



## The Global Ocean Observing System



Sustained ocean observation networks and applications to strengthen understanding of ecosystem function and biodiversity changes at regional level

Nic Bax, CSIRO, Australia

**Panel**

Valerie Allain – New Caledonia

*Sonia Batten – SAHFOS - Canada*

*Lisandro Benedetti-Cechi –UP - Italy*

*Dave Checkley – Scripps – USA (Retired)*

*Sanae Chiba – JAMSTEC - Japan*

*Dan Costa – UCSC - USA*

*Emmett Duffy – Smithsonian - USA*

*Raphael Kudela – UCSC - USA*

*Frank Muller-Karger – USF - USA*

*David Obura – CORDIO – Kenya*

*Lisa Maria Rebelo – IWMI - Laos*

*Yunne Shin – IRD – France*

*Sam Simmons – NMMC - USA*



## Executive

**Nic Bax, Daniel Dunn, Patricia  
Miloslavich, Ward Appeltans**

<http://goosocean.org/>



*A permanent global system for observations, modelling and analysis of marine and **ocean variables** to support operational ocean services worldwide  
Came under IOC-UNESCO in 1990*

### **Provides:**

- Accurate descriptions of the present state of the oceans
- Continuous forecasts of the future conditions of the sea ➡

### **Major areas:**

1. Climate
2. Real time services
3. Ocean health



### **Essential Ocean Variables**

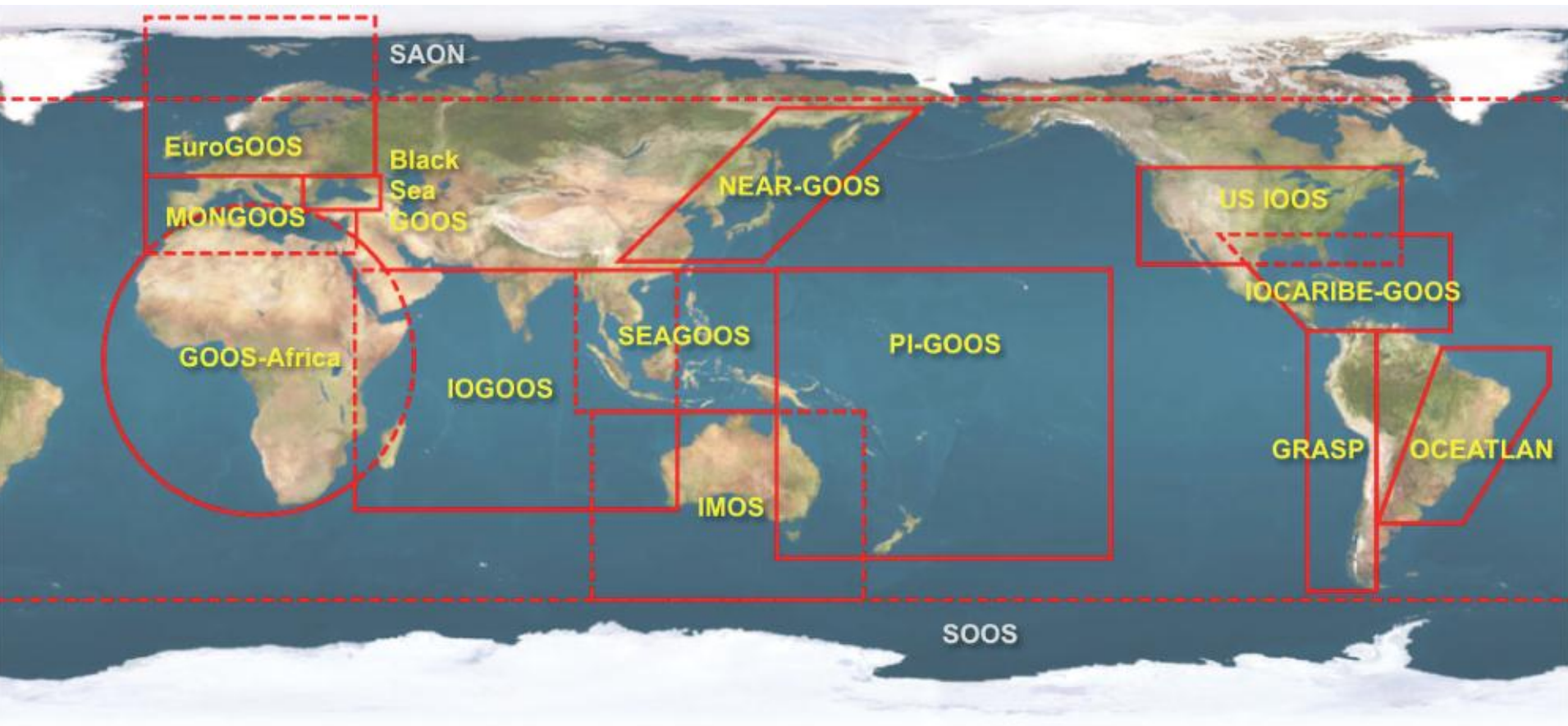
Driven by requirements, negotiated with feasibility

Sponsored by:



***We cannot manage what we do not measure***

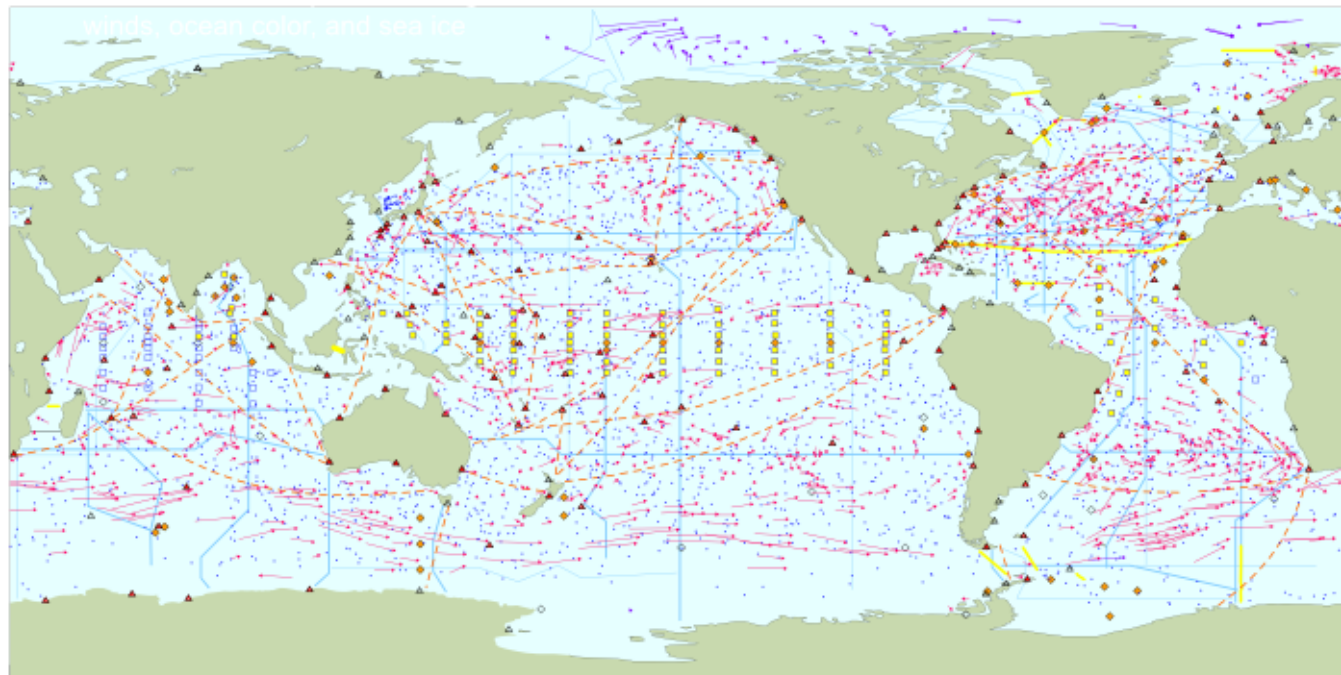
## 13 GOOS Regional Alliances + 2



Formed in 1994 under Intergovernmental Oceanographic Commission of UNESCO (meet every 2 years)



# Monitoring the physical ocean



<http://imos.org.au/facilities/argo/>

Only 1 of 9 global networks

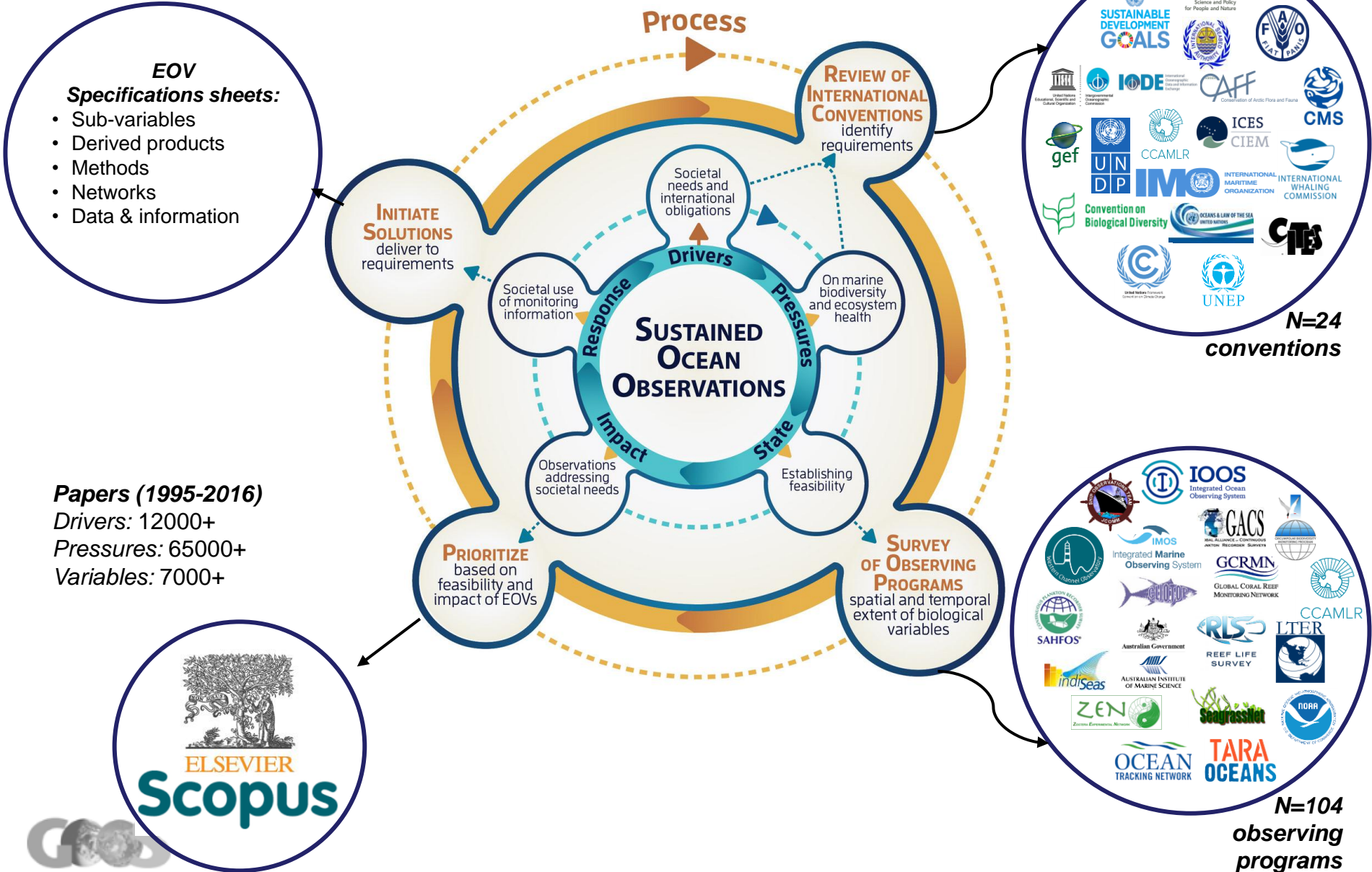
Real-time observations of temperature and salinity from 2000 m depth to the surface every 10 days

Open access data from Global Data Access Centres within 24 hours of collection

Highly quality-controlled data available after 12 months

Argo data is essential for ocean and climate research and prediction/re-analyses

## Biology and Ecosystems Panel



# Essential Ocean Variables: all GOOS panels

## PHYSICS

Sea state  
Ocean surface vector stress  
Sea ice  
Sea surface height

## BIOGEOCHEMISTRY

Dissolved Oxygen  
Inorganic macro nutrients  
Carbonate System  
Transient tracers

## BIOLOGY AND ECOSYSTEMS

Phytoplankton biomass and diversity  
Zooplankton biomass and diversity  
Fish abundance and distribution  
Marine turtle, bird and mammal abundance and distribution

Sea surface temperature  
Subsurface temperature  
Surface currents  
Subsurface currents  
Sea surface salinity  
Subsurface salinity

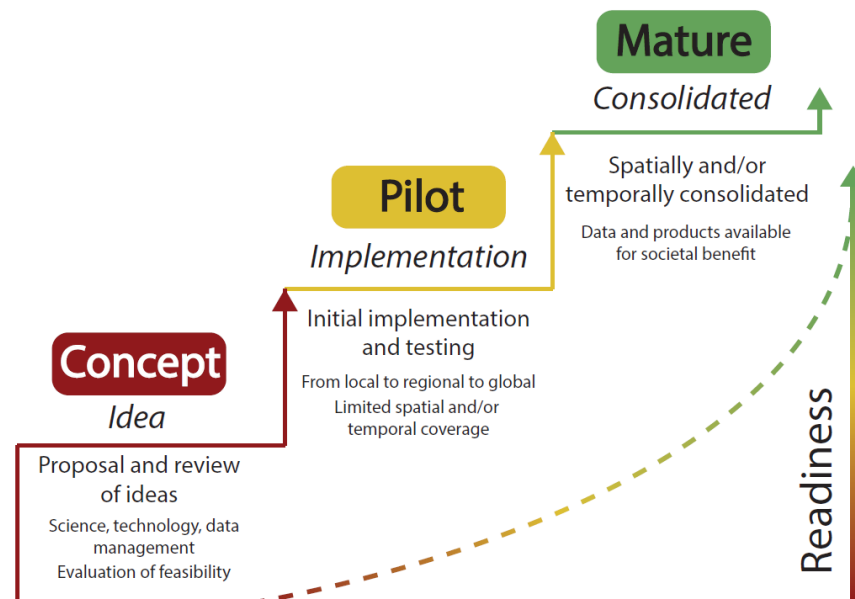
Suspended particulates  
Nitrous oxide  
Carbon isotope ( $^{13}\text{C}$ )  
Dissolved organic carbon

Live coral  
Seagrass cover  
Macroalgal canopy  
Mangrove cover

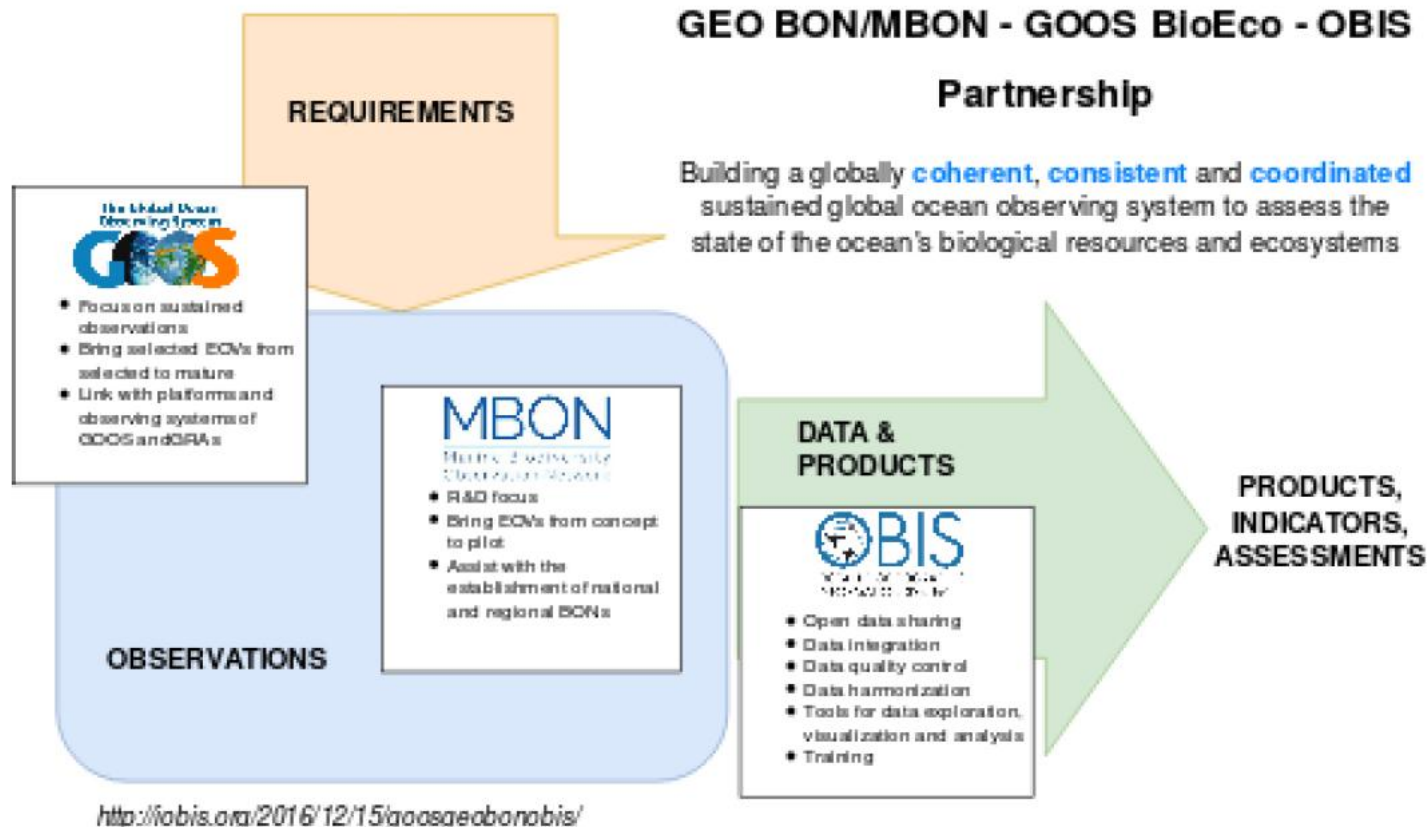
Heat flux / radiation

Readiness level: **CONCEPT** | **PILOT** | **MATURE**

## Framework for Ocean Observing (2012)



# Coordination



“This unified strategy, ensuring closer coordination between the U.S. Marine Biodiversity Observation Network (MBON) and international ocean observing and data networks such as the Global Ocean Observation System (GOOS) and the Ocean Biogeographic Information System (OBIS) will improve the acquisition, delivery and application of information on change in the marine environment, and support marine conservation and decision-making at the national, regional, and global levels.”

- U.S. President Barack Obama

# Capacity development

- Linking capacity building to sustained observation
  - Provides ongoing networks and support, once capacity building project concludes
  - Extends global coverage of existing observing networks
  - Supports countries reporting against agreed international targets – leading to more accurate prioritisation of overseas aid
- Requires infrastructure as well as people
- Examples:
  - GO-SHIPS (IMSOO 2017)
  - P-SIDS (Oceans 2017): develop prototype capacity development (PIFS, PSIDS, CSIRO, IOC, USP, NOAA, NIWA)
  - Live coral cover EOY (WIOMSA 2017) (GCMRN, ICRI)





# Summary

- Coordinated monitoring of the regional and global oceans is now being developed for the biological as well as the physical components
- Essential Ocean Variables provide an organising framework that can help coordinate observations, develop capacity and improve delivery and uptake by national, regional and international conventions and management initiatives
- Coordinated observations and identification of critical gaps will rapidly increase our understanding of ocean ecosystems and how they change
- Ongoing coordination and capacity development are essential
- GOOS is exploring additional opportunities for coordination including through the:
  - JCOMM
  - GEOBON
  - P-SIDS (Oceans 17 agreement)
  - CBD and SDG targets and indicators
  - World Ocean Assessment II
  - And others





Thank you  
[nic.bax@csiro.au](mailto:nic.bax@csiro.au)



GLOBAL OCEAN OBSERVING SYSTEM

The oceans are the basis of the life support system. GOOS measures ocean warming and provides an opportunity for the human system to respond.

[www.ioc-goos.org](http://www.ioc-goos.org)

© 2004 IOC/GOOS