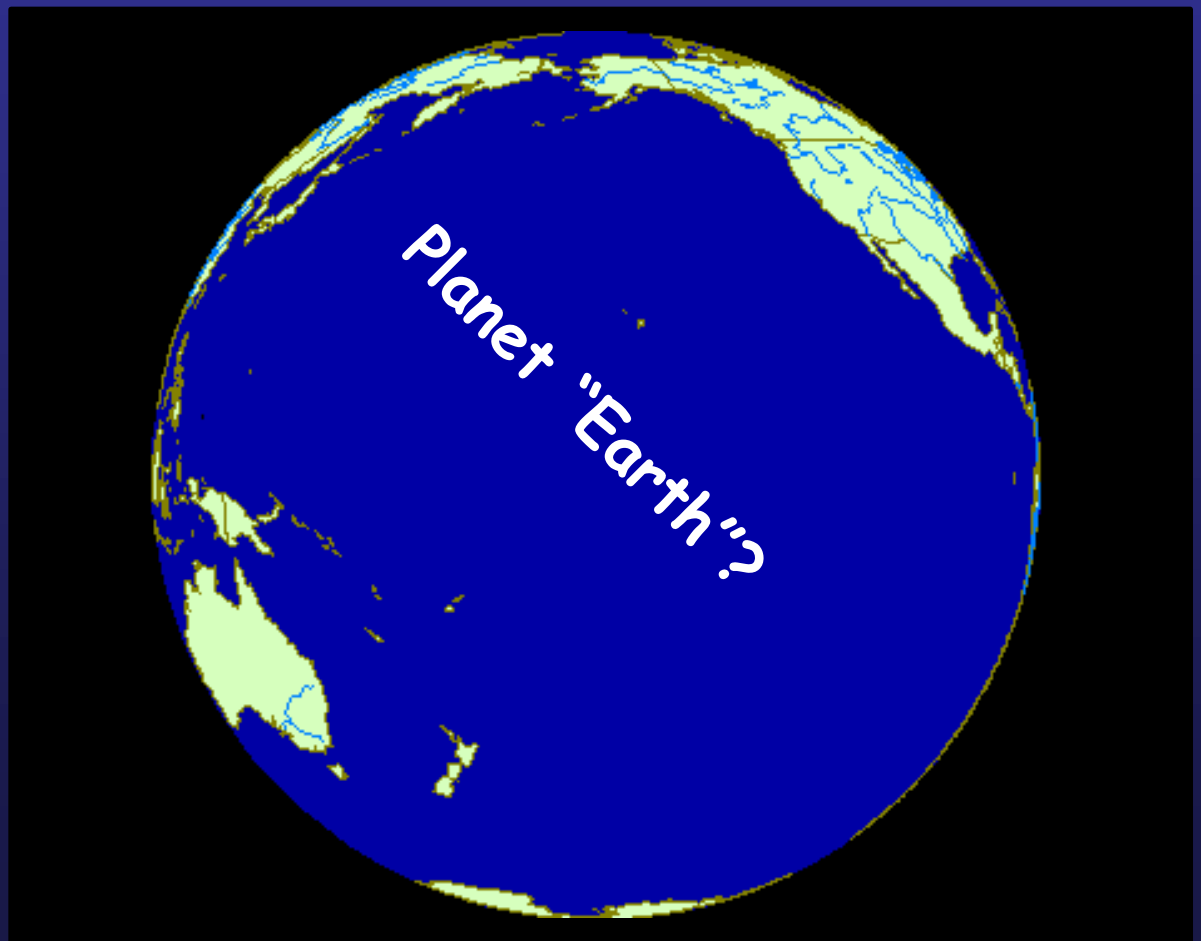
EuroSITES to FixO^3.

Richard Lampitt
National Oceanography Centre
Southampton
UK

If we are to understand the role of the oceans in the global climate system and respond appropriately, we must observe them at a range of temporal and spatial scales.

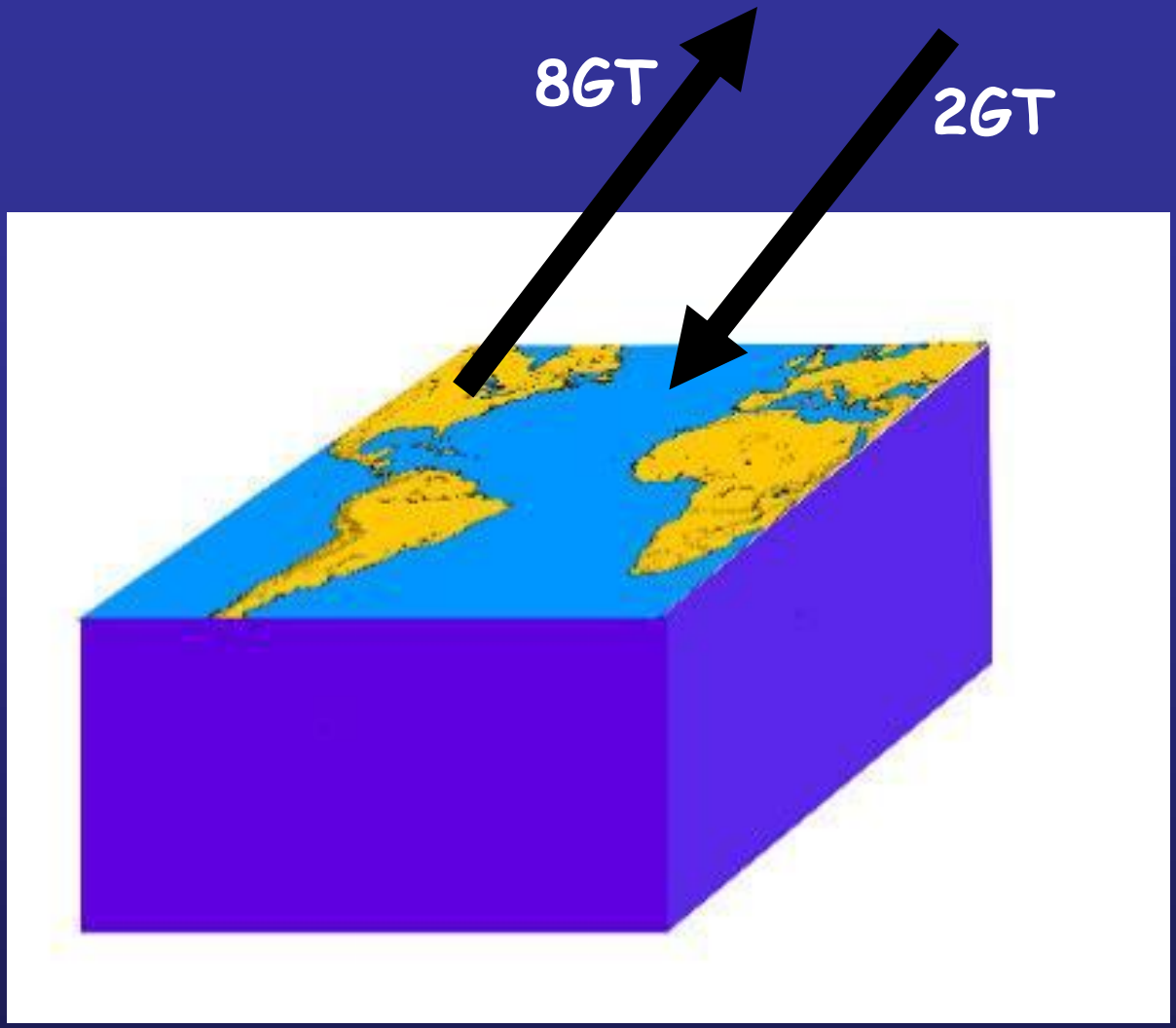


1. What are the ways to make observations?
2. What is the current status of fixed point (Eulerian) observatories?
3. What are the limits to progress?

Winslet and Di Caprio 1997


JAHRE VIKING

The Humpback Whale



Global annual carbon fluxes

Observing systems:

Ships of opportunity

Research cruises

Satellite (Altimetry, ocean colour & SST)

Floats

Autosub

Gliders

Benthic crawlers

Fixed point observatories

Data Management

Conceptual and computational models

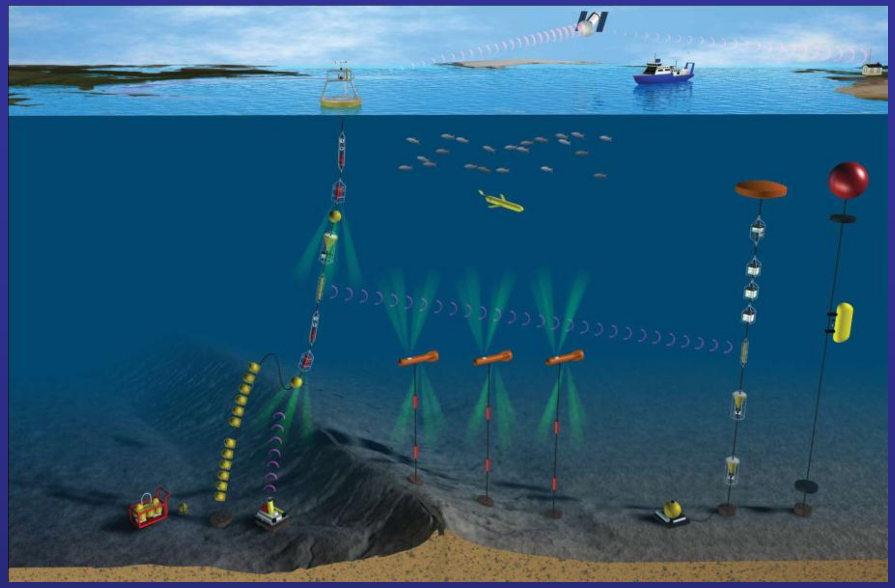
All approaches have strengths and weaknesses

User community

Autonomous systems have many advantages

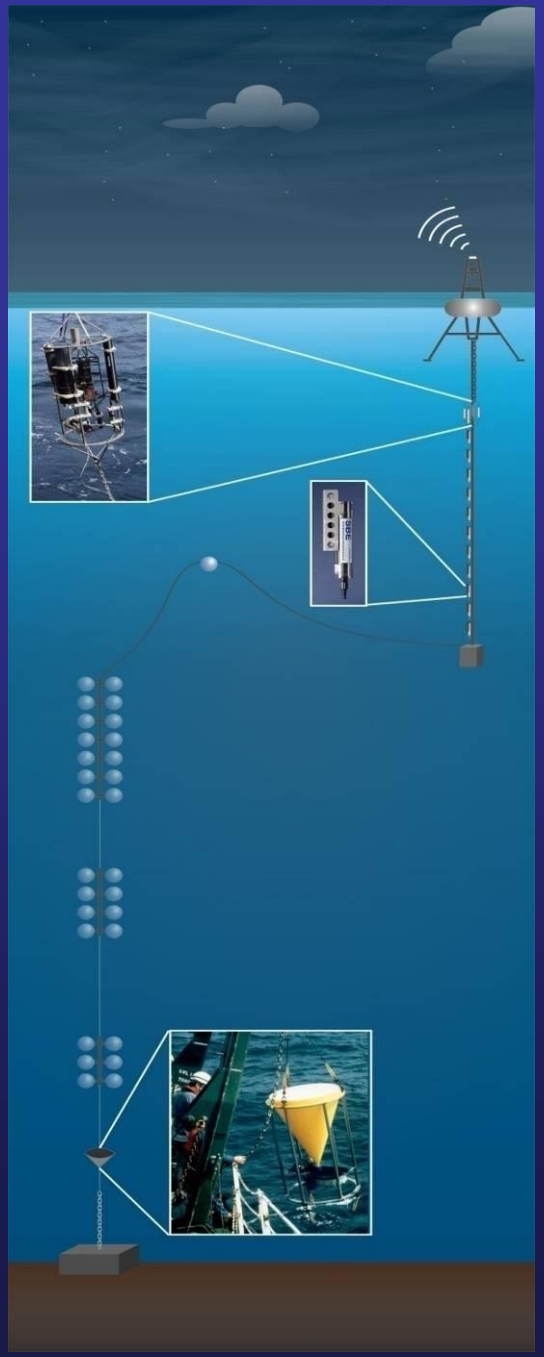
Observations are sometimes challenging at sea

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)

1. What are the ways to make observations?
2. What is the current status of fixed point (Eulerian) observatories?
3. What are the limits to progress?



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

www.eurosites.info

Dual function of funding:

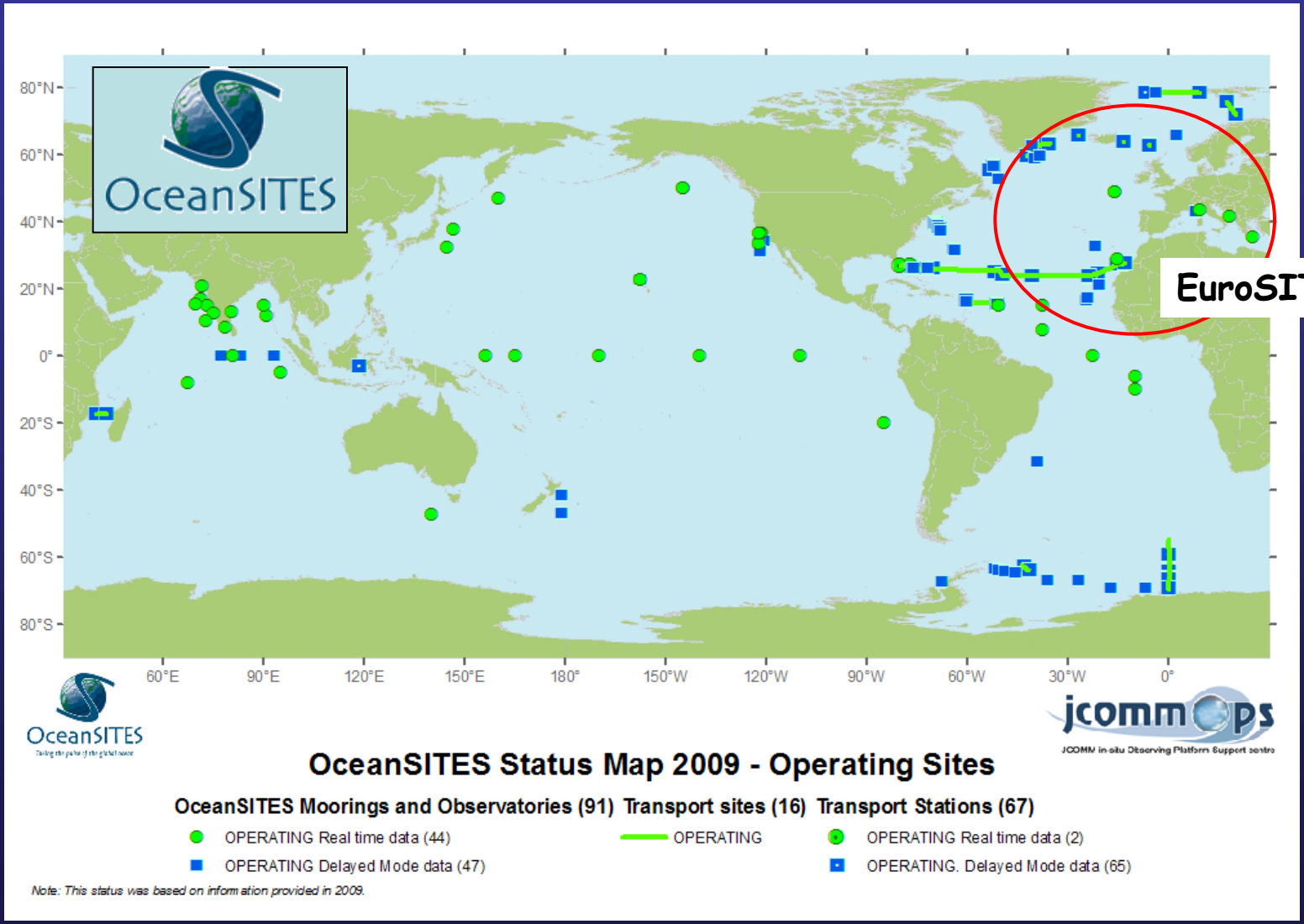
1: **Observatory support**

- Staff
- Equipment

2: **Glue**

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

OceanSITES: Global network.
An essential component of GOOS.



Connection to national initiatives

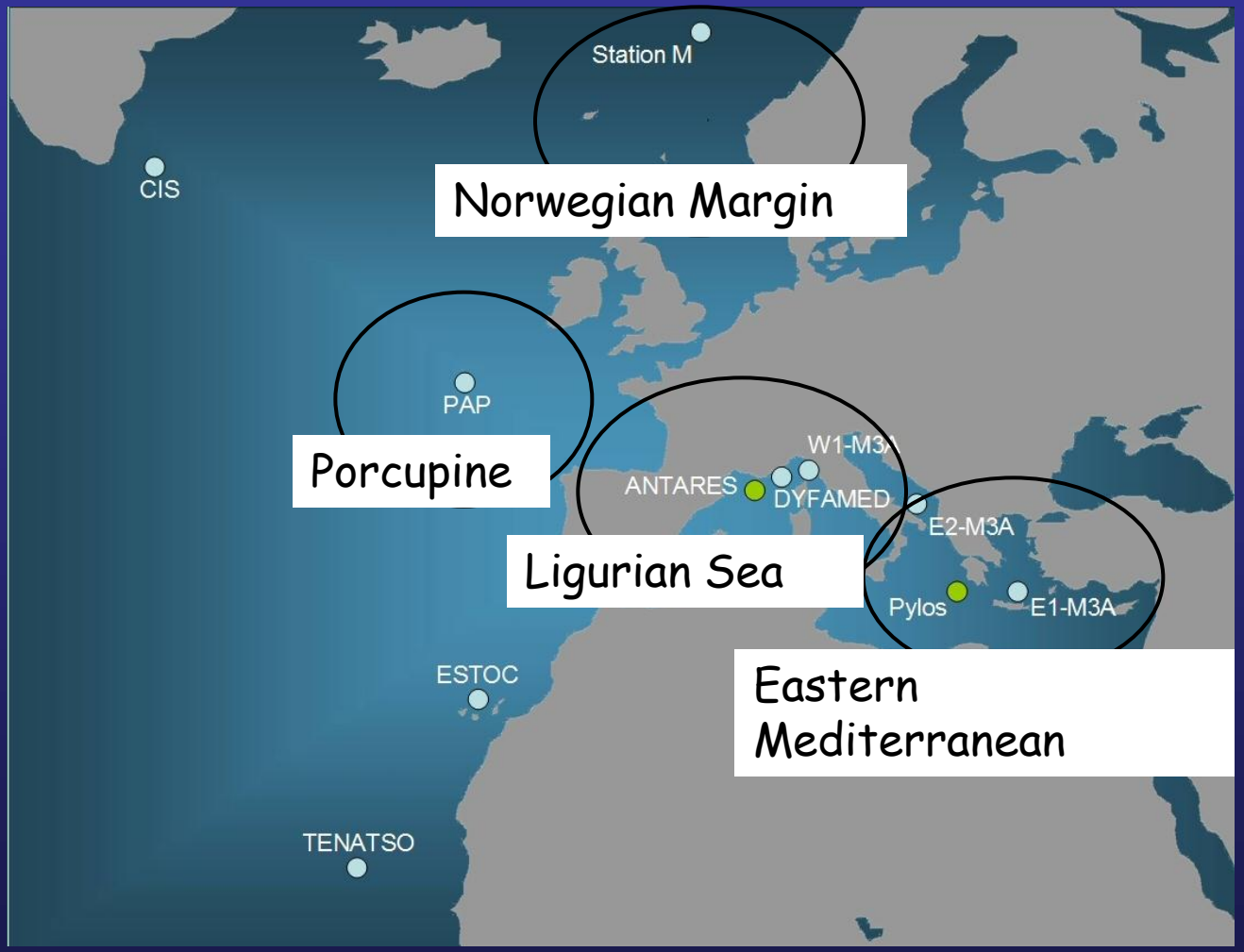
EuroSITES

OCEAN OBSERVATORIES INITIATIVE

Ocean Observatories Initiative

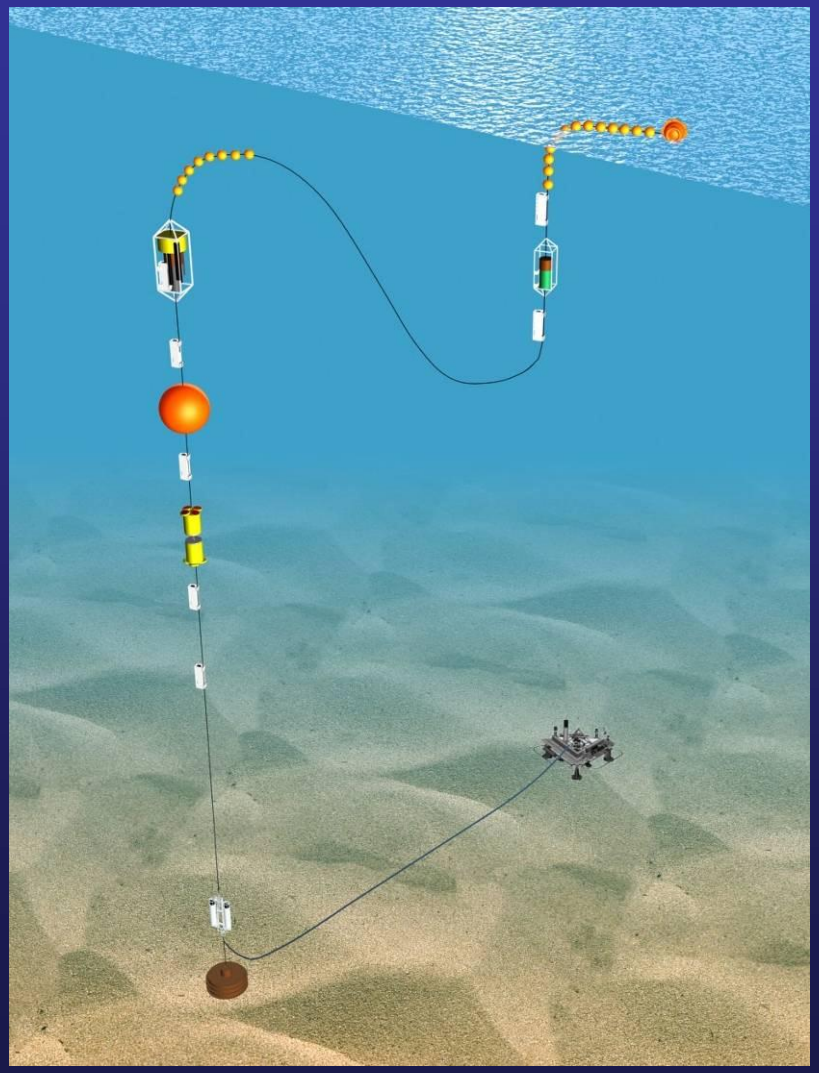
6 of the EuroSITES oversight committee were key players in OOI and Neptune Canada

Regional, collaborative science



EuroSITES and ESONET/EMSO: 4 Common regions

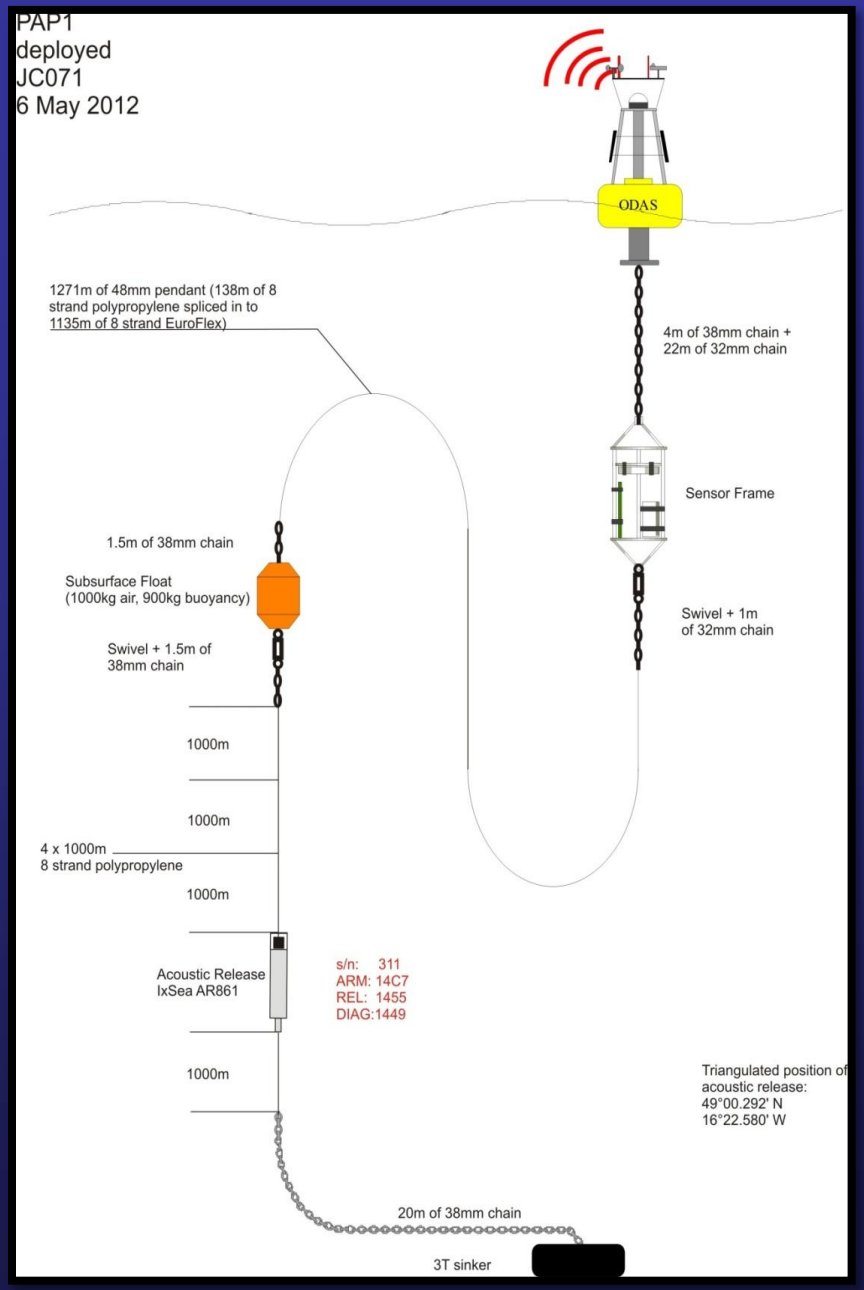
Multidisciplinary time-series
Vertical coverage: Surface to seafloor



- Temperature
- Salinity
- Currents
- Nutrients
- Chl-a
- CO_2
- O_2
- Particle flux
- Benthic components

Real-Time Telemetry

Porcupine Abyssal Plain (PAP)


PAP1
deployed
JC071
6 May 2012
ODAS
1271m of 48mm pendant (138m of 8 strand polypropylene spliced in to 1135m of 8 strand EuroFlex)
4m of 38mm chain + 22m of 32mm chain
Sensor Frame
1.5m of 38mm chain
Subsurface Float (1000kg air, 900kg buoyancy)
Swivel + 1m of 32mm chain
Swivel + 1.5m of 38mm chain
1000m
1000m
4 x 1000m 8 strand polypropylene
1000m
Acoustic Release IxSea AR861
s/n: 311
ARM: 14C7
REL: 1455
DIAG:1449
1000m
Triangulated position of acoustic release:
49°00.292' N
16°22.580' W
20m of 38mm chain
3T sinker

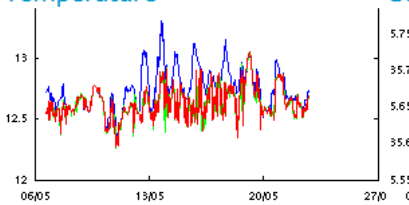
Meetings
Outreach
Oversight Comm.
Partner Area
Links
Contact
Help

Join the EuroSITES mailing list

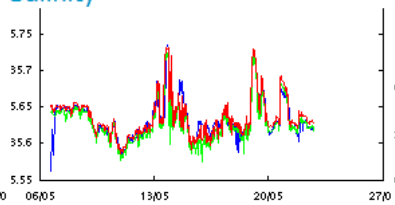
Click her to view engineering graphs

2009 May
2007 June
2006 July
2005 July
2004 June
2003 November
2003 July
2002 October
Download Data

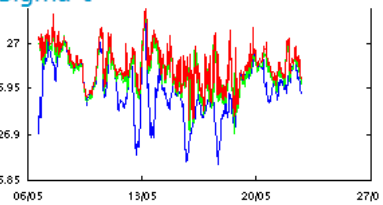
Temperature



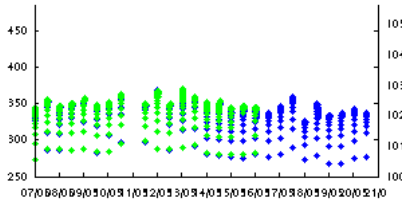
Salinity



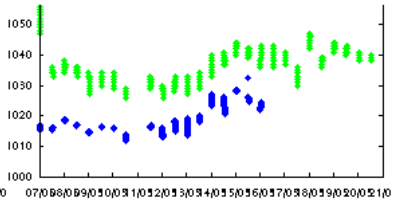
Sigma-t



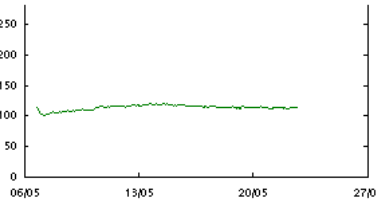
Carbon Dioxide



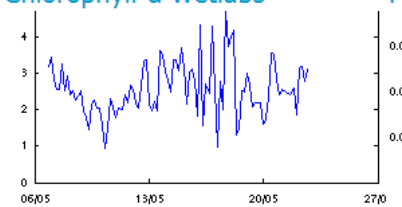
Pro-oceanus Pressures



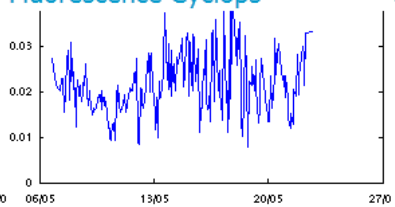
Aanderaa Carbon Dioxide



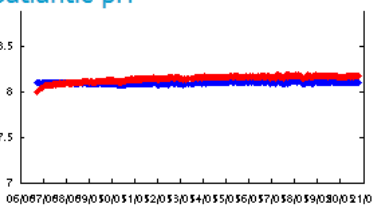
Chlorophyll-a Wetlabs



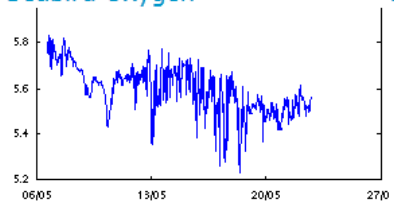
Fluorescence Cyclops



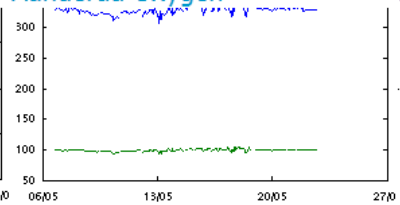
Satlantic pH



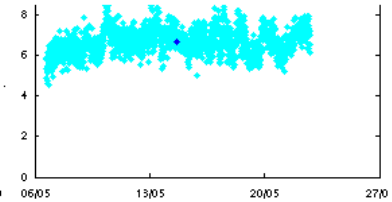
Seabird Oxygen



Aanderaa Oxygen



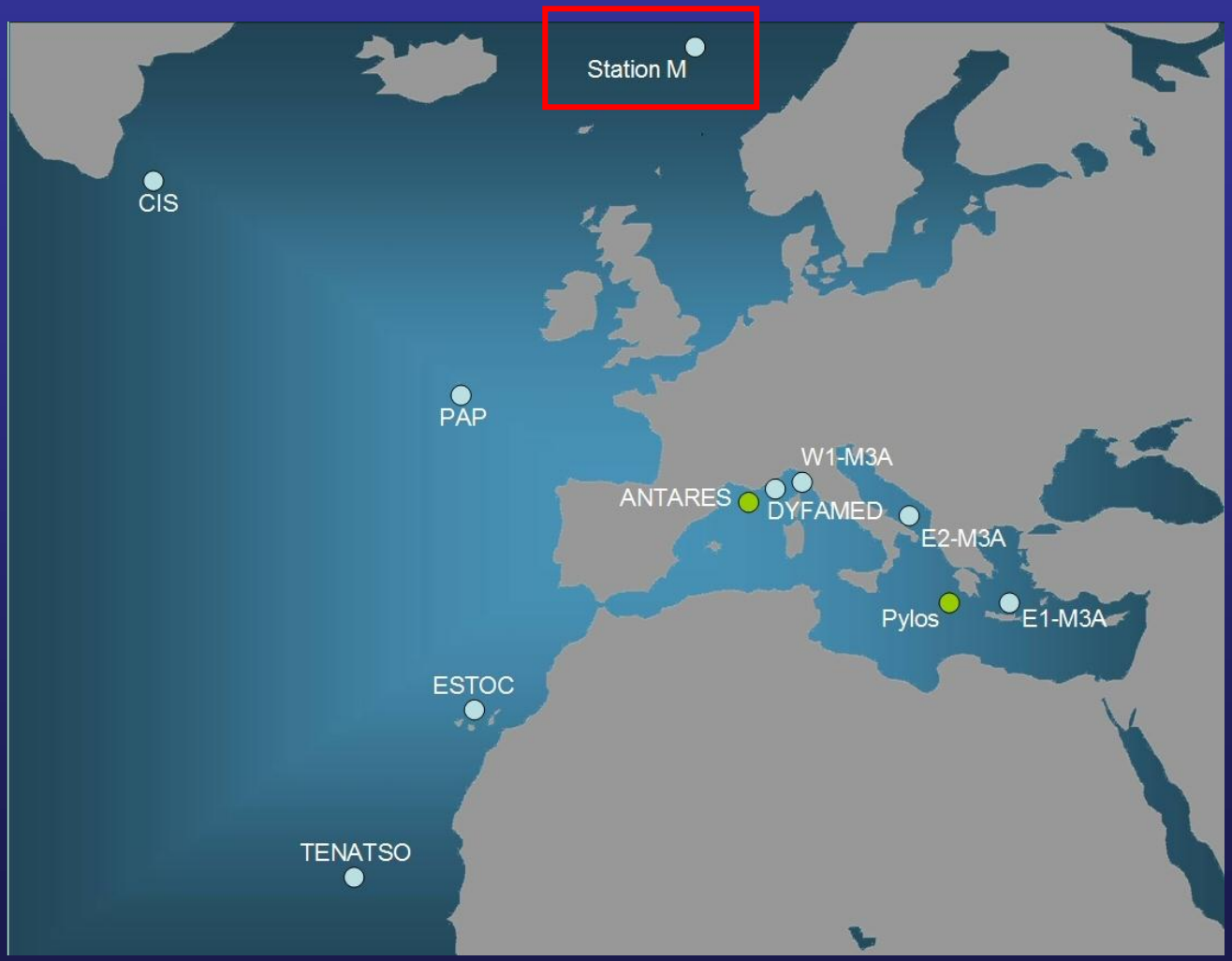
Nitrate : ISUS



Data from PAP up to today

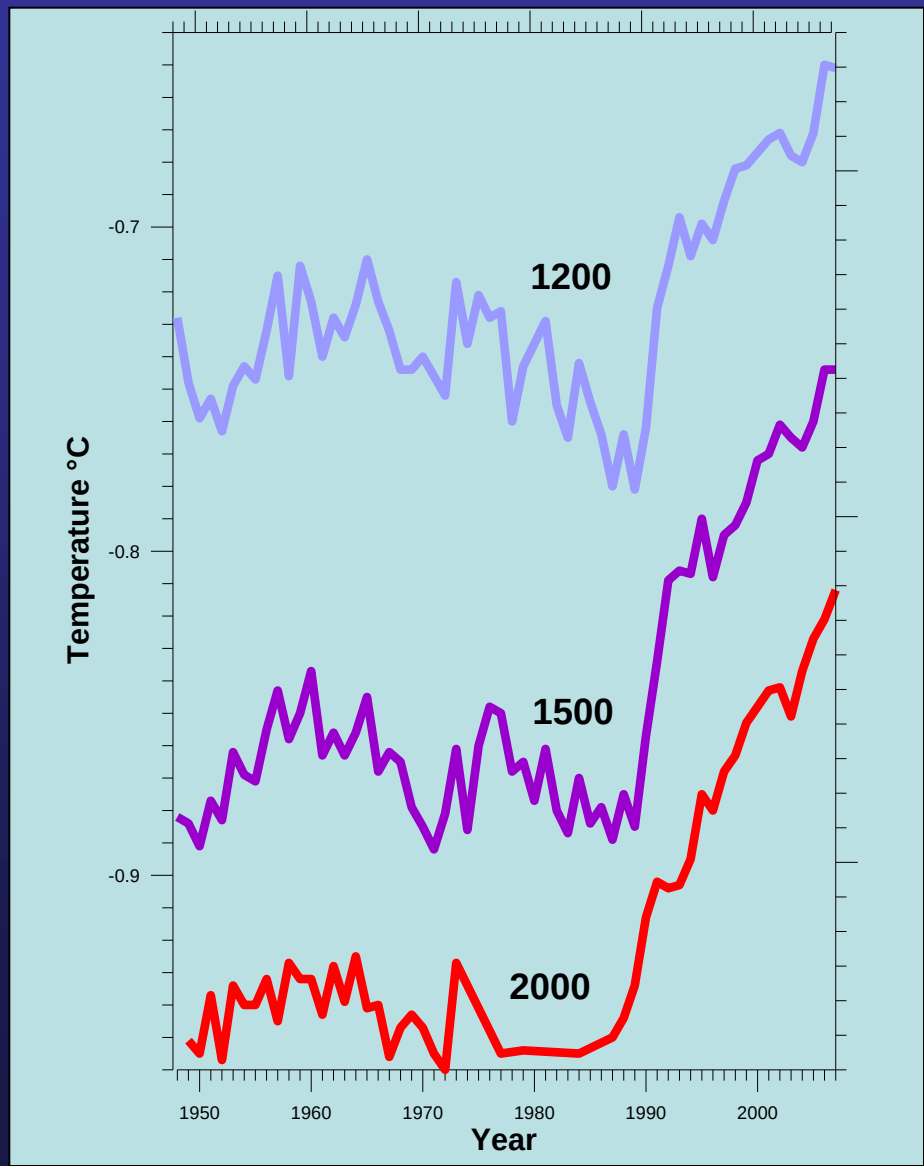
www.eurosites.info

Station M, Norwegian Sea



Station Mike

Dramatic deep water temperature increase

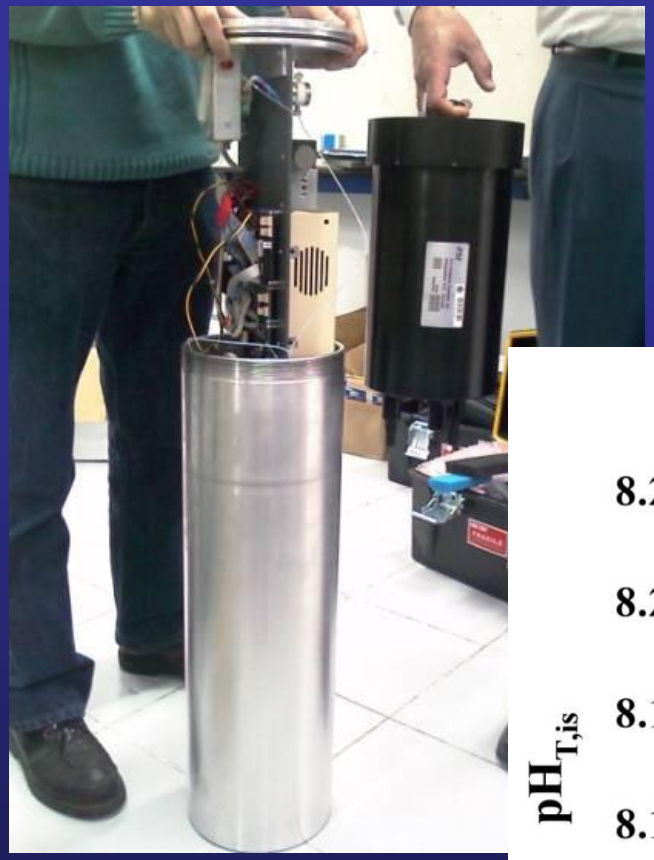


ESTOC

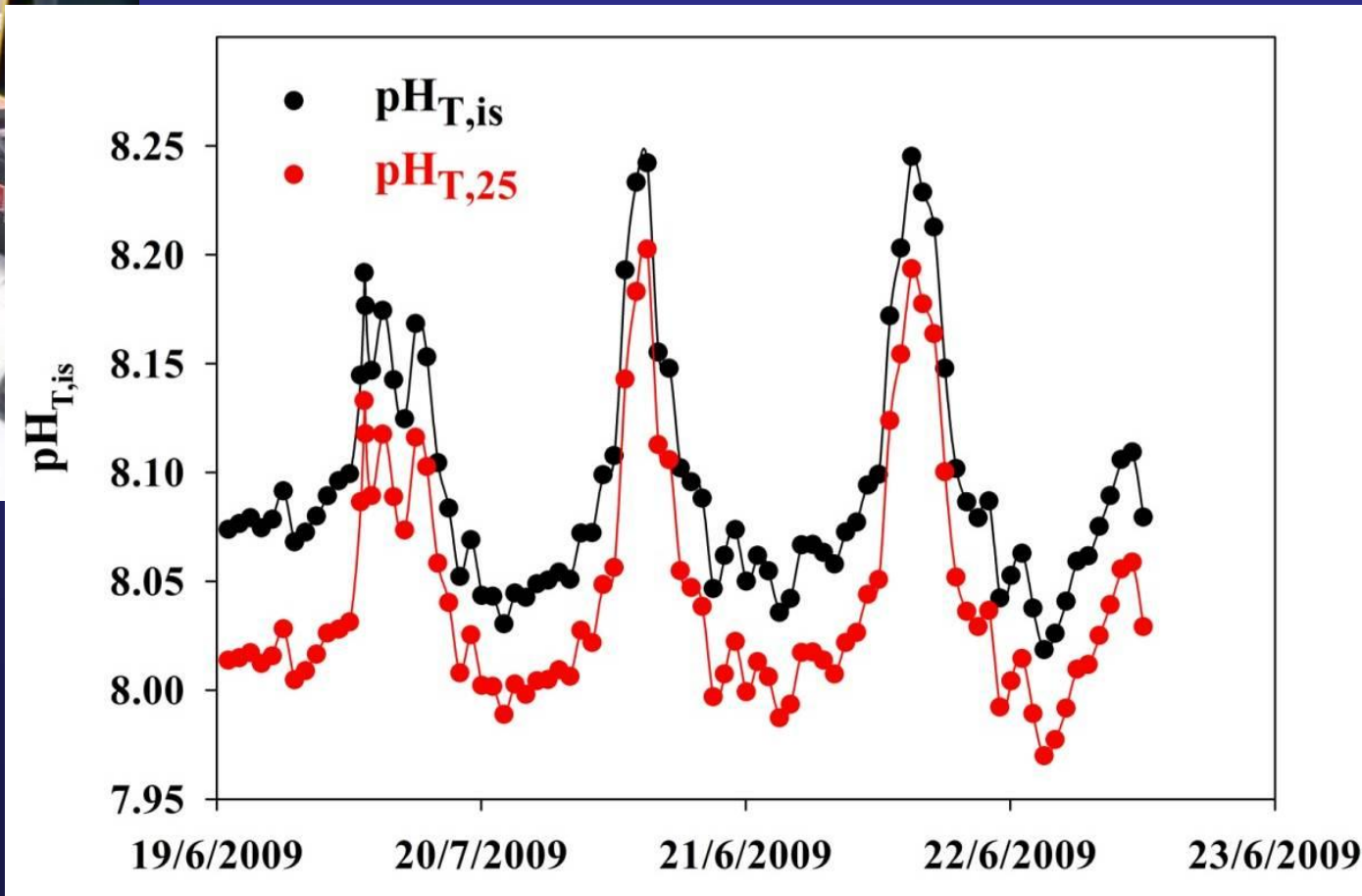

Station M
CIS
PAP
W1-M3A
ANTARES
DYFAMED
E2-M3A
Pylos
E1-M3A
ESTOC
TENATSO

Ocean acidification

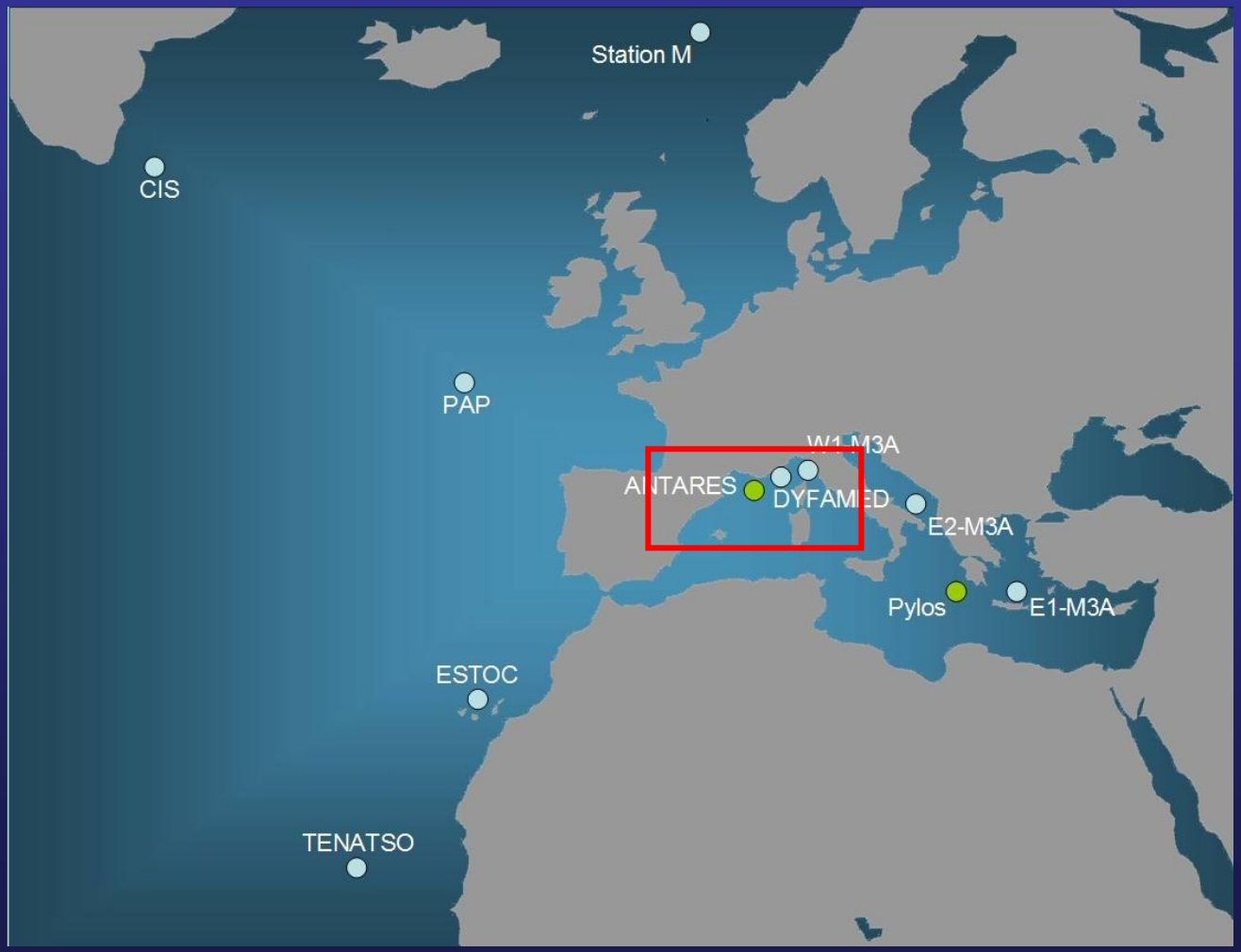
-autonomous pH time-series sensor



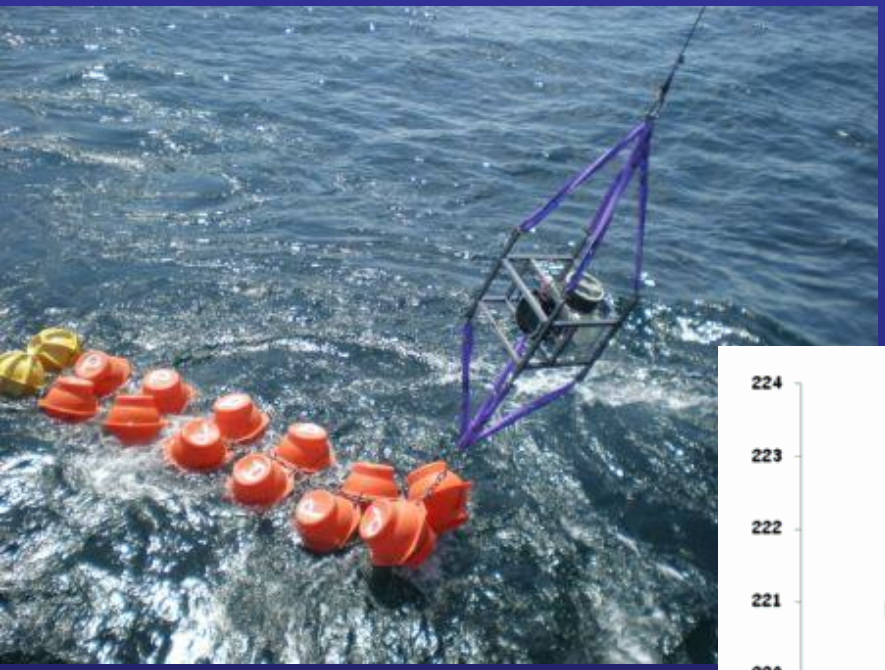
- Links with EPOCA and CARBOOCEAN

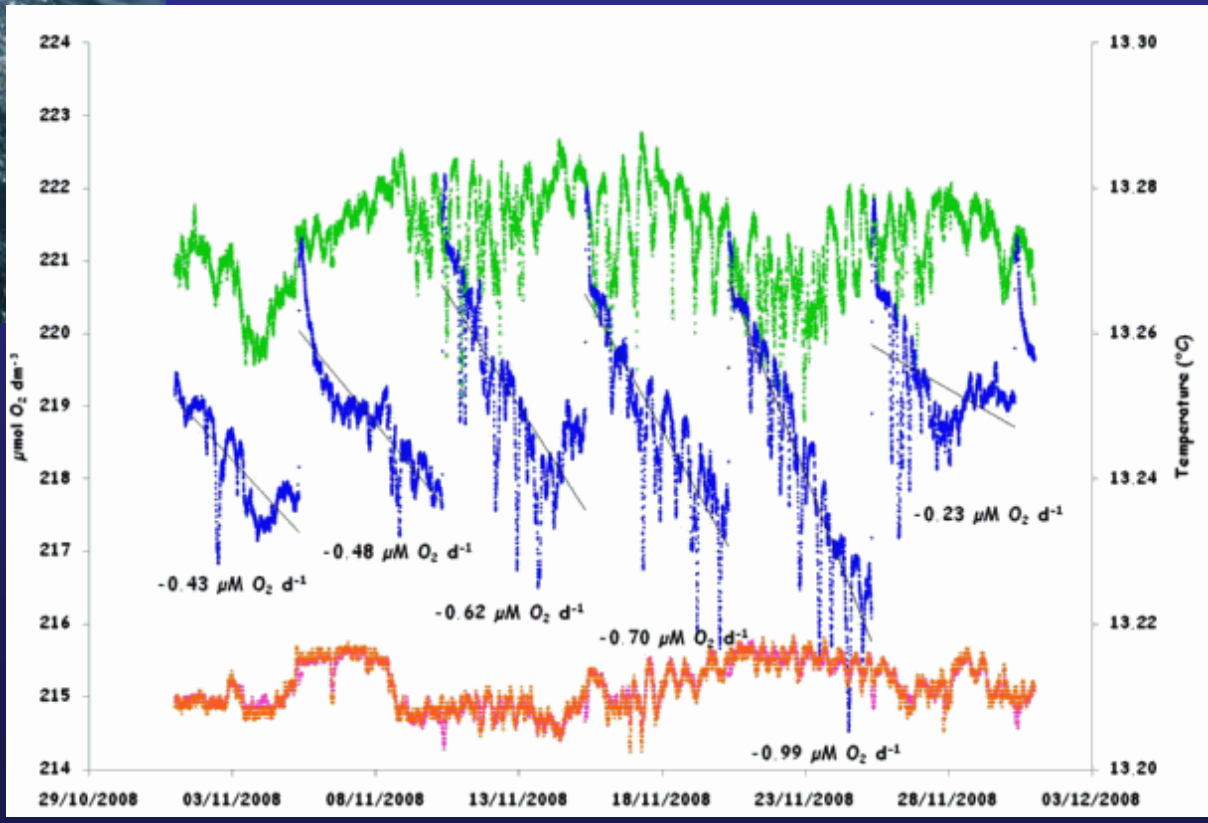


Western Mediterranean

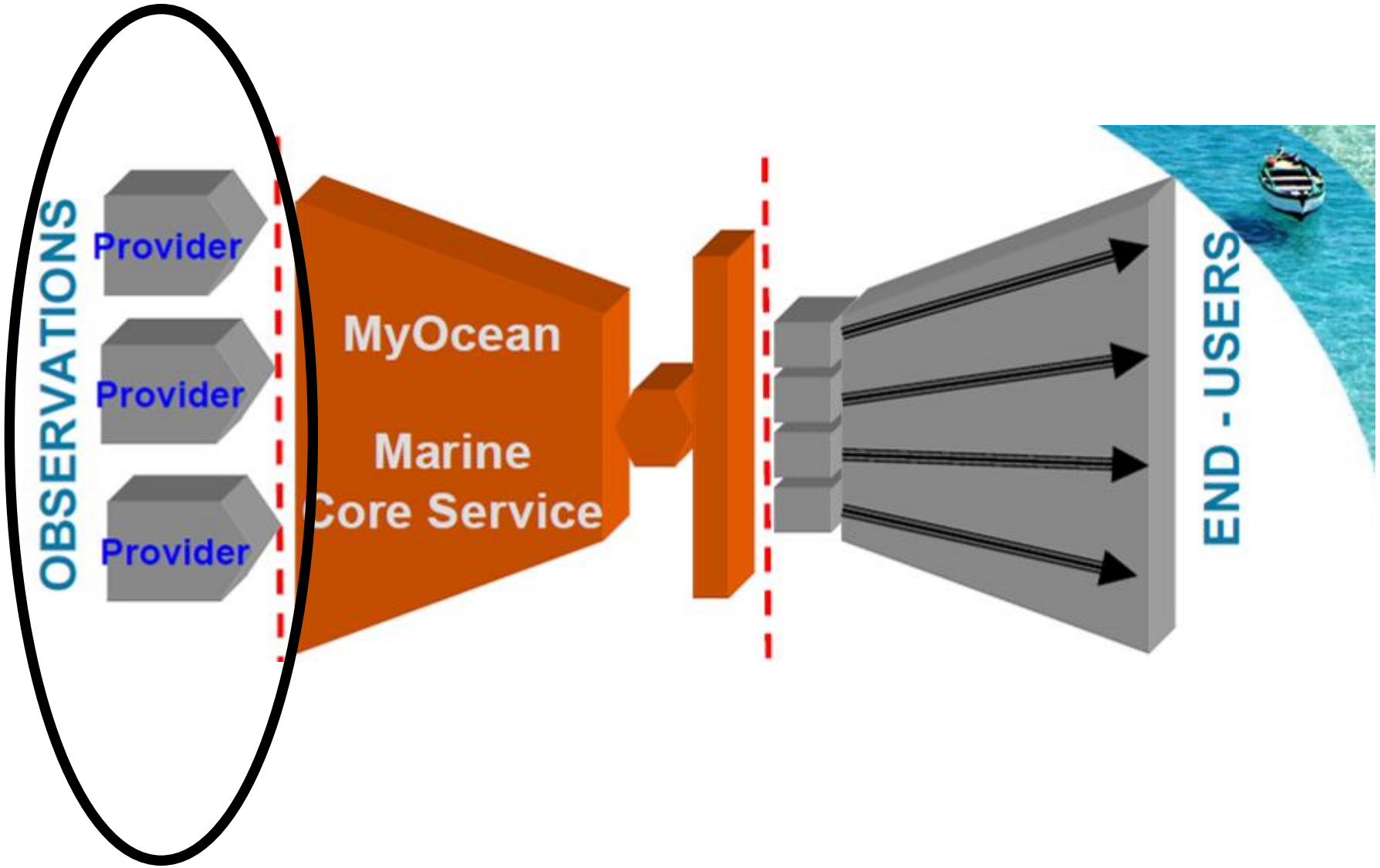


Deep ocean oxygen consumption
- *in situ* measurement





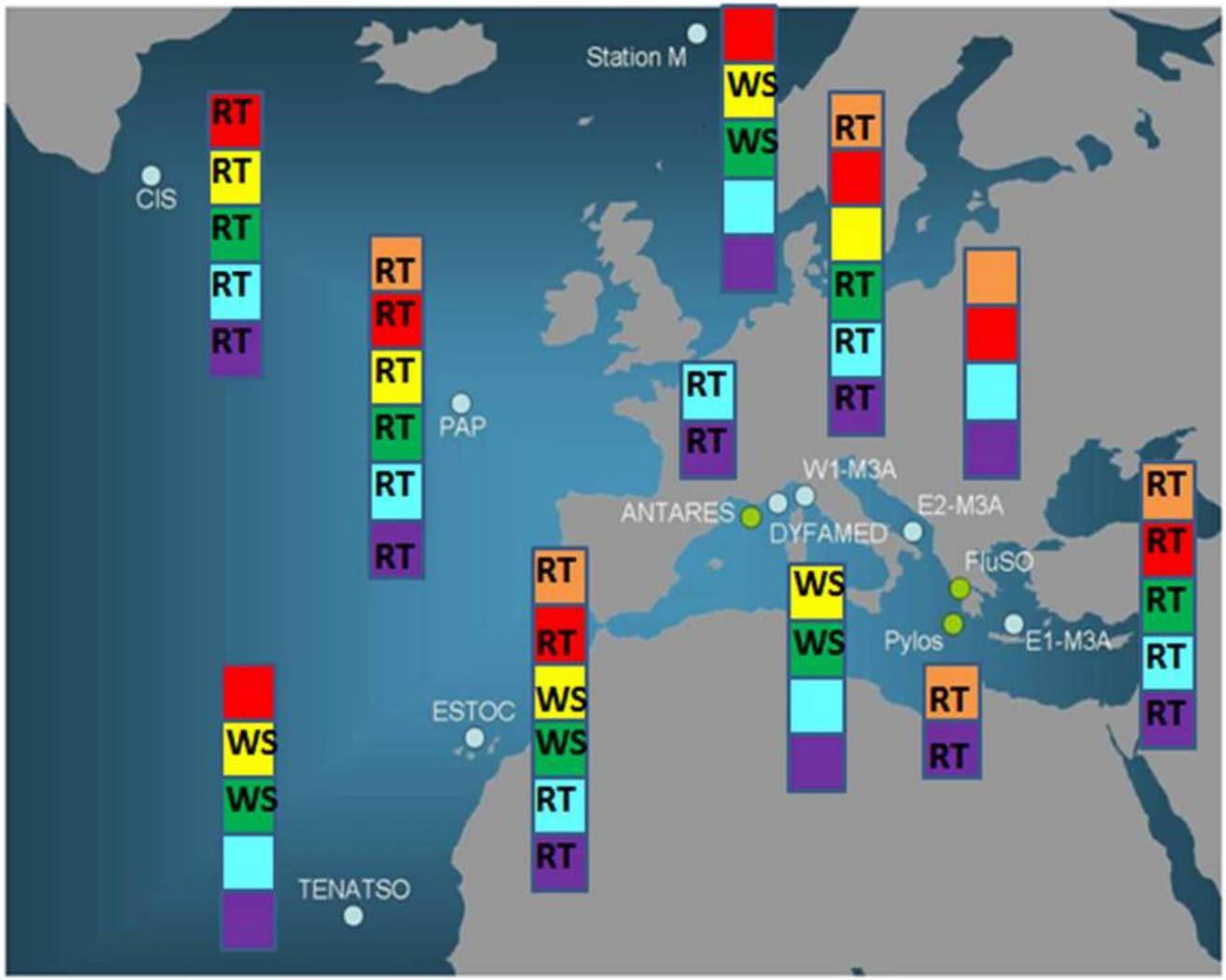
O_2 concentration inside and outside of IODA chamber



The vision of MyOcean

Data:

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



Atmospheric

pCO_2

Nitrate

Chl-a

O_2

Physics (T/S, currents)

RT: Capability for transmitting data in near real-time

WS: Water sample only, no sensor

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

1. What are the ways to make observations?
2. What is the current status of fixed point (Eulerian) observatories?
3. What are the limits to progress?

The funding gap

FP7 I3 call.

Fixed point open ocean observatories.

FixO^3

Submitted November 2011
EU Contribution requested ≈ 10M Euro
29 partners
Coordinated by NOC, Southampton

FixO^3

Open seas and ocean

Fixed critical locations.

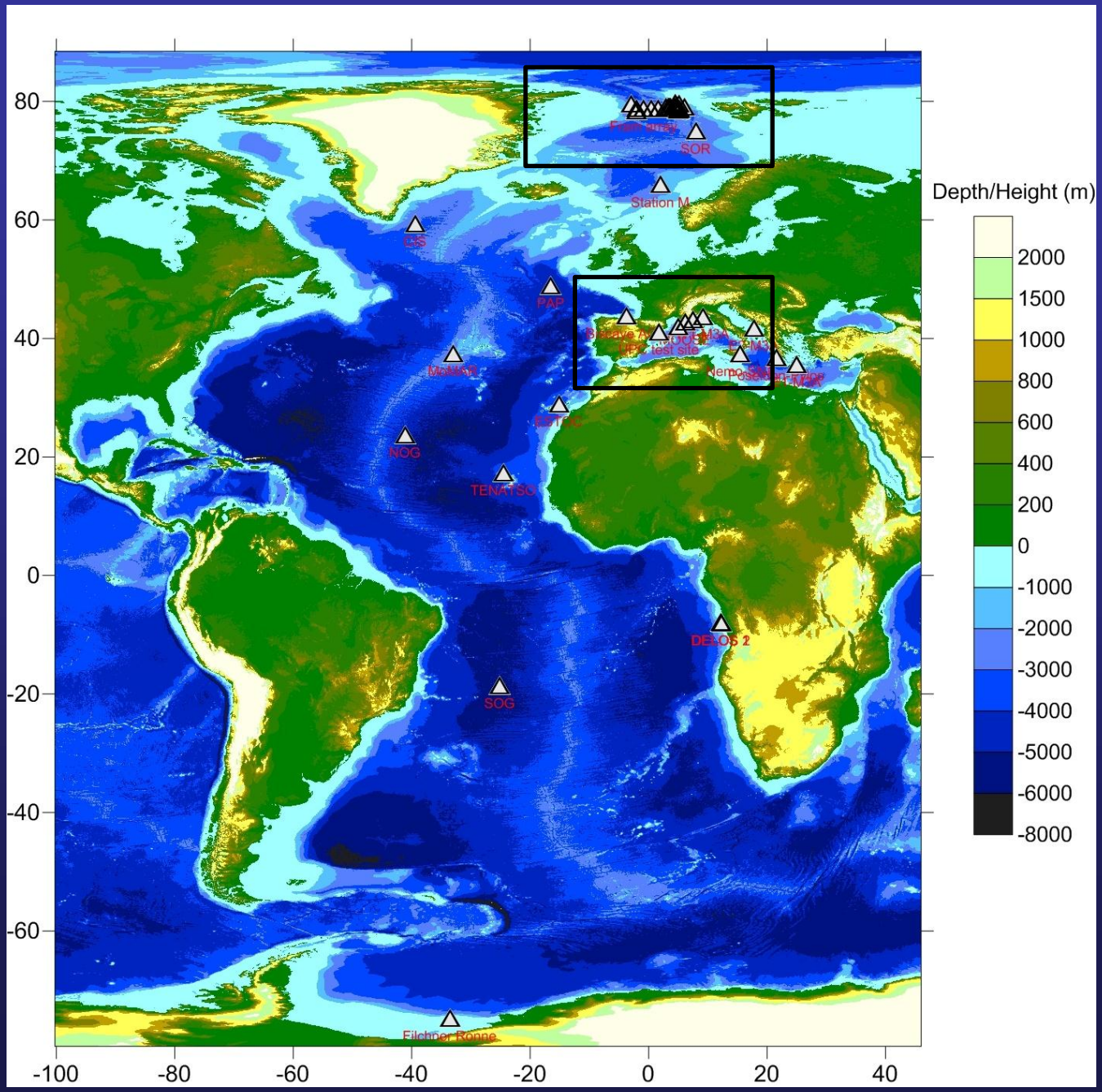
EuroSITES, ESONET and CARBOOCEAN

EMSO and ICOS

SeaDataNet standards

GMES initiative

European SME


Depth/Height (m)
2000
1500
1000
800
600
400
200
0
-1000
-2000
-3000
-4000
-5000
-6000
-8000
80
60
40
20
0
-20
-40
-60
-100
-80
-60
-40
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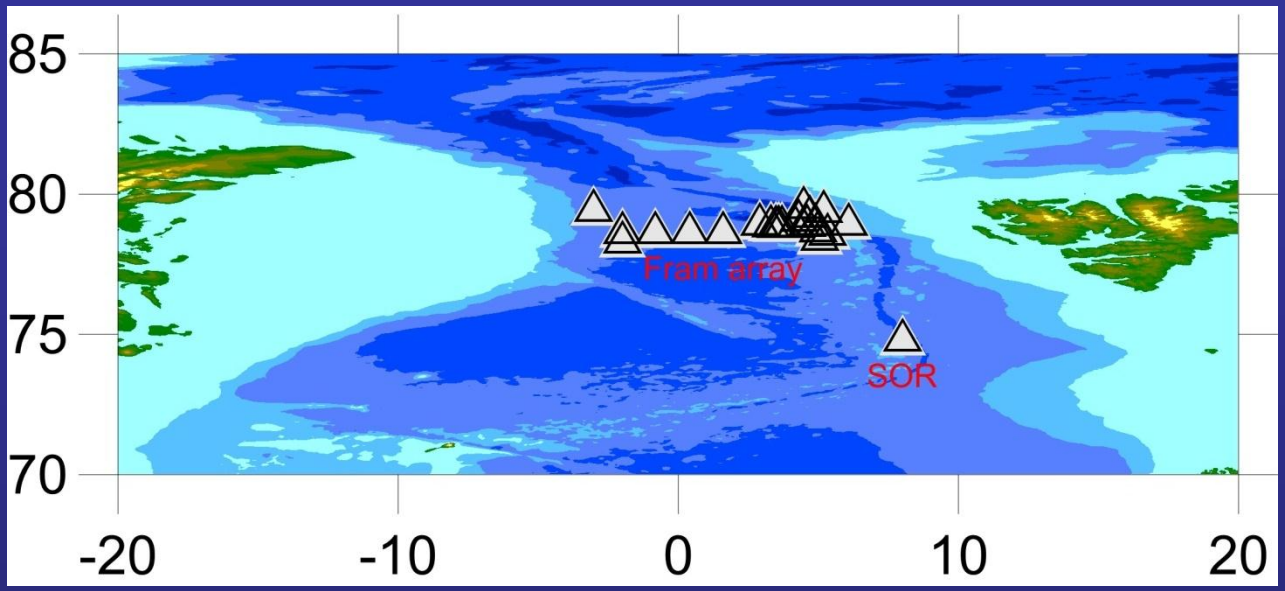
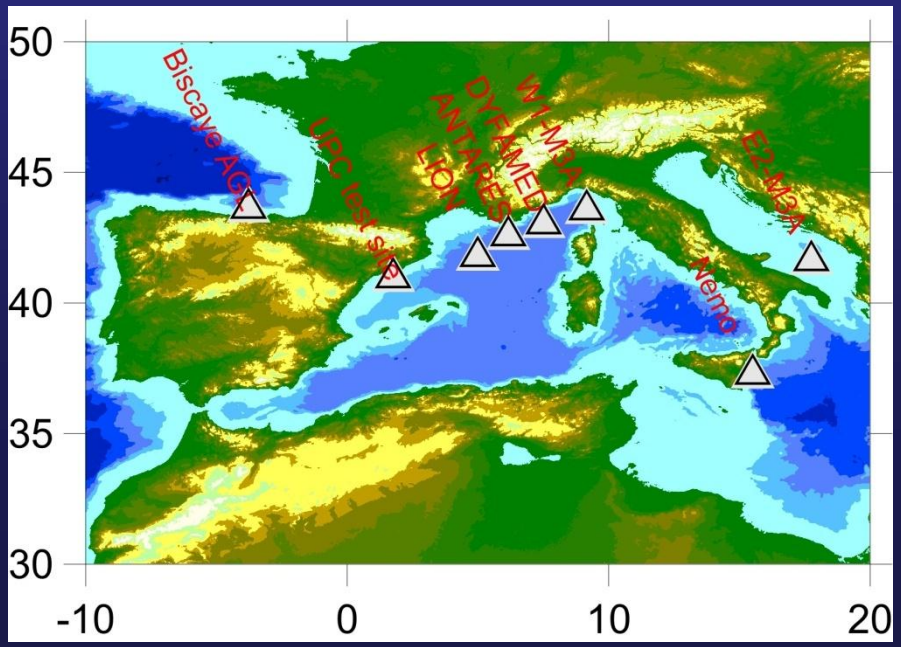
20
40
SOR
Station M
CIS
PAP
NOG
TENATSO
DELOS 2
SOG
Eilchner Ronne

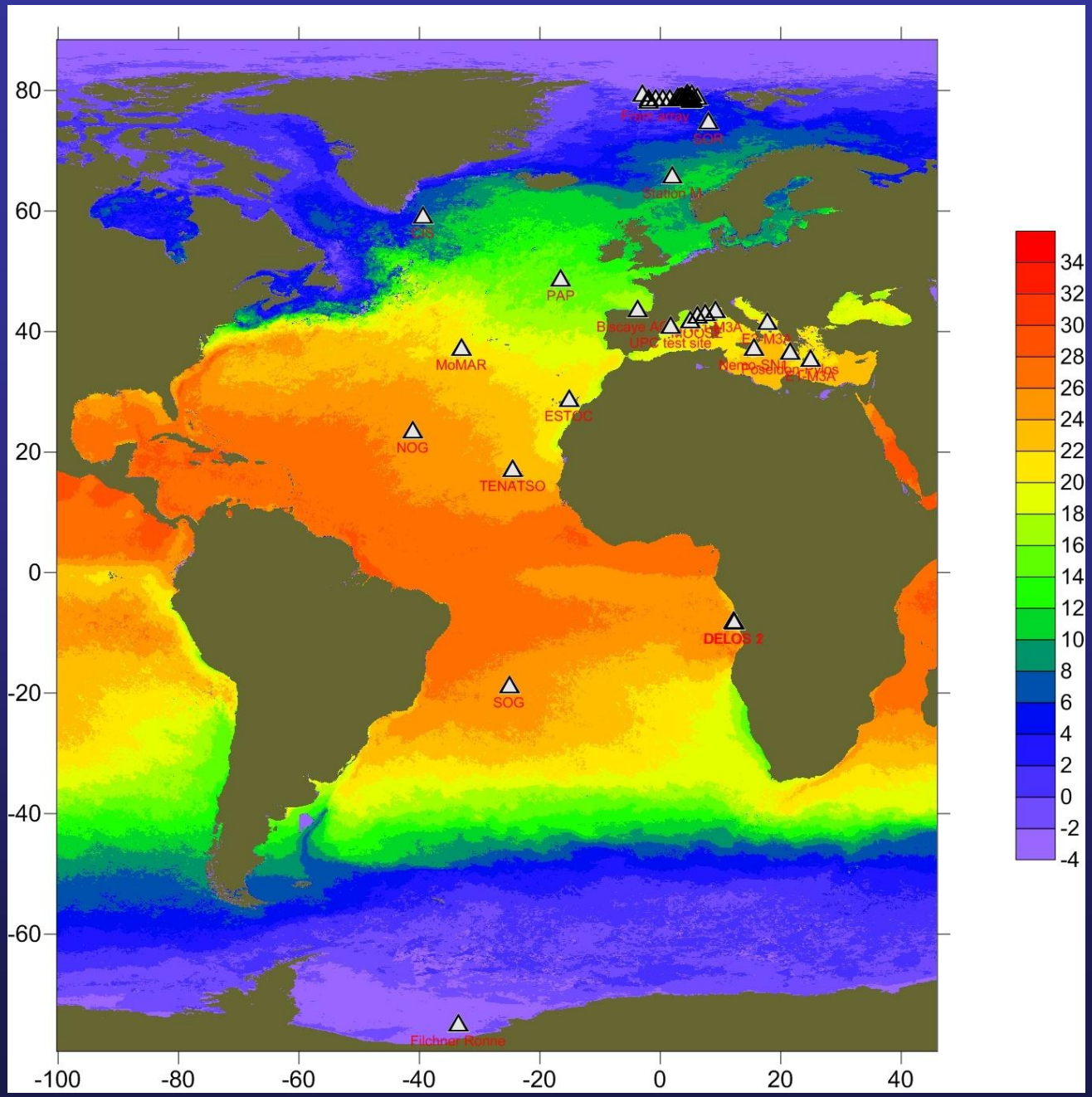
FixO³



Across the Fram strait



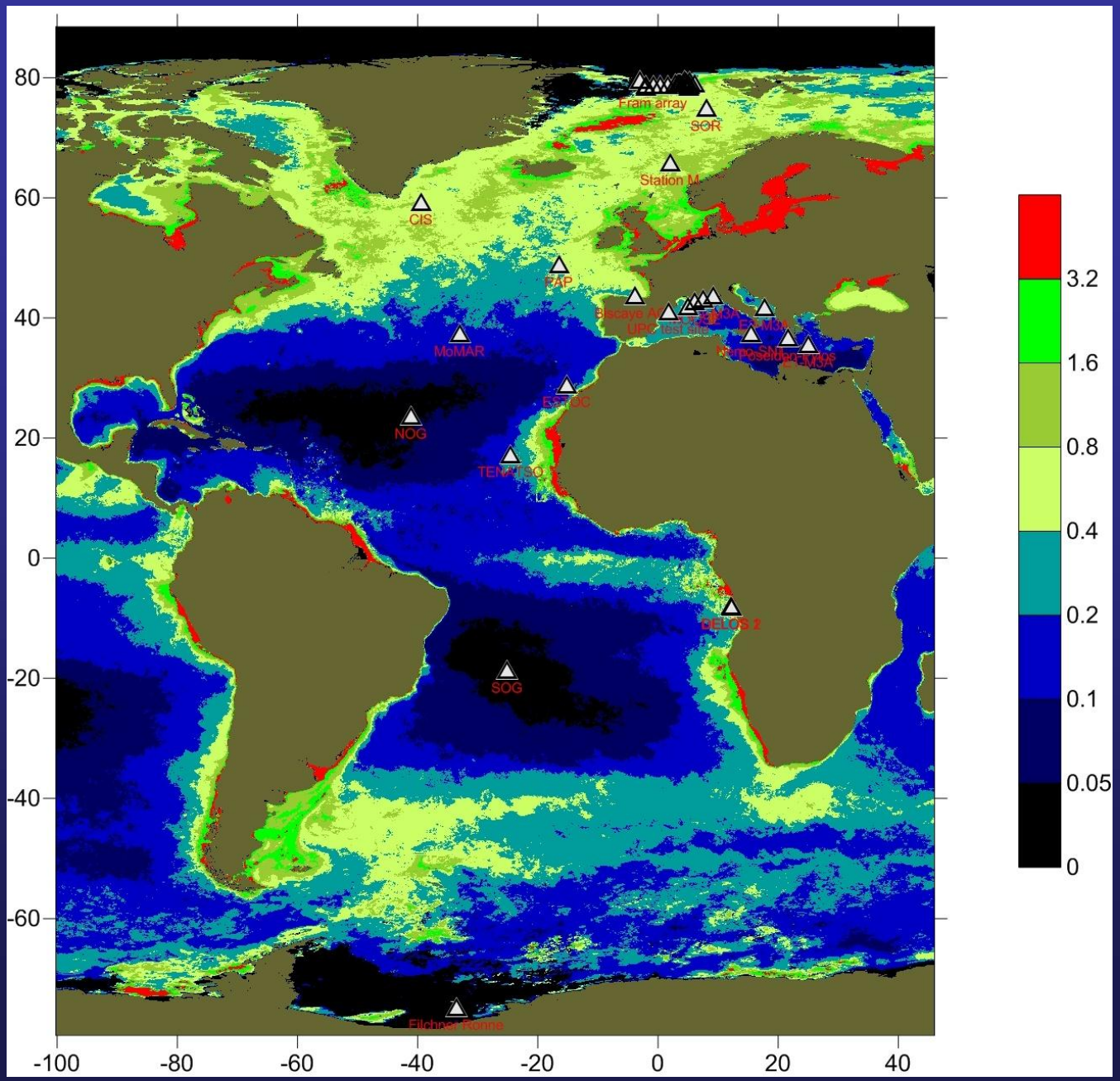
Within the Mediterranean



FixO^3

With Surface temperature climatology

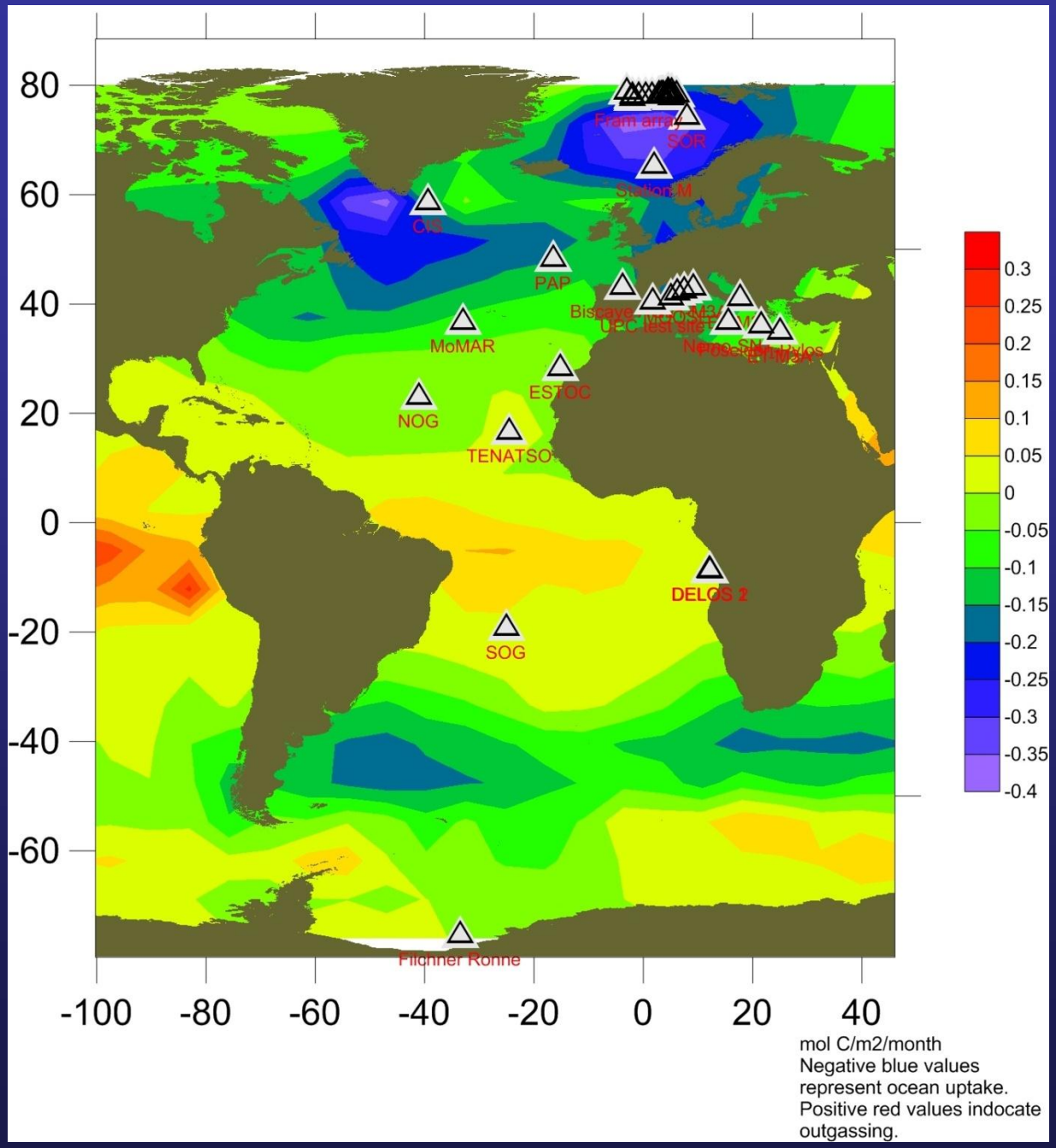
Courtesy RSDAS



FixO^3

With surface chlorophyll (average 2007)

Courtesy RSDAS

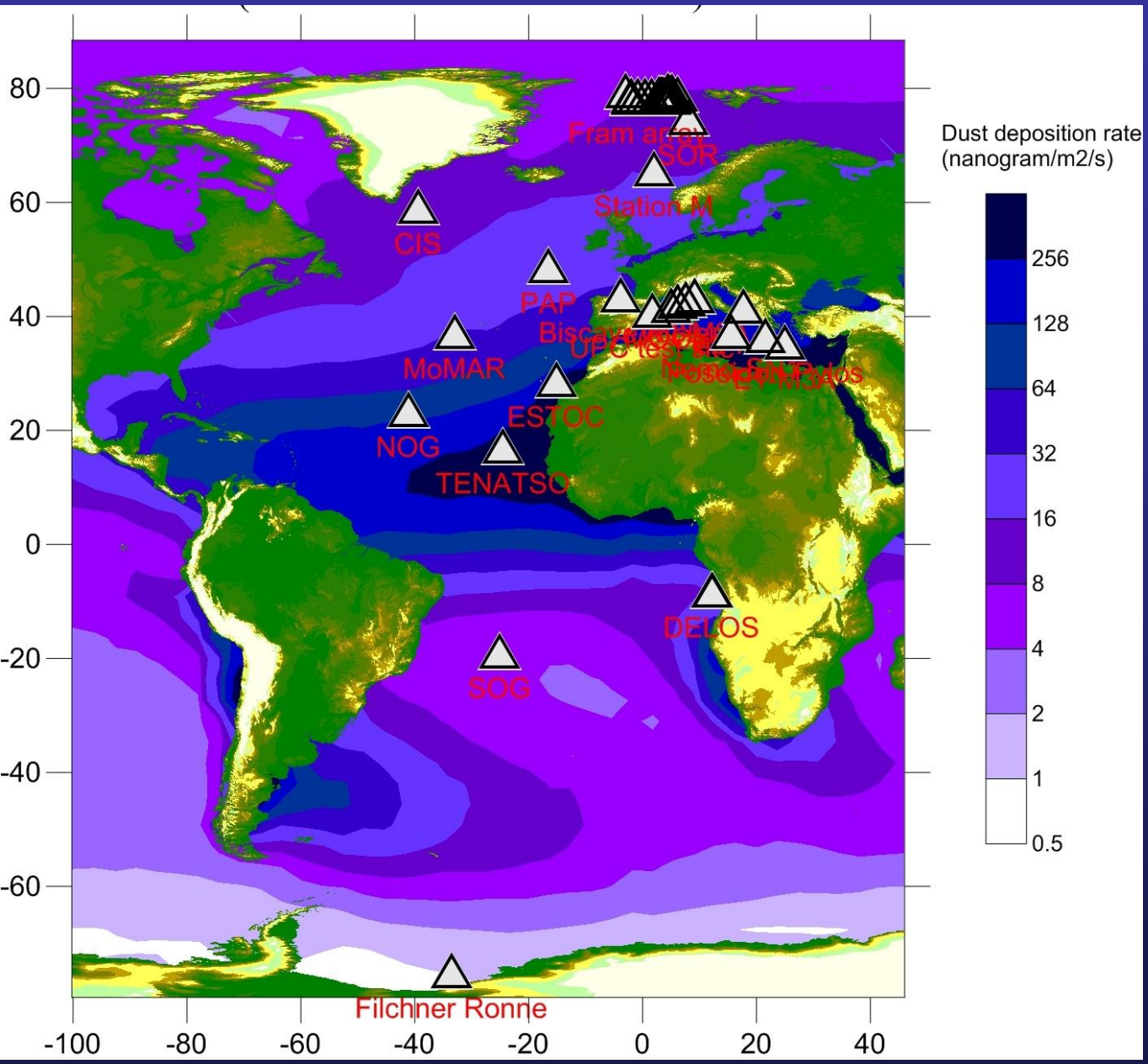


FixO^3

With air-sea flux of CO2 (average 2000)

(From Takahashi et al 2009)

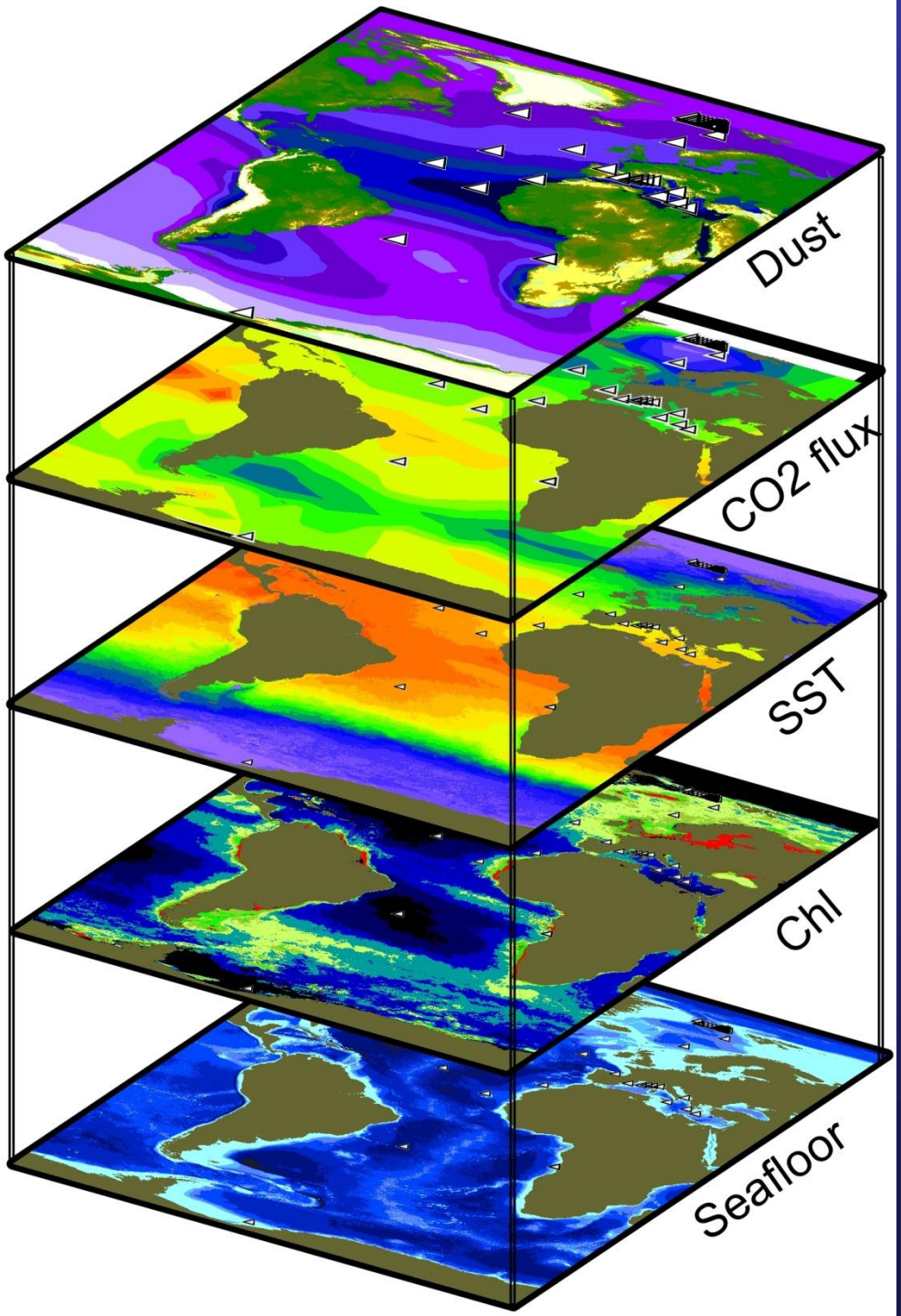
Courtesy Ute Schuster, UEA



FixO^3

With dust deposition rate annual climatology (from Mahowald 2005)

Courtesy Natalie Mahowald


Dust
CO2 flux
SST
Chl
Seafloor

Structure of FixO^3

COORD: Networking activity (7 WPs)
SUPP: Service Activity and Transnational Access (2 WPs)
RTD: Research (2 WP's)

External advisory board

Outstanding issues

Engineering development:
Sensors, Platforms, data transmission, power supplies

Geographical coverage

Model development

Cabled or not?

Power requirement
Data transmission
Flexibility
Cost to install and maintain

The AstroParticle Physics community is already involved in some of the ocean observatories. Now is the time to explore additional interactions.