Coordination and Integration of Global Ocean Observing through JCOMM

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With input from GOOS (Eric Lindstrom, Albert Fisher) and many others observing the ocean every day
Stronger El Niño Could Bring Drought Relief to California

Justin Worland  May 14, 2015

NOAA/NWS/NCEP/EMC Marine Modeling and Analysis Branch Oper H.R.

RTG SST Anomaly (0.083 deg x 0.083 deg) for 16 Sep 2015

Cold Atlantic 'blob' puzzles scientists

By Dave Hennen, CNN

Atlantic Ocean’s Cold ‘Blob’

Possible Spoiler for El Niño: A ‘Battle of the Blobs’
Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) – 1999

**Vision**

JCOMM coordinates, and develops and recommends standards and procedures for, a fully integrated marine observing, data management and services system.
Essential Ocean Variables for Climate
Spatial and temporal sampling
requirements achieved by multi-platform integration

- Temperature: Surface and subsurface
- Salinity: Surface and subsurface
- Currents: Surface and subsurface
- Sea Level
- Sea State
- Sea Ice
- Ocean Surface winds and stress
- Ocean Surface Sensible and Latent heat fluxes (proposed)
- pCO2, nutrients, etc

GO-SHIP
Gliders
Argo
GLOSS-Tide Gauge Network
VOS/Ship of Opportunity
Global Drifter
XBTs
Satellites
OceanSITES
GOOS/GCOS 2010 implementation goals for climate observations

Total in situ networks 66%

March 2015

Continuous satellite measurements of sea surface temperature, height, winds, ocean color, and sea ice

100% Surface measurements from volunteer ships (VOS)
- 250 ships in VOSclim pilot project

100% Global drifting surface buoy array
- 5° resolution array: 1250 floats

40% Tide gauge network (GLOSS committed)
- 300 real-time reporting gauges

39% XBT sub-surface temperature section network
- 37000 XBTs deployed

100% Argo profiling float network
- 3° resolution array: 3200 floats

62% Repeat hydrography and carbon inventory
- Full ocean survey in 10 years

66% Global time series network
- 87 combined sites

76% Global tropical moored buoy network
- 125 moorings planned

87 combined sites

125 moorings planned

Representative Milestones

System % sustained, of initial goals

30 34 40 45 48 55 56 59 60 62 62 62 62 62%

Original goal for full implementation by 2010

63%
Global Drifter Program

Critical high-quality in-situ information for SST calibration, ocean currents, and weather forecasting
- Satellite bias directly corresponds to drifter density
- DBCP study carried out by ECMWF quantified impact of drifter SLP on NWP
Global Drifter Program

Drifter deployment value: function of current and projected array density, drifter health/age, and designed array configuration

BLUE: High deployment value
RED: Low deployment value
Argo: growing capabilities
- Deep, biogeochemical, surface conditions, etc...NEXT TALK
JCOMMOPS: Barometric Pressure Obs

Centralized system coordination & monitoring

Barometric Pressure
Drifting Buoys (855)

Moored Buoys (247)

Fixed Platforms (88)

- USA (4)
- UK (84)
- BRAZIL (4)
- BRAZIL-FRANCE-USA (3)
- CANADA (27)
- FRANCE (4)
- GERMANY (3)
- GREECE (1)
- INDIA (18)
- IRELAND (2)
- JAPAN (7)
- SOUTH KOREA (11)
- SPAIN (2)
- UK (11)
- UK-FRANCE (1)
- USA (131)
- USA-INDIA (0)
- UNKNOWN (16)
Elements of GOOS are Fragile

Tropical Pacific Observations

Courtesy N. Smith
Future- Ocean observations for societal benefit:

Climate, services, ocean health
Framework for Ocean Observing

A simple system

Input (Requirements)

Process (Observations)

Output (Data & Products)
Towards sustained system: requirements, observations, data management

**Readiness**

- **Concept**
  - Attributes: Peer review of ideas and studies at science, engineering, and data management community level.

- **Pilot**
  - Attributes: Planning, negotiating, testing, and approval within appropriate local, regional, global arenas.

- **Mature**
  - Attributes: Products of the global ocean observing system are well understood, documented, consistently available, and of societal benefit.

**Increasing Readiness Levels**
JCOMM Obs Work Plan 2015-2020

Focus Areas – moving to variable framing

- Observing System Requirements
  - GCOS and integration/Framework for Ocean Observing
  - WMO: WIGOS, RRR, GFCS
  - GOOS Themes: Climate, Realtime Services, Ocean Health

- Wider scope
  - Expansion
  - Focus for integrating global/coastal observing (Bernadette)

- Observing System Implementation and Integration
  - Incorporating technological innovation
  - Consider GOOS pilot projects (e.g., TPOS2020, AtlantOS)
  - Integration of satellite and in-situ

- Observing System Monitoring and Metrics
  - Monitoring; identifying and addressing risks

- Access to Data and Information/Products
Summary

• Implementation:
  – Mixed success reaching envisioned goals
  – Moving towards variable-centric framing
  – Embracing wider requirements (e.g., ocean health, climate, services) -> great opportunity!!!
  – New technological revolution in platforms and sensors -> more opportunities
  – JCOMM facilitates standards development and communities of best practice

• Observing system monitoring and coordination
  – Fantastic progress with JCOMMOPS for system monitoring
  – Notable increase in efficiencies regarding system deployments/servicing

• Knowledge and Products
  – Key indicators of change in ECVs (e.g. temperature, heat content, carbon content, sea-level) strongly reliant on in-situ systems
  – Working with researchers to develop more observation-based diagnostics & indicators

• The system, largely developed within research funding is still fragile
  – JCOMM undertaking risk assessment and linkages to key indicators

www.jcomm.info
www.jcommops.org
GOOS Application Areas

**Climate**
(through GCOS for IPCC, UNFCCC, GFCS and national monitoring, mitigation, adaptation)

**Real-time Services**
(through JCOMM services, GODAE.OV to specific benefit areas)

**Ocean Health**
(with GEO BON and others for IPBES, WOA, CBD, and national applications)

GOOS separation of responsibility for disciplines (ocean variables)

Physics  Biogeochemistry  Biology

Strength of disciplinary contribution to application area
EOVs and readiness level

CONCEPT  PILOT  MATURE

Physics
- Sea State
- Ocean surface vector stress
- Sea Ice
- Sea level
- SST
- Subsurface temperature
- Surface currents
- Subsurface currents
- SSS
- Subsurface salinity

Biogeochemistry
- Oxygen
- Inorganic macro nutrients
- Carbonate system
- Transient tracers
- Suspended particulates
- Nitrous oxide
- Carbon isotope ($^{13}$C)
- Dissolved organic carbon

Biology and Ecosystems
- Phytoplankton biomass and productivity
- HAB incidence
- Zooplankton diversity
- Fish abundance and distribution
- Apex predator abundance and distribution
- Live coral cover
- Seagrass cover
- Mangrove cover
- Microalgal canopy cover
Development of GOOS

GOOS projects

• Deep Ocean Observing Strategy project
• Links to AtlantOS, Global Ocean Acidification Observing Network (GOA-ON)
• GRA projects