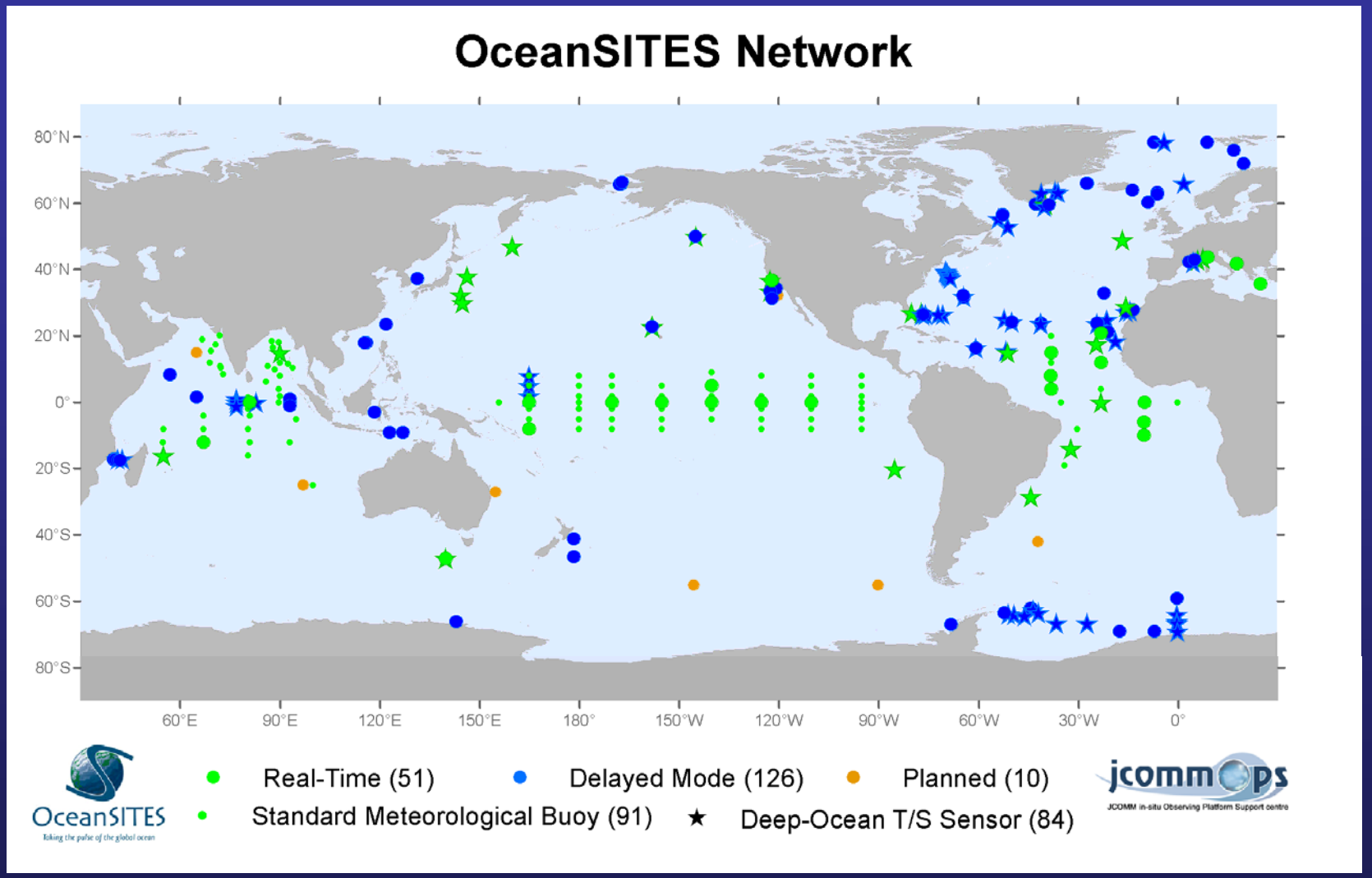
Richard Lampitt
National Oceanography Centre
Southampton
UK

OceanSITES Characteristics

1. Global network of over 170 sustained open ocean fixed point observatories.
2. Measurement of many variables.
3. Full depth from air-sea interface to sea floor
4. Open data policy (common data format)
5. Part of Global Ocean Observing System (GOOS)
6. Funding of sites by individual investigators
7. Project office at JCOMM (Observations Program Area)



Current status (July, 2013)

OceanSITES

- Organizational structure:
  - Executive Committee
  - Science Team
  - Data Management Team
  - Project office

Executive Committee

Chairs:

- Uwe Send, (SIO, USA)
- Robert Weller, (Woods Hole, USA)

Members:

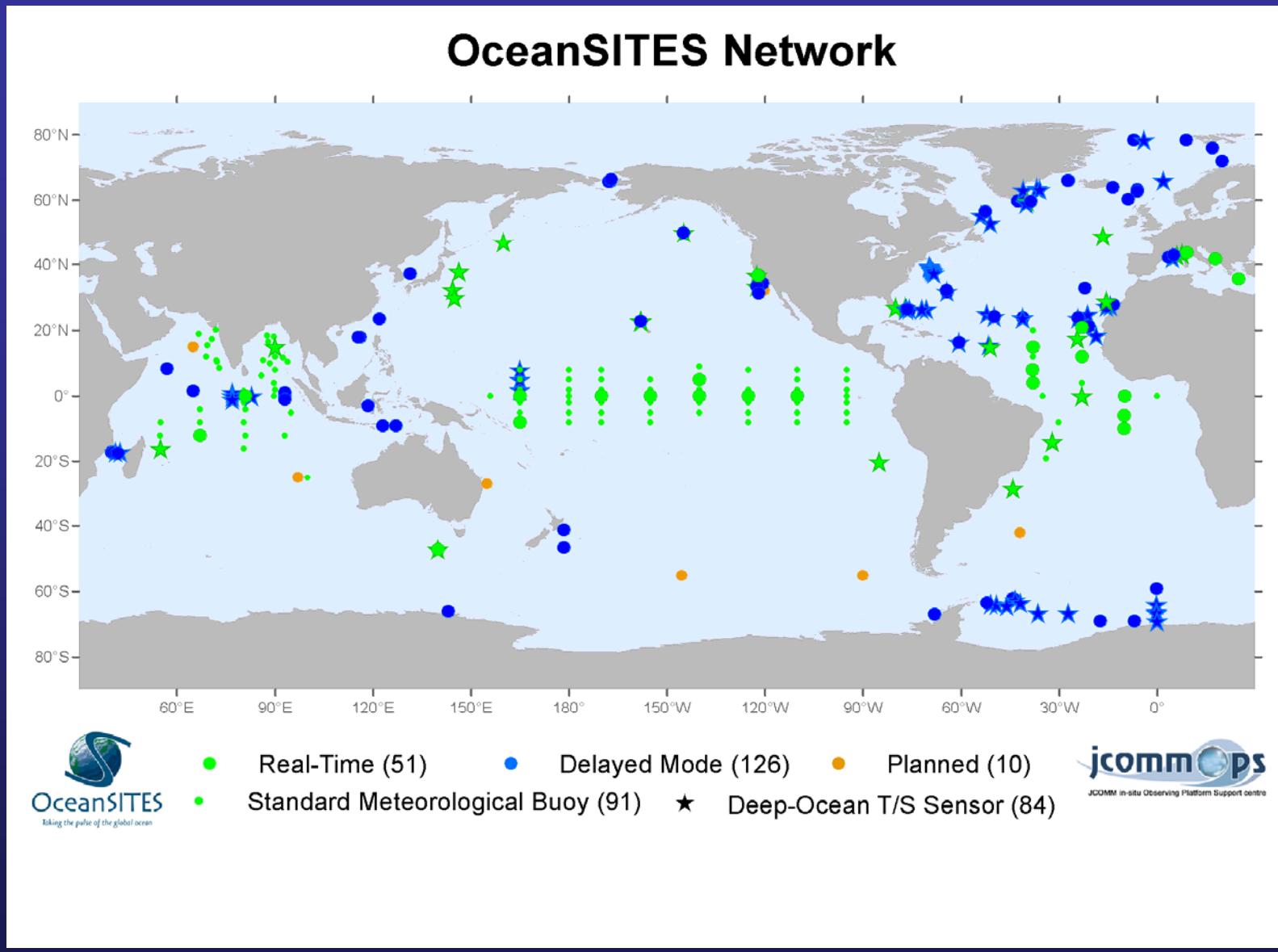
- Antje Boetius, AWI, Germany)
- Makio Honda, (JAMSTEC, Japan)
- Richard Lampitt, (NOC, UK)
- Roger Lukas, (University of Hawaii,USA)
- VSN Murty, (NIO, India)
- Tom Trull, (UTAS, Australia)
- Doug Wallace, (Dalhousie University, Canada)

Project Office role

- Support to OceanSITES members

- Assist OceanSITES:
  - ensure data is shared and used.
  - consider system resources, logistics, data delivery (real-time, delayed-mode)
  - collate documentation for new sites and update maps.
  - update website (general information, news, etc)
  - Organise teleconferences
  - Organise AGM

- Assist Data Management team:
  - Document data sources in a central Metadata Catalogue
  - Develop and improve data formats
  - Ensure data flows are correct for new sites



Current status (July, 2013)

3 disciplines have been defined.

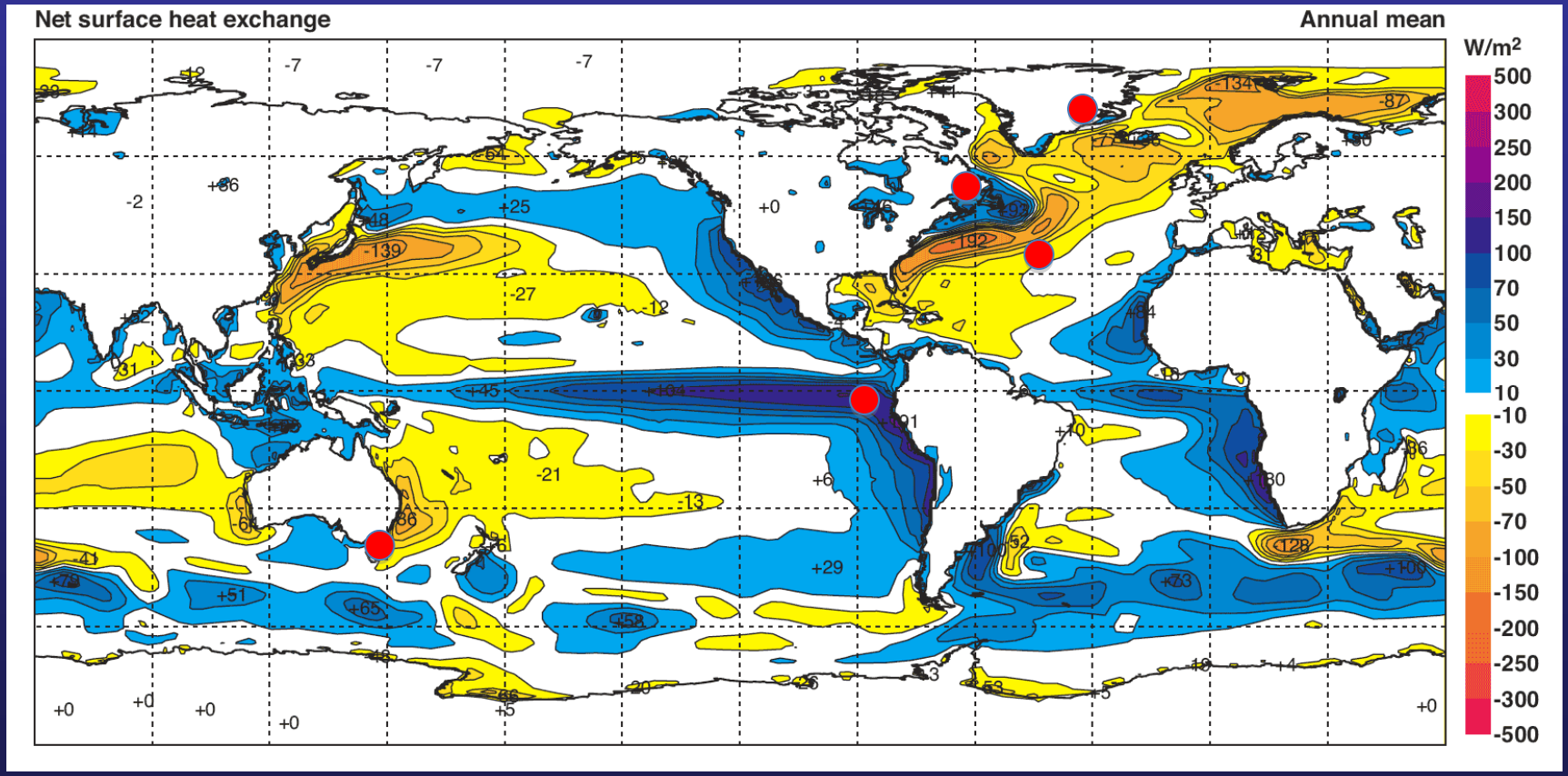
1. Air sea flux 
2. Physical time-series (ocean circulation, deep changes)
3. Biogeochemistry and ecosystem

OceanSITES Flux Reference Sites

- At characteristic or critical sites
- Addressing ocean mixed layer dynamics and identifying model bias and error
- Addressing climate dynamics and processes
- Validation of model and remote sensing based surface meteorological and air-sea flux fields.

Flux Reference Sites

Characteristic or critical sites

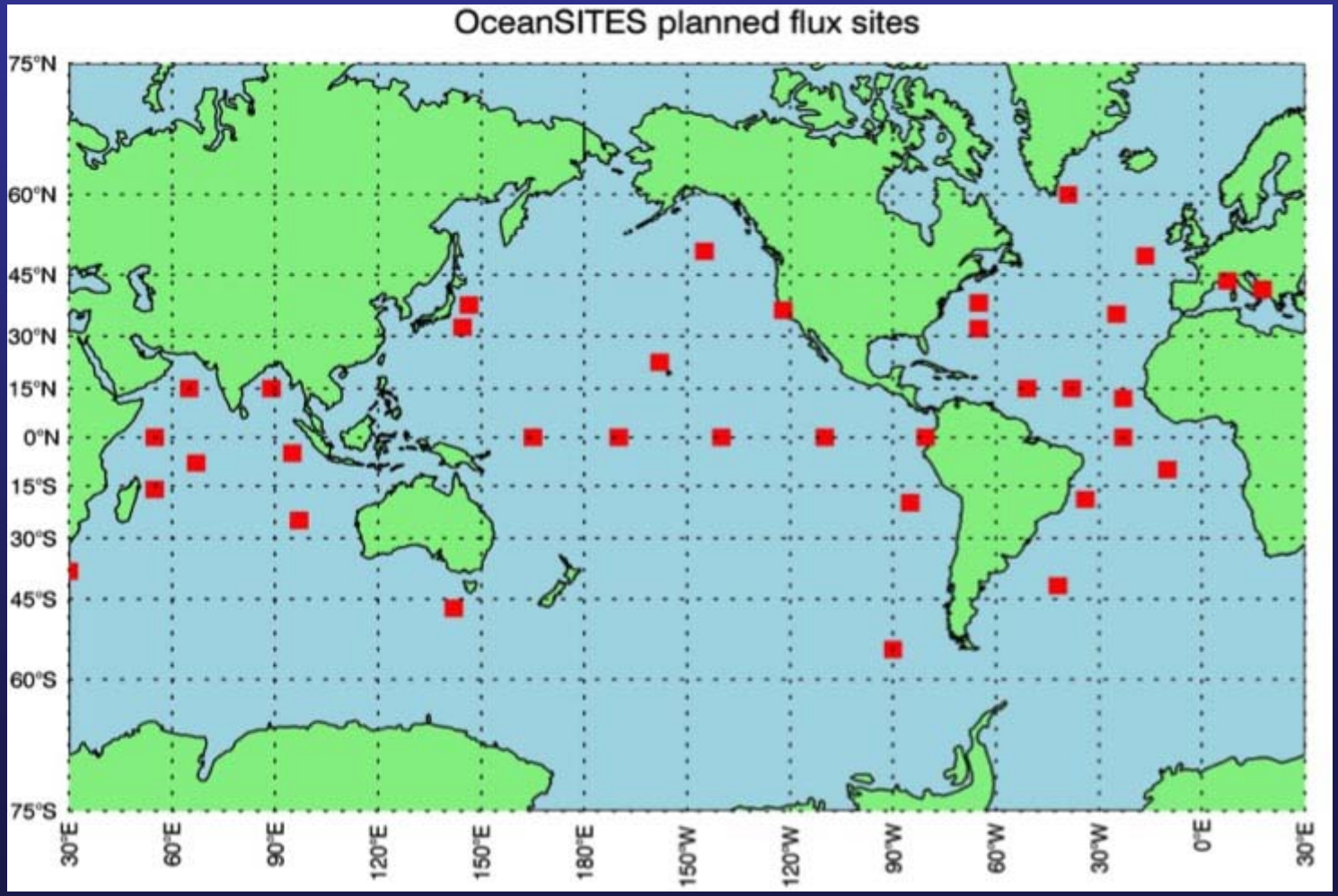


Annual air sea heat flux from ECMWF 40-year reanalysis.

Kallberg et al 2005

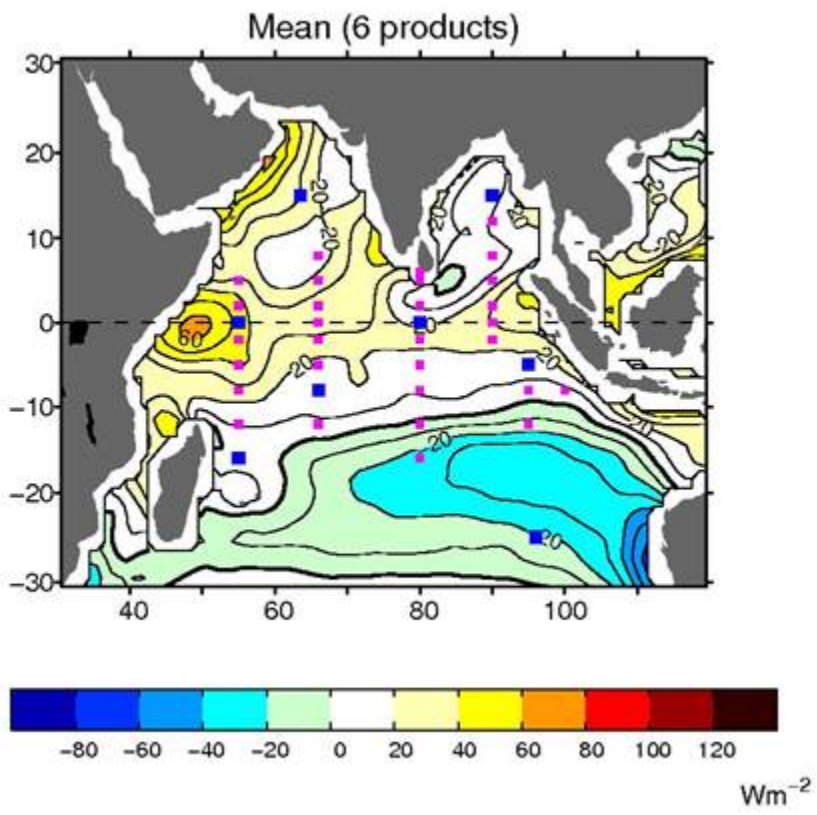
Flux Reference Sites

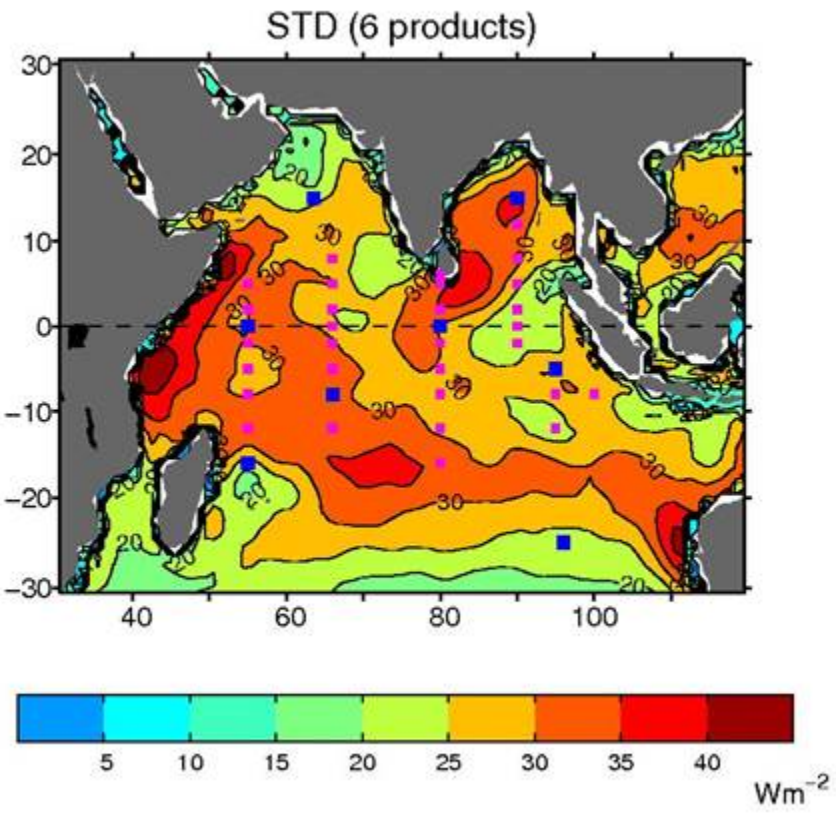
Characteristic or critical sites



Flux Reference Sites

Indian Ocean array:
reducing uncertainty in a data sparse region.





From Lisan Yu

Flux Reference Sites: integration across networks

- Interoperability, commonality across blue water and coastal meteorological and flux observations
- Continued dialog with land-based networks (e.g., BSRN – Baseline Surface Radiation Network), remote sensing efforts
- Equipping OceanSITES Flux Reference Sites to also make Deep Ocean Temperature and water column biology, biogeochemistry observations

Flux Reference Sites: strategy for evolution

- More capable buoys: High latitudes, higher power, more bandwidth
- Integration of Direct Covariance Flux Systems
- Integration of surface wave observing systems
- More diverse sensors (e.g., LIDAR, aerosol, radiation,….)
- Maintain links to shipboard sampling, remote sensing, modeling, analysis products

Flux Reference Sites: issues and challenges

- Ship time – annual servicing at remote sites
- Enhance synergy with other networks and shared use of ship time
- Dedicated ship time for in-situ calibration, intercomparison

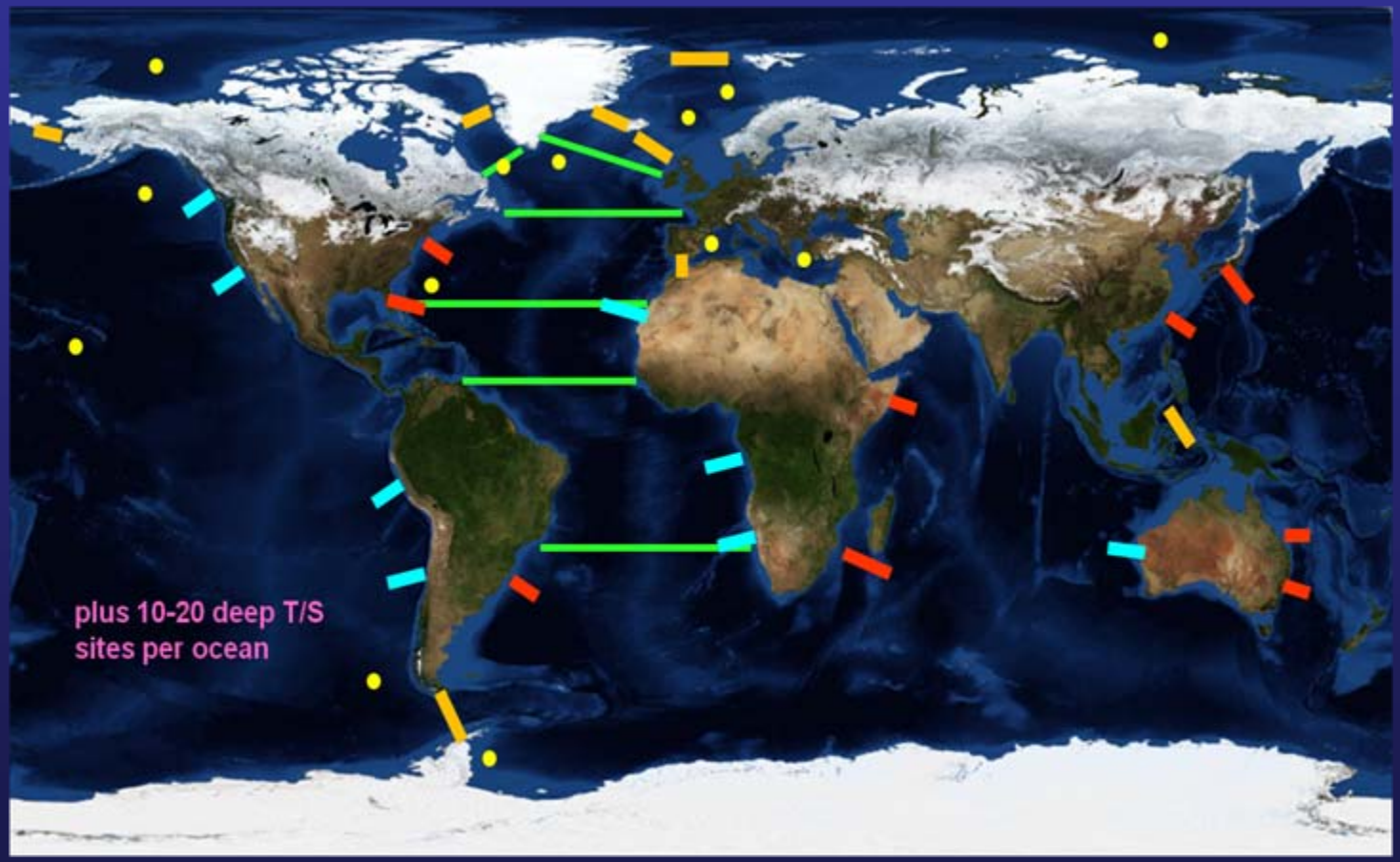
3 disciplines have been defined.

1. Air sea flux
2. Physical time-series (ocean circulation, deep changes)
3. Biogeochemistry and ecosystem

Physical processes array: requirements

- Contribute to closure of time-varying budgets of mass, heat, freshwater, momentum
- Provide reference data for processes or regions where data or model performance is inadequate
- Link to models (models are essential to integrate observations and advise on optimal observational strategy)

OceanSITES physical processes array



Deep-Ocean T/S Challenge

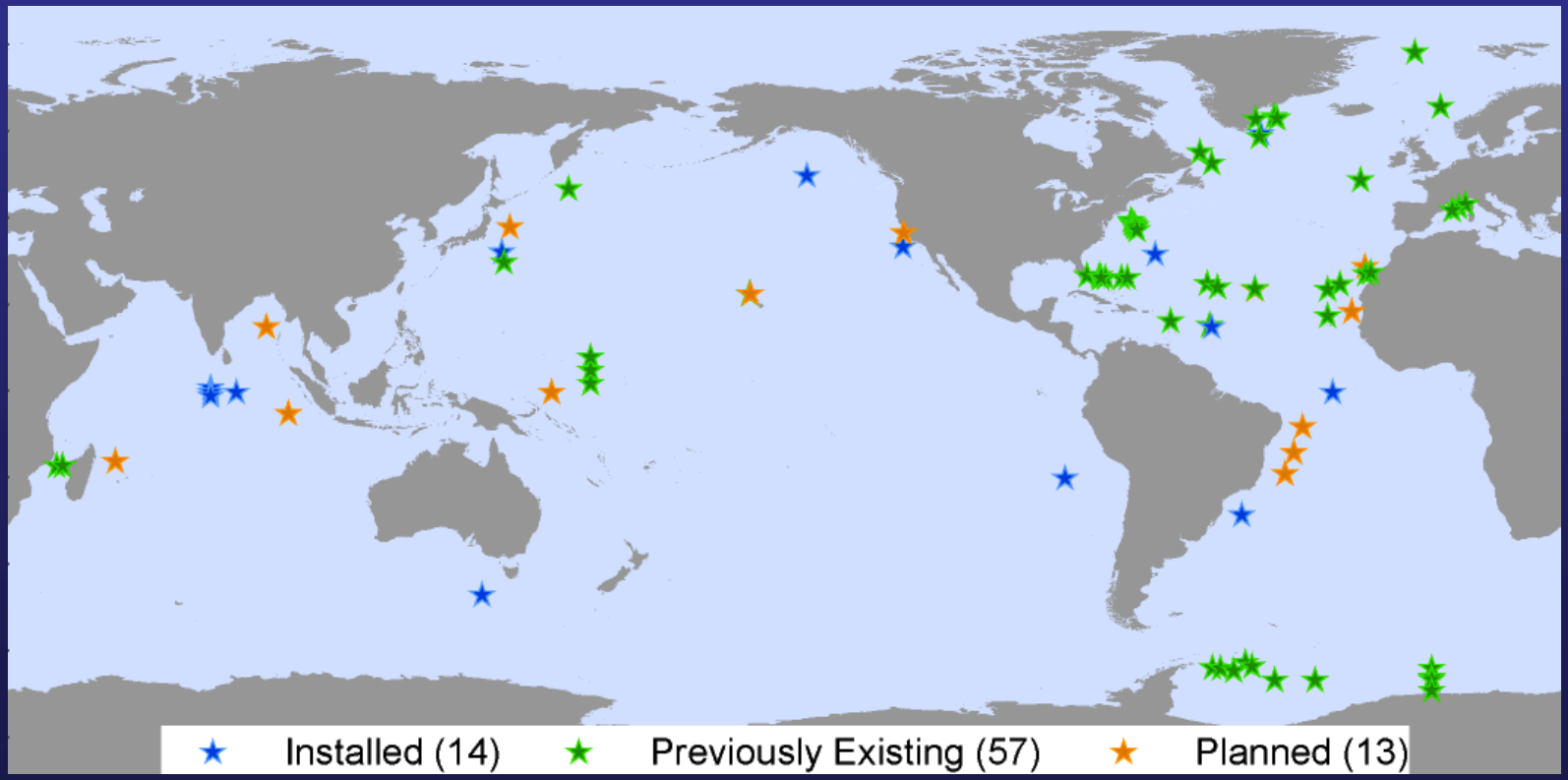
- Deep-ocean observations are recognized as an important gap (OceanObs09*)
- At the Dec 2011 OceanSITES Meeting, the "deep-ocean observing strategy" was developed. The goal:

"To make use of the many existing OceanSITES platforms in deep water to make an instant contribution towards this need and goal."

*http://www.oceanobs09.net/proceedings/cwp/cwp34/

Deep-Ocean T/S Challenge

Deep high-accuracy T/S sensors. Another 10 sites being added (on tropical moorings)



Matching Contributions

- SeaBird Electronics:
  1 MicroCAT for every 10 purchased under the OceanSITES initiative.

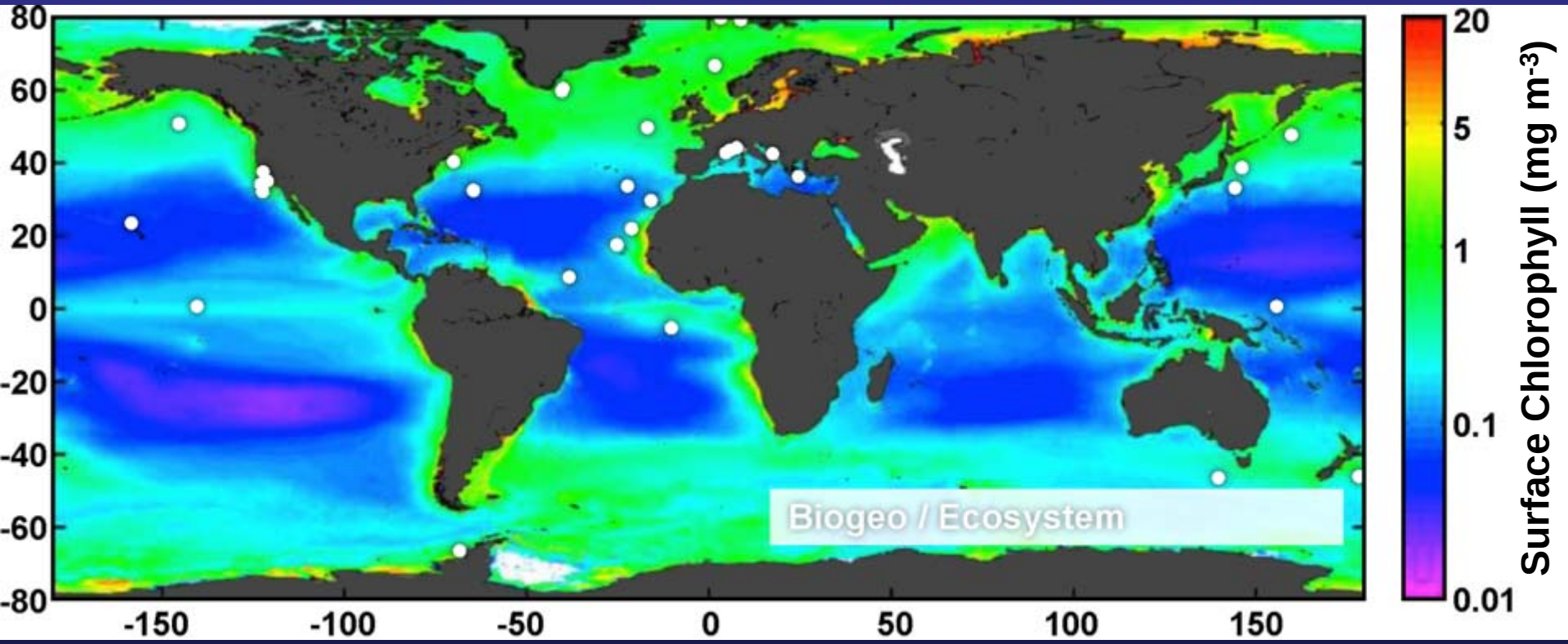
3 disciplines have been defined.

1. Air sea flux
2. Physical time-series (ocean circulation, deep changes)
3. Biogeochemistry and ecosystem 

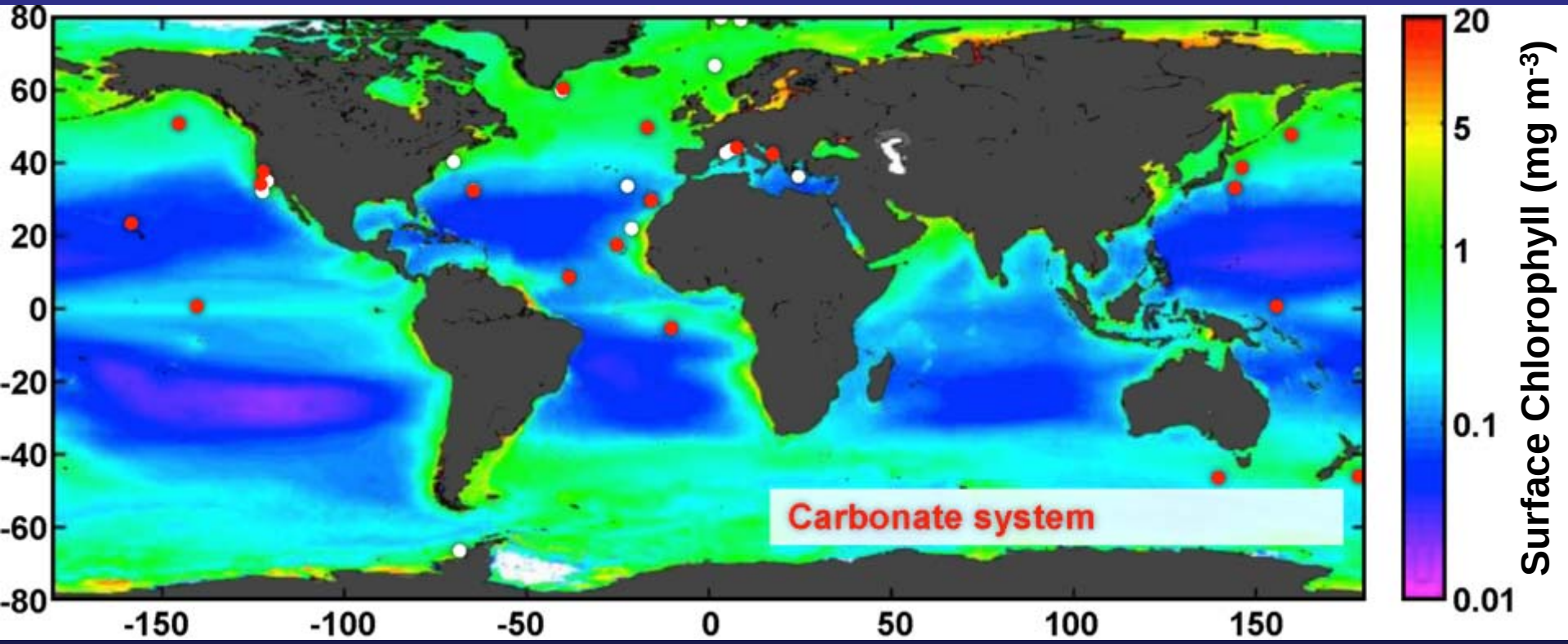
OceanSITES biogeochemistry array: requirements-setting processes

- Ocean‘s response and feedback to global change (CO_2 level, warming, acidification, deoxygenation...)
- Measure fluxes of key elements (C, O_2, N, P...) and ecosystem function throughout water column
- State and rate variables

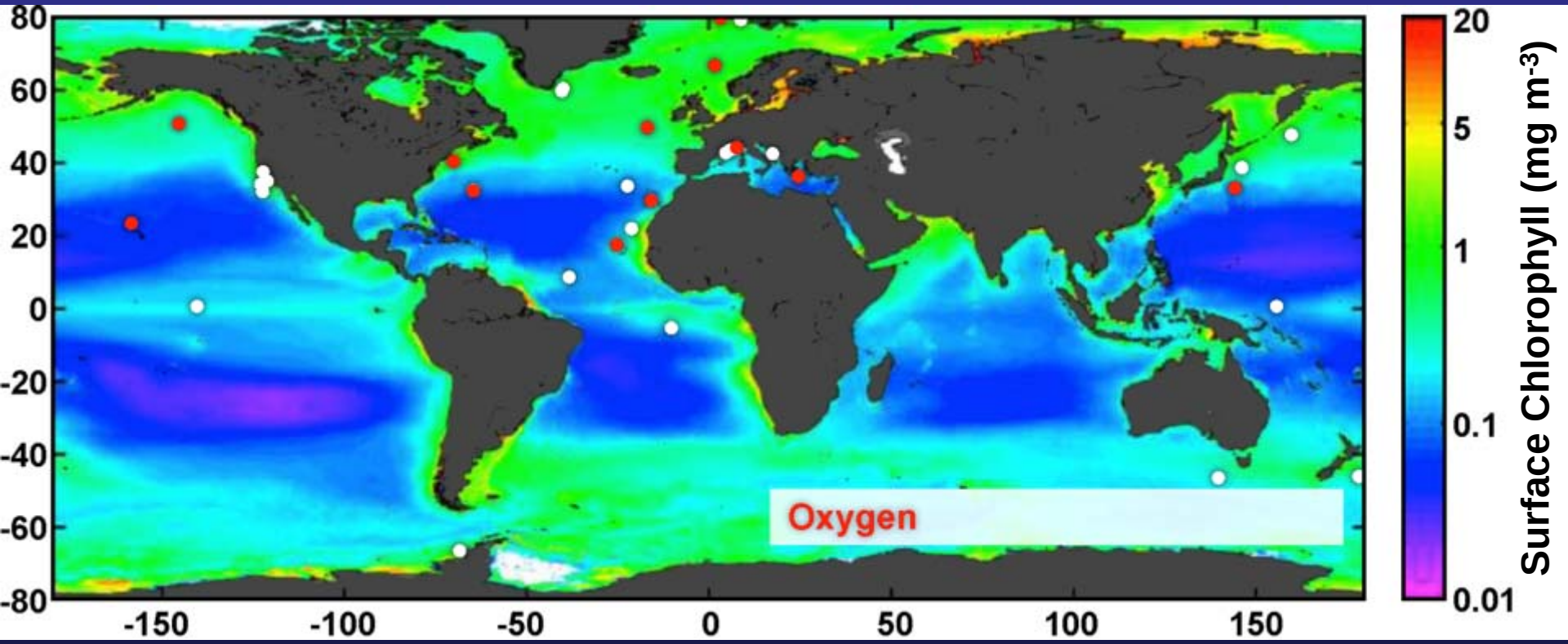
Biogeochemistry array



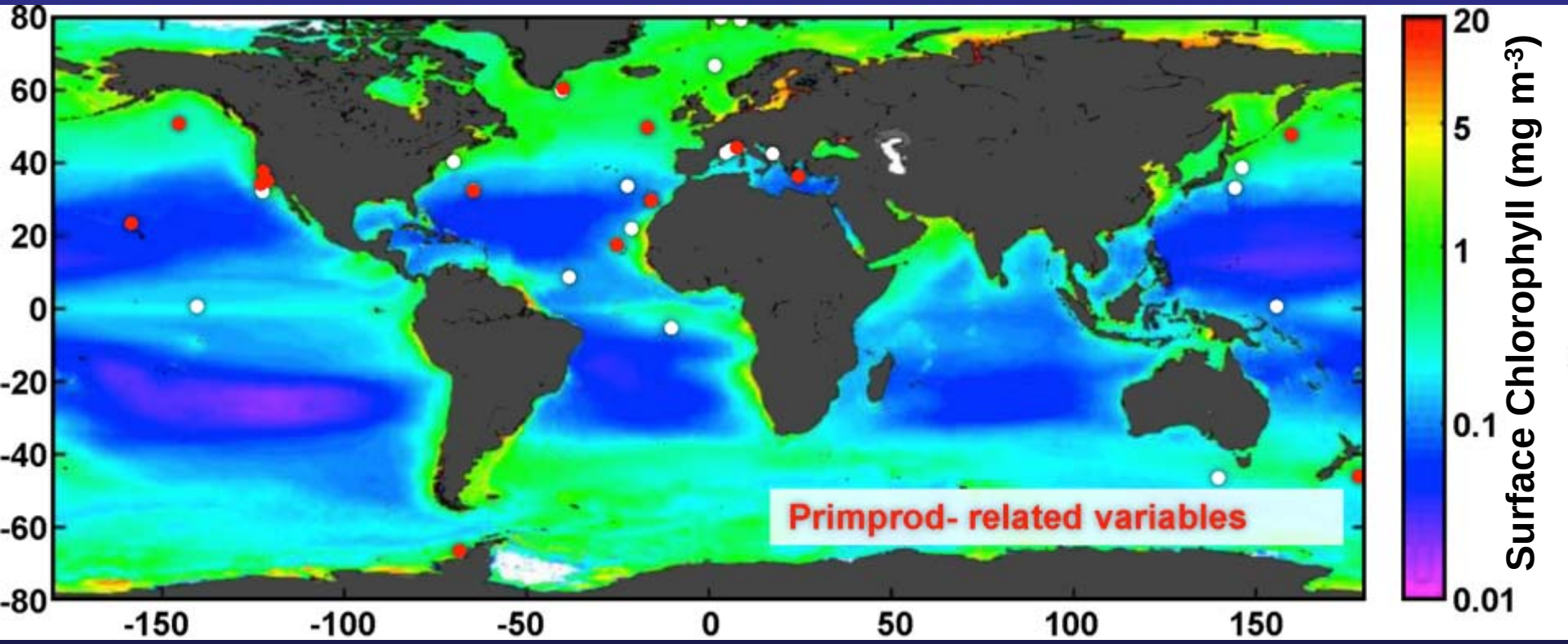
Biogeochemistry array



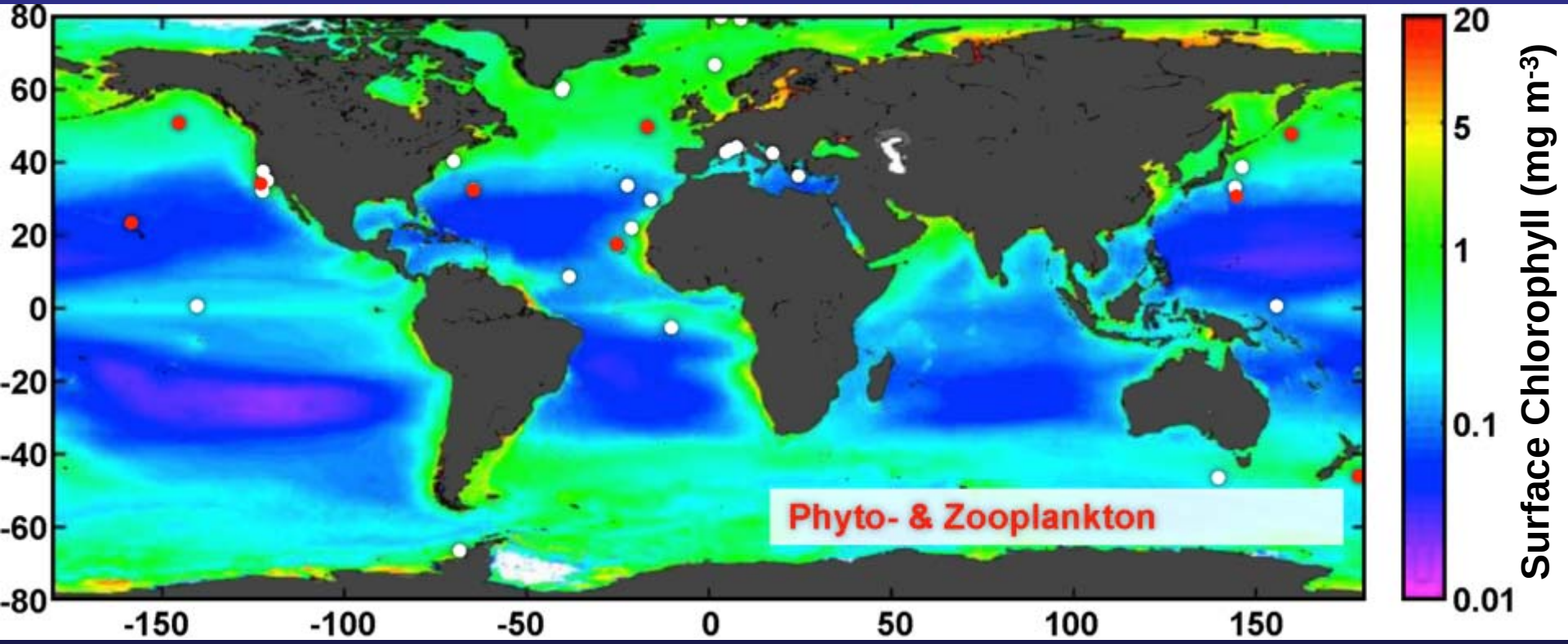
Biogeochemistry array



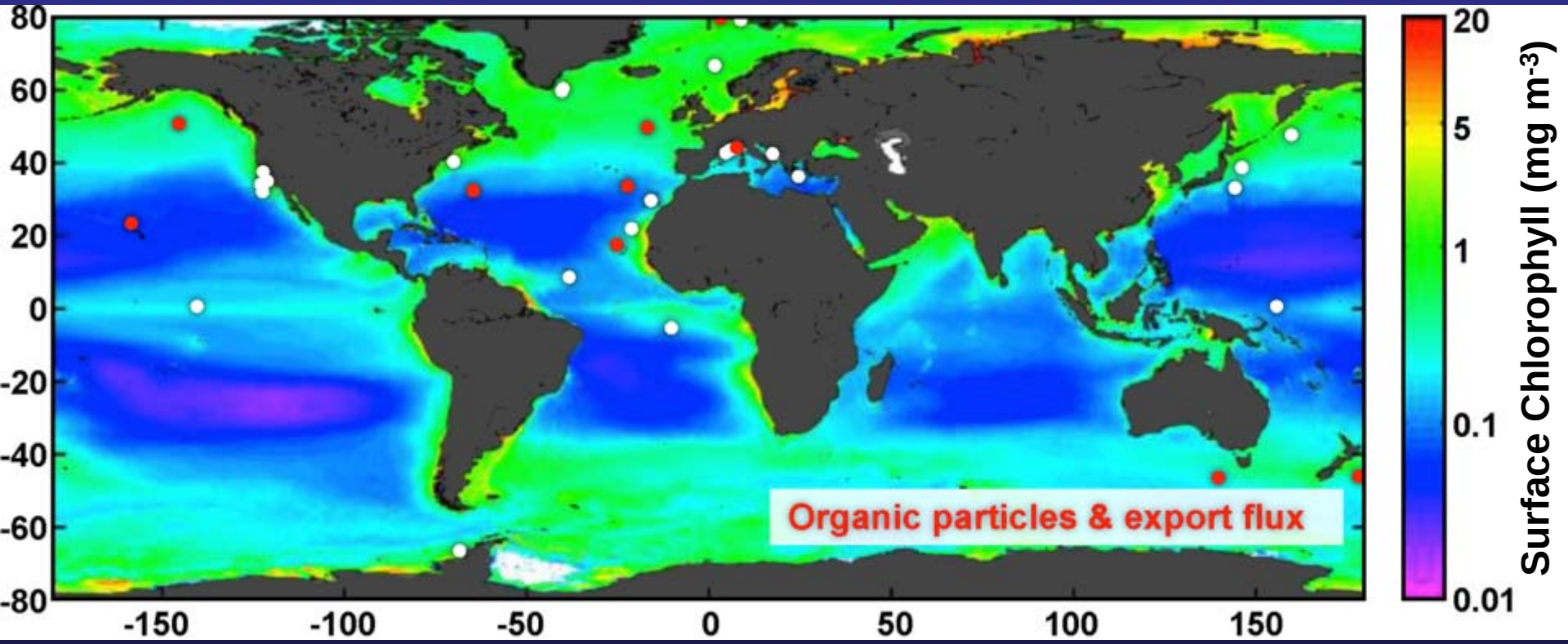
Biogeochemistry array



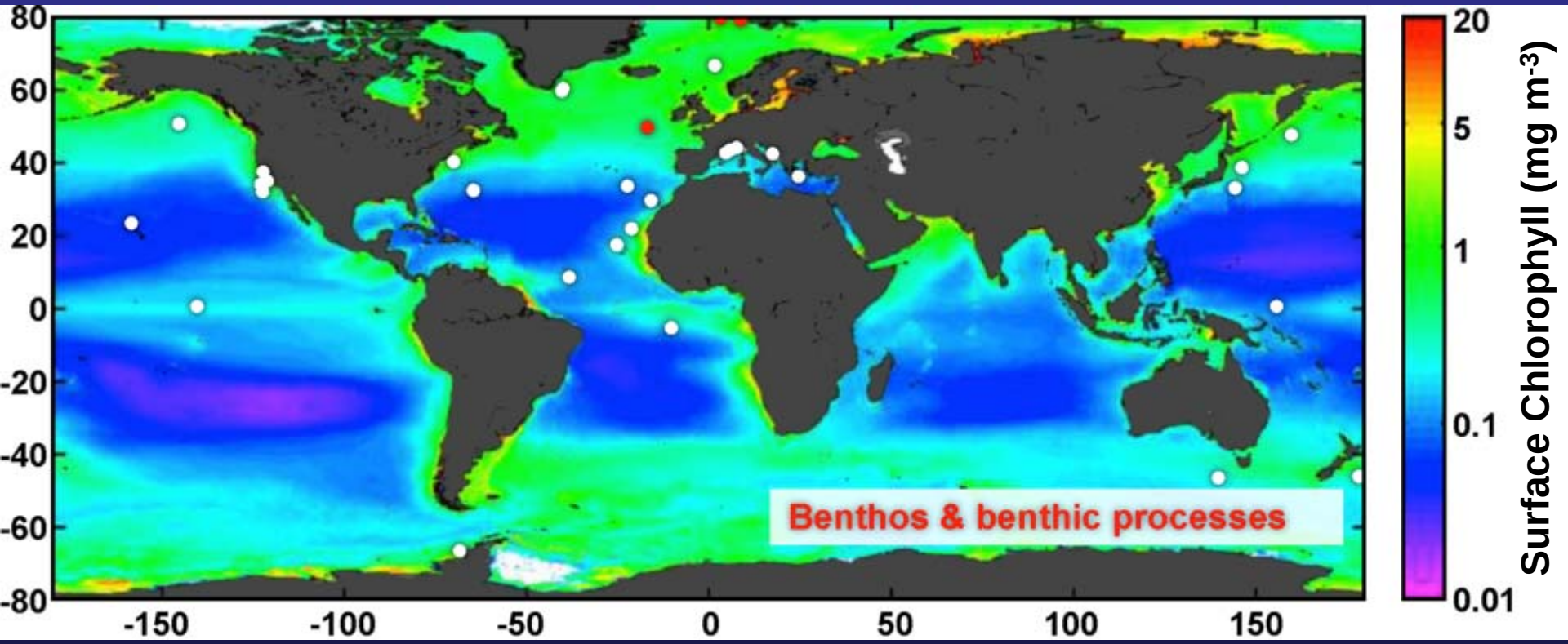
Biogeochemistry array



Biogeochemistry array



Biogeochemistry array



Biogeochemistry array: issues and challenges

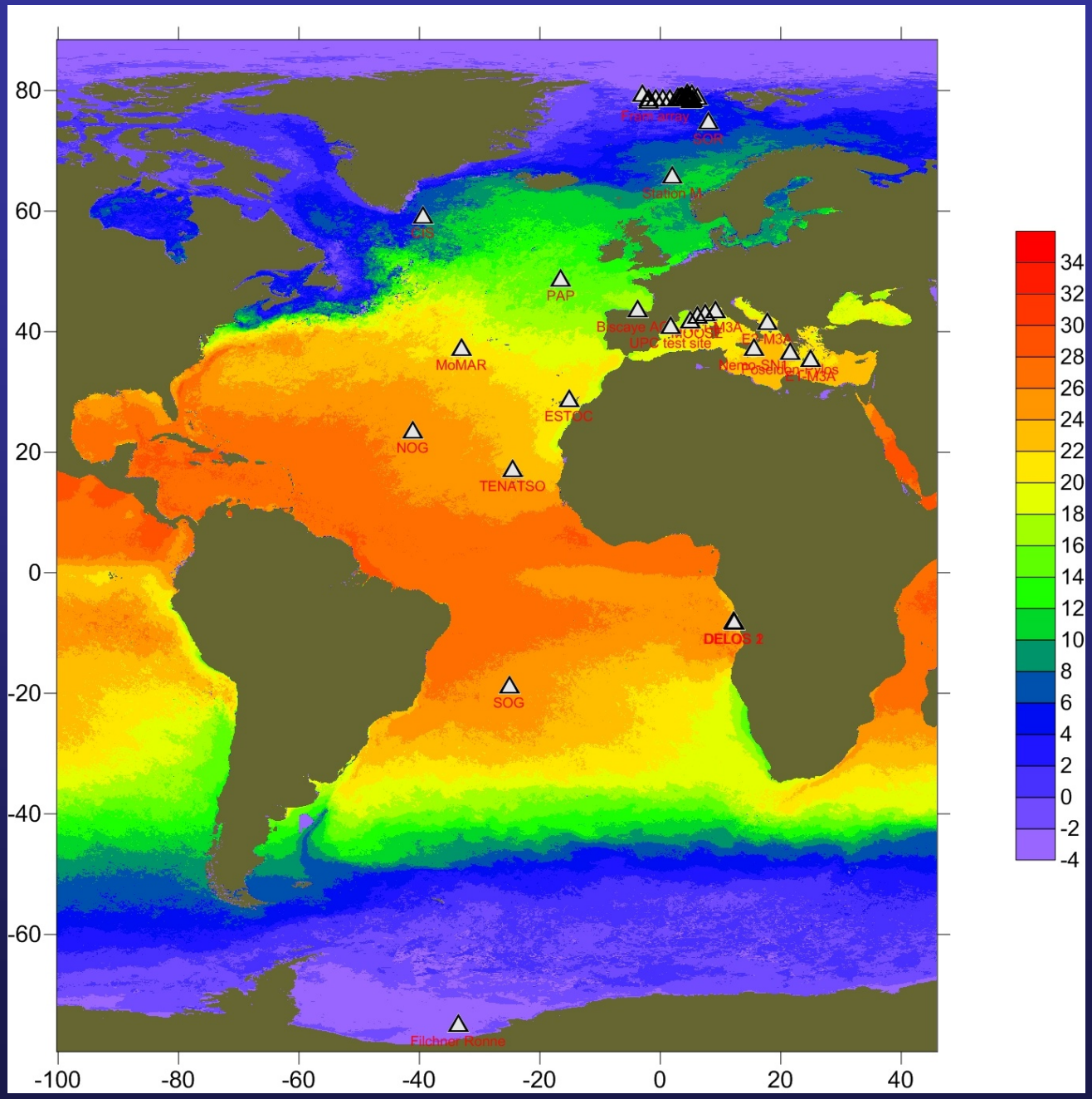
- Wide areas are undersampled (Indian Ocean, S-Atlantic, S-Pacific, high latitudes, low prod. areas)
- Few essential variables can be measured autonomously (e.g. O_2, pCO_2, photopigments, some nutrients)
- Sampling-based variables and processes underrepresented (particle flux, seafloor processes, biodiversity)

Biogeochemistry array: strategy for evolution

- New technologies (e.g., imaging, O_2 consumption, active & passive bioacoustics, in situ DNA analyses)
- Build ‘Minimalist OceanSITES Interdisciplinary Network ‘MOIN’
- Establish small number of combined biogeochemistry and ecosystem ‘supersites’ (surface to seafloor)

OceanSITES achievements

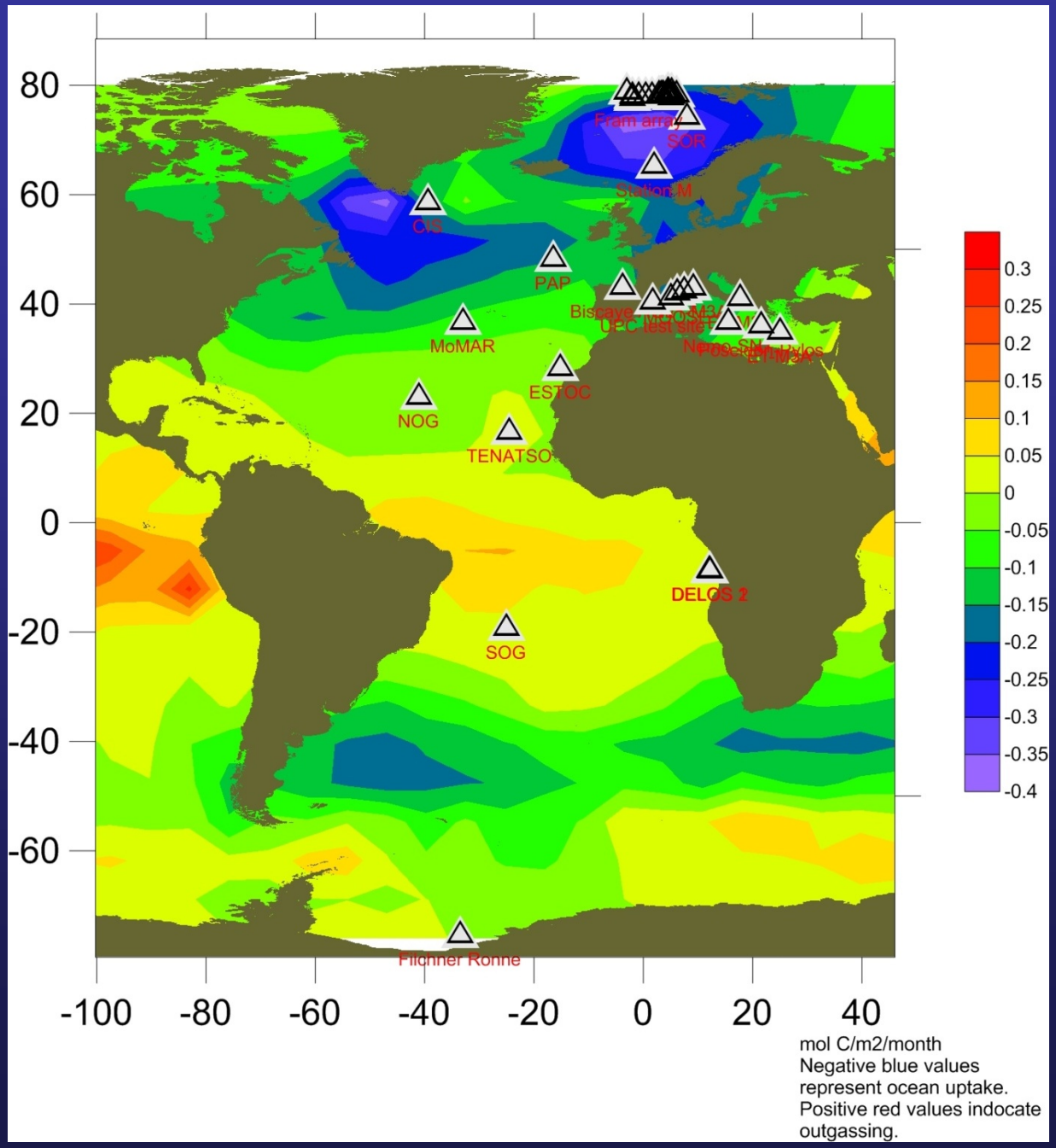
Links to regional/national networks



FixO³

With Surface temperature climatology

Courtesy RSDAS



FixO^3

With air-sea flux of CO2 (average 2000)

(From Takahashi et al 2009)

Courtesy Ute Schuster, UEA

OCEAN OBSERVATORIES INITIATIVE

2013 Meeting

- The OceanSITES Data Management and Steering Team met in April at the Seoul National University

Data management team achievements

Data flow and format well-defined
- **Site nomenclature with unique identifiers**
- **Sophisticated data format description**
- **Strong emphasis on metadata**

Data distribution system fully operational
- **GDACs synchronized since late 2010**
- **> 1500 files online at GDACs**

2013 Meeting

1. Major commitments from Korea, China and India
2. 11 new sites incorporated
3. Consolidation of MOIN
4. Progress measures of success (Metrics)
5. Strategy for future defined

Plans for 2013-2014

Plans for 2013-2014

Executive & Data Management Team will continue to meet regularly.

Publish documents to assist user's of OceanSITES data and possible new contributors:
1) an updated User's Manual,
2) "How to Become an OceanSITES Member",
3) "How to work with the GDACs",
4) "How to Access OceanSITES Data".

Updates to the OceanSITES website by the Project Office.

Finalization of concrete metrics for OceanSITES. The 3 disciplines will write White papers
1) Air sea flux
2) Physical time-series (ocean circulation, deep changes)
3) Biogeochemical and ecosystem

Formalization of the processes and procedures for managing the deep ocean temperature/salinity program, and establishment of the next set of sites to be instrumented.

Review and finalization of new products and indicators.

Publish the updated *Minimalist OceanSITES Interdisciplinary Network (MOIN)* document and hold a MOIN Workshop

Plans for 2013-2014 (Continued)

Work closely with other communities and attend meetings when appropriate. For example,
Hydrophone sites – LIDO
Ocean Tracking network
Deep Ocean initiative
INDEEP- Intern Network for scientific investigation of Deep sea ecosystems
Ocean Acidification, IOCCP

Increase data holdings at the OceanSITES GDACs

Finalization of OceanSITES data archive with NOAA's National Oceanographic Data Center (NODC). Formal archive to be functioning in early 2014.

Participation in the Partnership for the Observation of the Global Ocean (POGO) meeting in Hobart in January and presenting a proposal for OceanSITES and POGO to play a role in working toward interoperability of sustained time series observing efforts in the ocean.