



OCG and the global ocean observing networks at the core of GOOS

Ann-Christine Zinkann, GOMO Program Manager

*OCG - Observations Coordinating Group
*GOOS - Global Ocean Observing System

What is GOOS?

The **Global Ocean Observing System** (GOOS) leads the development of a truly global ocean observing system that delivers the essential information needed for our sustainable development, safety, wellbeing and prosperity

GOOS Steering Committee



Observations
Coordinating
Group (OCG)



International
Ocean Carbon
Coordination
Project (IOCCP)



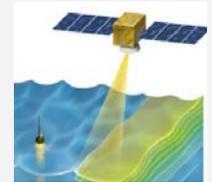
Global
Regional
Alliances
(GRA)



Biology and
Ecosystem
Panel
(BioEco)



Ocean
Observation
Physics and
Climate Panel
(OOPC)



Expert Team on
Operational
Ocean Forecast
Systems
(ETOofs)

The Role of OCG

The Observation Coordination Group (OCG) works to **efficiently operate, maintain, coordinate** and **integrate** a comprehensive in-situ global ocean observing system.

OCG targets 8 foci for action across the 12 OCG Networks:

1. Requirements
2. Observing Advances
3. Standards and Best Practices
4. Data Management
5. OceanOPS
6. Metrics
7. Environmental Stewardship
8. Capacity Development



GOMO Contributions

In-kind Support

- David Legler - (OCG) Chair
- Kevin O'Brien - OCG Vice-chair for Data and Information
- Ann-Christine Zinkann - OCG executive member
- Editing team support for [OceanOPS report card](#)

Financial

- OceanOPS (3 FTE*) and OOPC (1 FTE) Staff support



- Direct Ocean Observing Network support

OCG Achievements (2017 - now)

- [Ocean Observing Report Card 2021](#)
- [Development of network attributes and requirements](#)
- OCG Data Flow Mapping and Data Implementation Strategy
- Searchable 'GOOS endorsed' best practices
- [Capacity Development](#)
- [Environmental stewardship](#)
- New network assessments

- [Report on UNCLOS in the EEZ*](#)
- [WMO Data Policy](#)
- Oceanops Strategic Plan & enlisted contribution from WMO for OceanOPS
- Catalyzed development of AniBos, Global Glider networks
- Monitoring of COVID impacts on ocean observing and assistance in coordinating mitigation effort

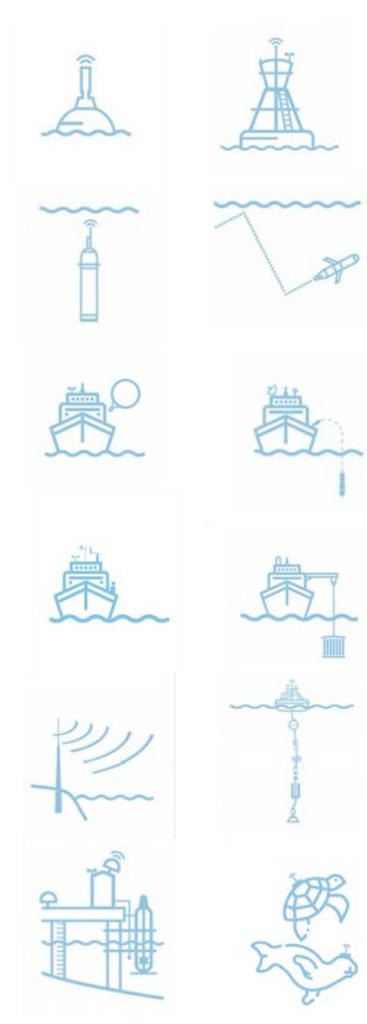
OCG future Developments

- GOOS/MTS Industry dialogues
- Harmonize network metadata, frictionless data flow
- Integration: Emerging Networks
- Managing Risks: working/operating in EEZs
- Planning: Coordinating UN Decade Projects /Programmes
- GOOS BioEco: Interactions/coordination towards improved observing systems
- [GBON](#)* - international exchange of observational data
- System Evolution: Observing technology development, assessment, and infusion



OCG Adding Value

- OCG **strengthens** GOOS through integration, standardization, system tracking;
- Raises **visibility** and **value** through the OceanOPS Report Card, Specification Sheets, and website;
- **Support** cross-network coordination;
- **Strengthens** networks through delivery of OCG attributes;
- **Provides** technical coordination and metadata support through OceanOPS;
- **Represents** at a global level with IOC, WMO, GOOS, GCOS

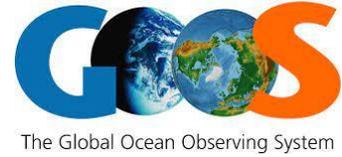




Global Ocean Monitoring and Observing
NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION



Additional Slides

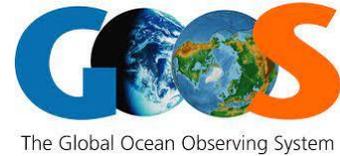


GOOS Today

OCG and the global ocean observing networks at the core of GOOS



Why is ocean observing so important?



- **71%** of the planet is covered by the ocean
- Ocean provides the oxygen for every second breath we take
- We rely on the ocean to support **human life** and our **economic, cultural, social and environmental wellbeing**
- Ocean observing is an essential to inform decision makers:
 - understand how society and the planet will be affected by **climate change**
 - improve weather forecasting - e.g., extreme heat waves, seasonal prediction
 - support a sustainable ocean economy - food, jobs, energy



What is GOOS?

The **Global Ocean Observing System** (GOOS) is a permanent global system for observations, modeling, and analysis of marine and ocean data that aims to contribute to its highest capacity towards building an integrated and responsive global system.

Delivery across 3 target application areas

Climate

Forecasts and warnings

Ocean health



*mitigation and adaptation,
seasonal forecasts*



*supporting the marine
economy
and reducing risk*



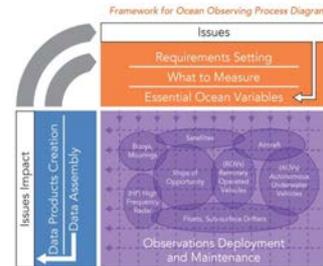
*sustainability of ocean
ecosystem services*

What GOOS does

- Since 1991, GOOS has been leading the development of a truly global ocean observing system that delivers the essential information needed for our **sustainable development, safety, wellbeing** and **prosperity**.
- We lead and **support a community of international, regional and national ocean observing programmes, governments, UN agencies, research organizations and individual scientists**.
- We **coordinate and develop the observing tools and technology, information systems, scientific analysis and forecasts** that enable the global community to leverage the value of its investment.
- Building a system to support climate science and be the observational backbone for operational forecast systems.
- GOOS is led by the Intergovernmental Oceanographic Commission (IOC) of UNESCO, and co-sponsored by the World Meteorological Organization (WMO), the United Nations Environment Programme (UNEP) and the International Science Council (ISC).

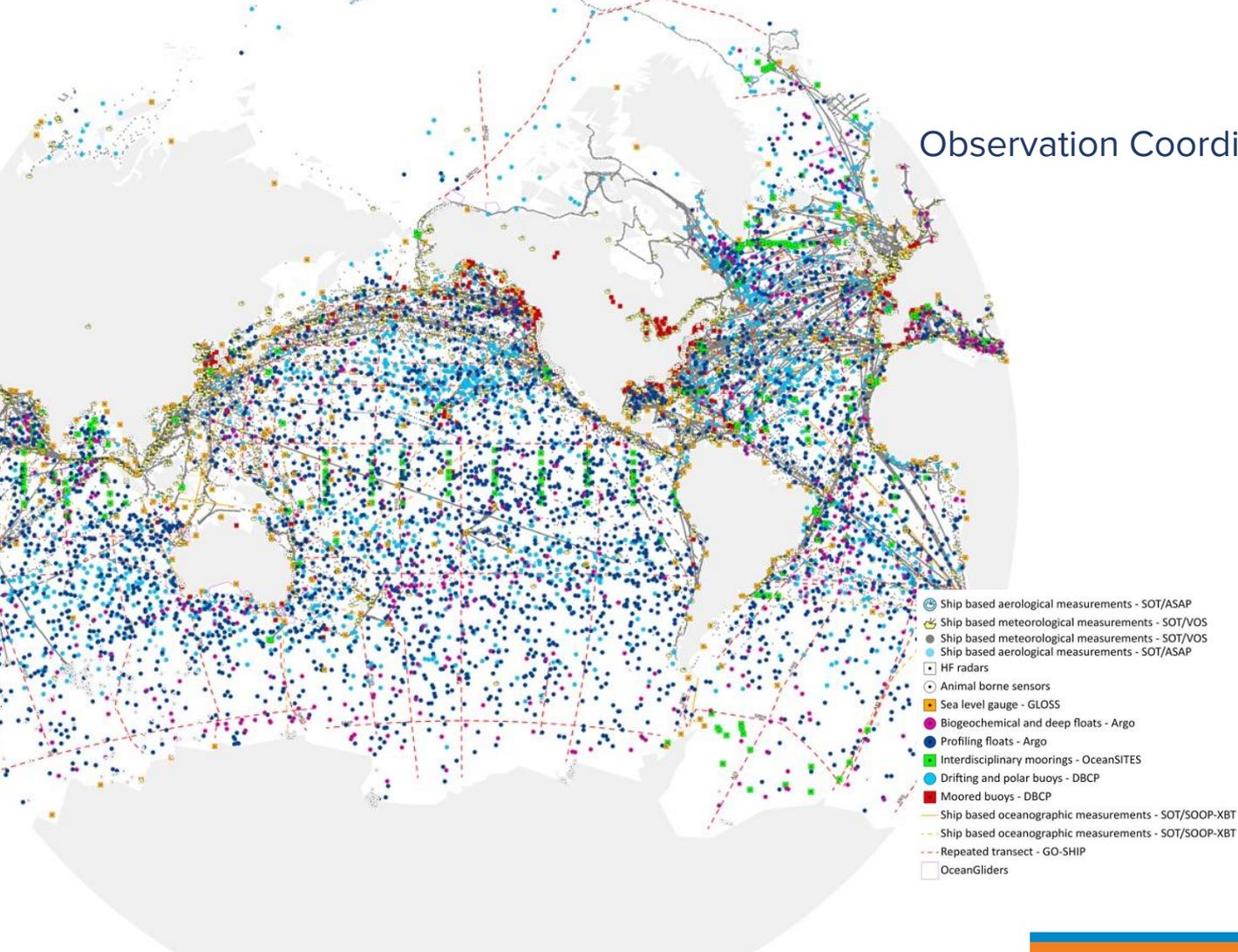


2021
2030 United Nations Decade
of Ocean Science
for Sustainable Development

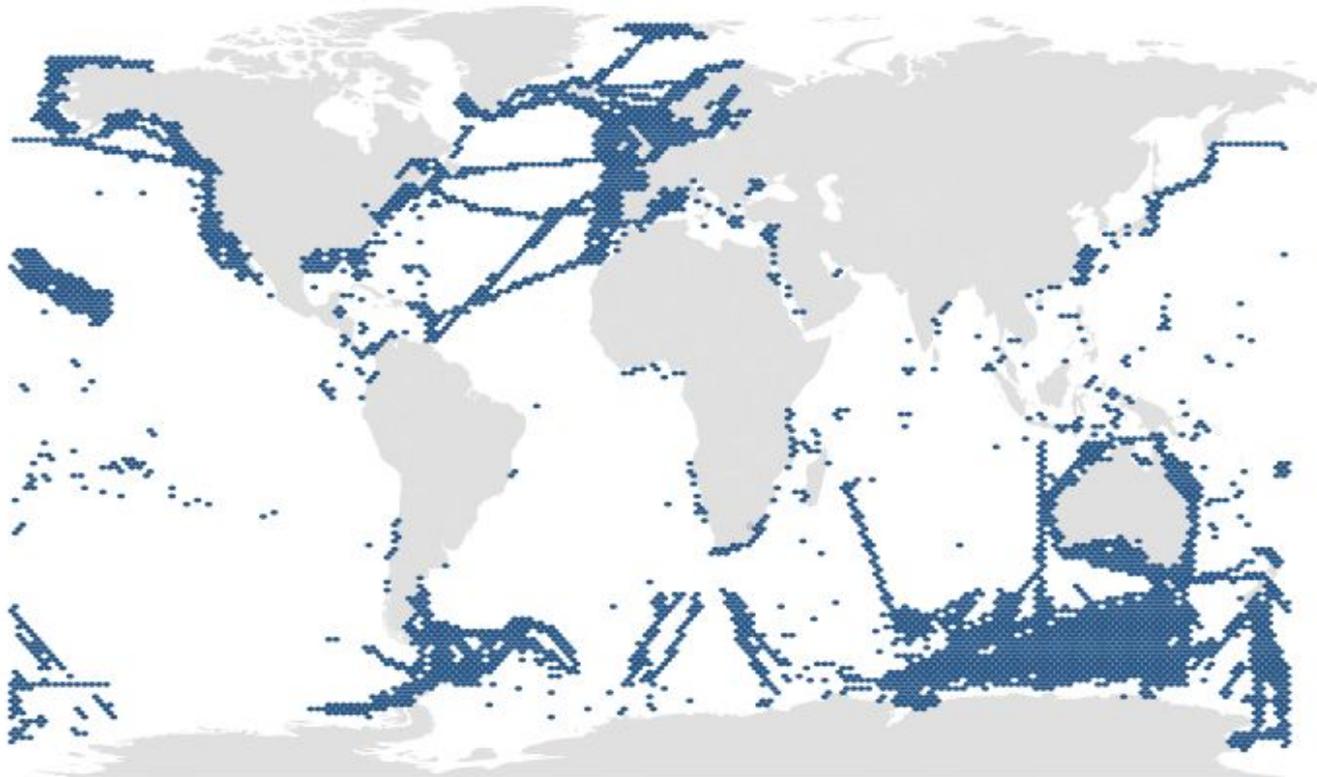


GOOS today

Observation Coordination Group networks



- Established arrays (Argo, DBCP), new networks (gliders, HF Radar)
- **86** countries, **8,933** in situ observing platforms, **170** satellites
- Early focus was on climate and operational services - increasing ocean health and human impacts
- *in situ* ocean observations – 12 global ocean observing networks
- Coordinated by GOOS towards Vision of the 2030 Strategy



GOOS today

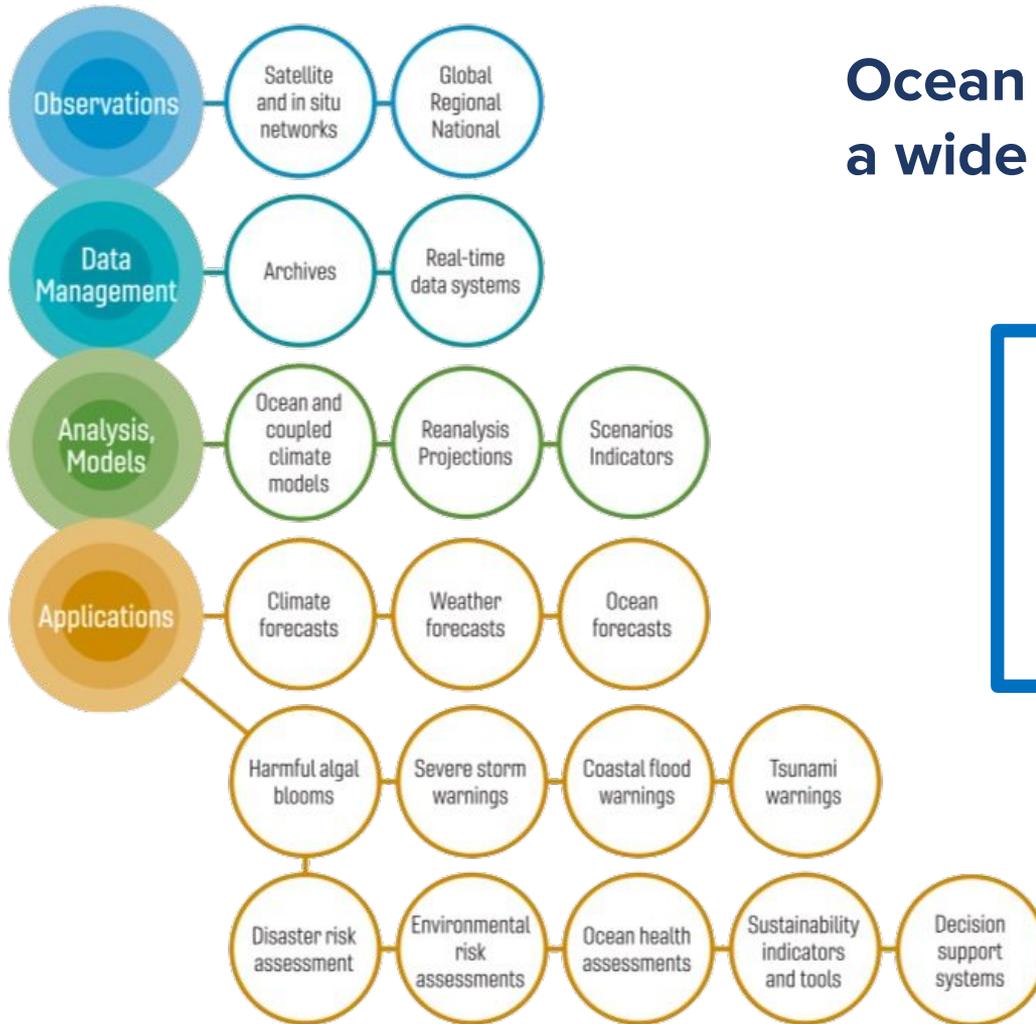
BioEco observations

- 203 active long-term biological observing programs*
- 10 BioEco Essential Ocean Variable (EOV) based observing networks
- Working towards the – **GOOS Vision**
- Coverage 6 -7% of the global ocean, 93% without known sustained observations

* Survey 643 observing entities identified, 371 responded, 203 programs were active, long-term (5 years or more) and sampled at least EOVs systematically but spatial data were only available for 192 observing programs (Satterthwaite et al. 2020 in prep)

Ocean observation underpin a wide range of applications

Research and innovation



The need for expansion of a global ocean observing system, designed to meet the requirements of a broad suite of users, is clear and urgent.



The GOOS 2030 Strategy

Vision

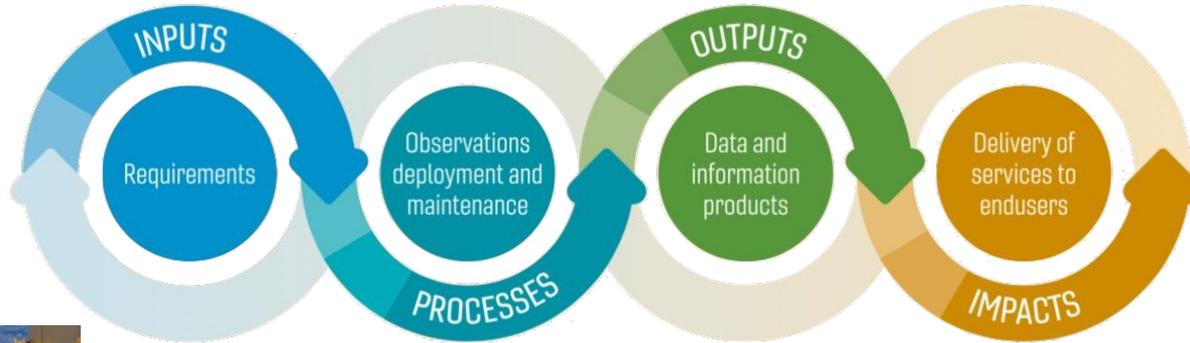
A truly global ocean observing system that delivers the essential information needed for our sustainable development, safety, wellbeing and prosperity

Mission

To lead the ocean observing community and create the partnerships to grow an integrated, responsive and sustained observing system



A key infrastructure building partnerships for delivery



Essential Ocean Variables: Expressing requirements, high impact, high feasibility

Physics	Biogeochemistry	Biology and Ecosystems
<ul style="list-style-type: none"> • Sea state • Ocean surface stress • Sea ice • Sea surface height • Sea surface temperature • Subsurface temperature • Surface currents • Subsurface currents • Sea surface salinity • Subsurface salinity • Ocean surface heat flux 	<ul style="list-style-type: none"> • Oxygen • Nutrients • Inorganic carbon • Transient tracers • Particulate matter • Nitrous oxide • Stable carbon isotopes • Dissolved organic carbon 	<ul style="list-style-type: none"> • Phytoplankton biomass and diversity • Zooplankton biomass and diversity • Fish abundance and distribution • Marine turtles, birds, mammals abundance and distribution • Hard coral cover and composition • Seagrass cover and composition • Macroalgal canopy cover and composition • Mangrove cover and composition • Microbe biomass and diversity (*emerging) • Invertebrate abundance and distribution (*emerging)
Cross-disciplinary		
<ul style="list-style-type: none"> • Ocean colour 	<ul style="list-style-type: none"> • Ocean sound 	<ul style="list-style-type: none"> • Marine debris (*emerging)



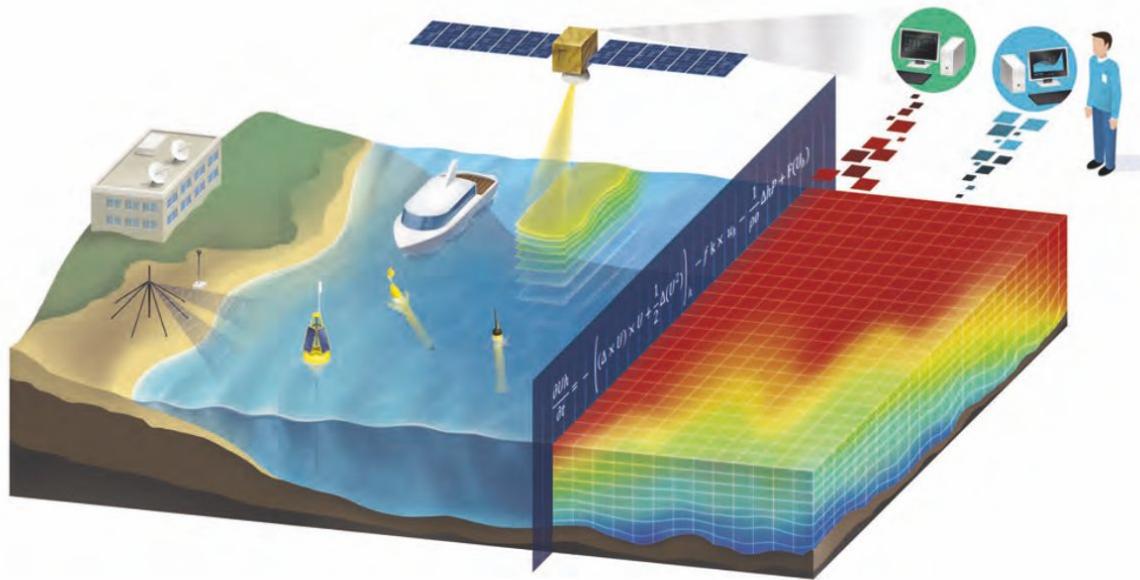
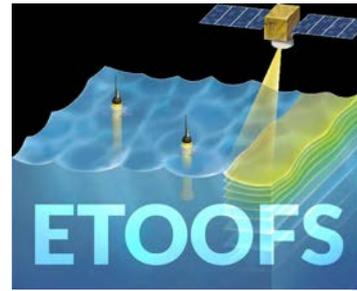
Ocean Observing Report Card 2020 - status of the global observing networks



GOOS <i>in situ</i> networks ¹	Implementation Status ²	Data & metadata			Best practices ⁶	GOOS delivery areas ⁷		
		Real time ³	Archived high quality ⁴	Meta-data ⁵		Operational services	Climate	Ocean health
Ship based meteorological measurements - SOT/VOS	★★★	★★★	★★★★	★★★	★★★			
Ship based aerological measurements - SOT/ASAP	★★★	★★★	★★★	★★★	★★★			
Ship based oceanographic measurements - SOT/SOOP	★★★	★★★★	★★★★	★★★	★★★			
Sea level gauges - GLOSS	★★★★	★★★	★★★★	★★★	★★★			
Drifting and polar buoys - DBCP	★★★★	★★★	★★★	★★★	★★★			
Moored buoys - DBCP	★★★	★★★★	★★★	★★★	★★★			
Interdisciplinary moorings - OceanSITES	★★★	★★★	★★★	★★★	★★★			
Profiling floats - Argo	★★★★	★★★★	★★★★	★★★★	★★★			
Repeated transects - GO-SHIP	★★★★	★★★	★★★★	★★★	★★★★			
OceanGliders	★☆☆ Emerging	★★★	★★★	★★★	★★★			
HF radars	Emerging	★★★★	★★★★	★★★	★★★★			
Biogeochemistry & Deep floats - Argo	★☆☆ Emerging	★★★★	★★★	★★★★	★★★			
Animal borne ocean sensors - AniBOS	Emerging	★★★★	★★★	★★★	★★★			

JCOMM legacy in GOOS

Operational ocean forecast systems



June 14-16th:
Awareness Workshop

Understanding the benefits of
Operational Ocean Monitoring and
Forecasting Systems

June 22-24th:
Practical Workshop

Implementing Operational Ocean
Monitoring and Forecasting Systems

WITH THE SUPPORT OF :



110 participants selected

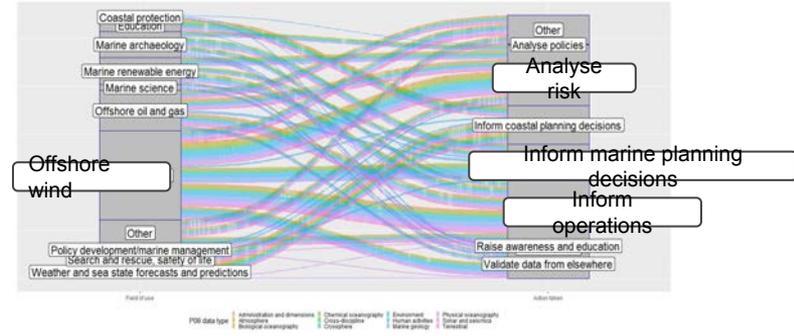
53 countries



Identifying the value of ocean observations

with **OECD**

- mapping of data flows into economies and industry (initial survey with UK MEDIN)
- best practice in economic valuation



GOOS Regional Alliances (**GRAs**) work led by US **IOOS**



Benefits of Ocean Observations Catalog
www.booc.info

GOOS projects



<https://deepoceanobserving.org/>



<http://tpos2020.org/>

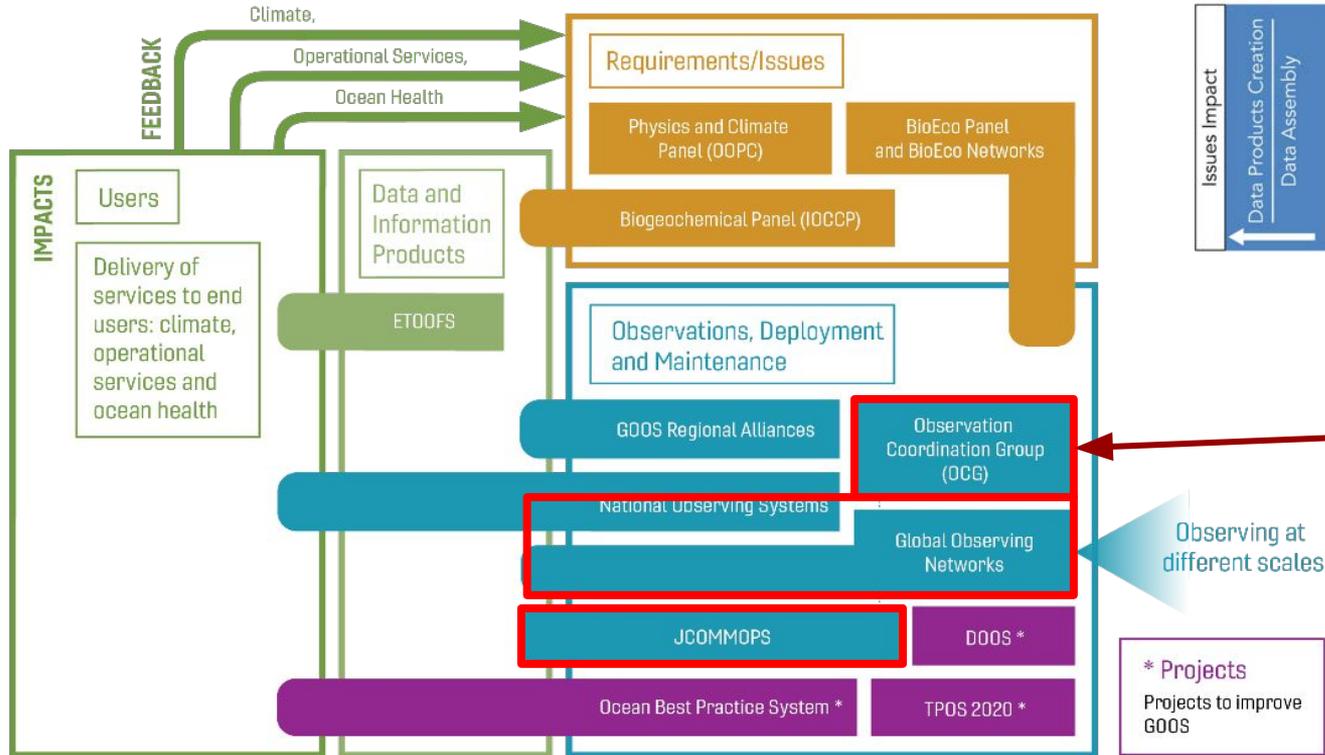


<https://www.oceanbestpractices.org/>

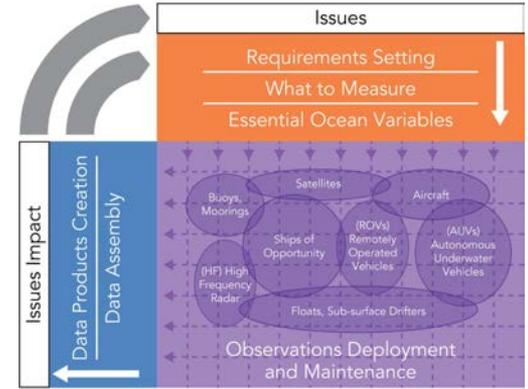


<http://www.atlantos-ocean.org/>

GOOS structure



Framework for Ocean Observing Process Diagram



OCG
Observations
Coordination
Group
Global observing
networks and
OceanOPS

* Projects
Projects to improve
GOOS



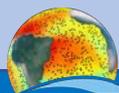
Who is OCG?



Global Ocean Observing Networks

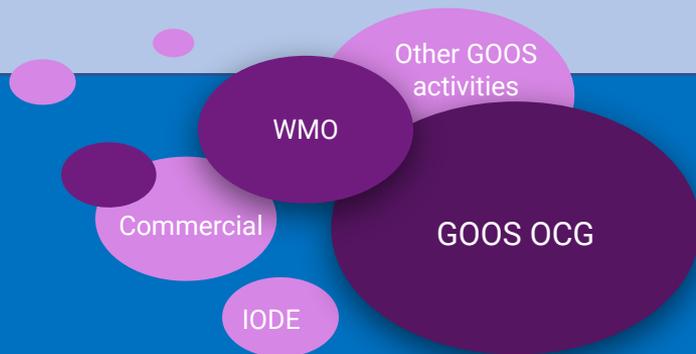


Emerging global observing networks



OceanOPS

Observation Coordination Group Executive
Chair, Vice Chairs WMO/Technical, Standards and Best Practice, Data Management, Developing Community representative

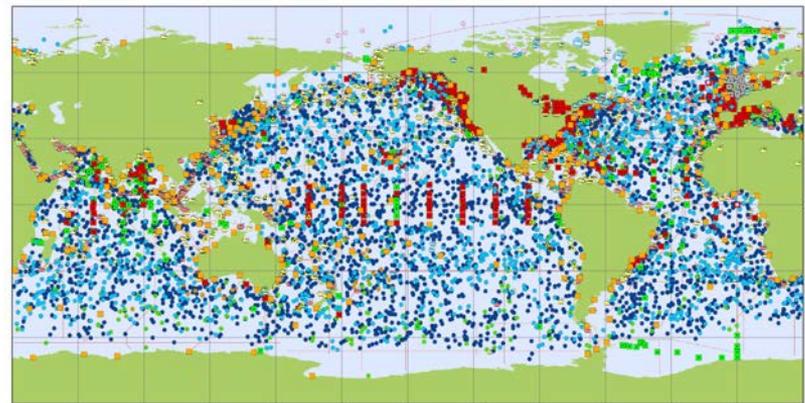


The role of OCG

The Observation Coordination Group (OCG) works to **efficiently operate**, **maintain**, **coordinate** and **integrate** a comprehensive *in-situ* global ocean observing system

OCG now targets 8 foci:

1. Requirements
2. Observing Advances
3. Standards and Best Practices
4. Data Management
5. OceanOPS
6. Metrics
7. Environmental Stewardship
8. Capacity Development



Main in-situ Elements of the Global Ocean Observing System

July 2017

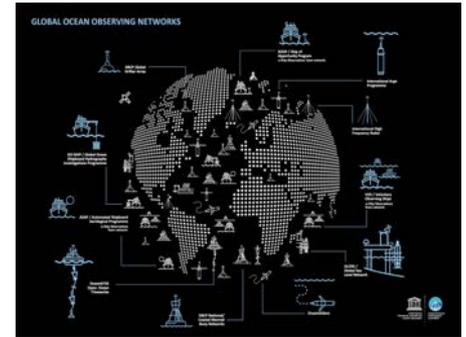


Generated by www.jcommaps.org, 10/08/2017



Requirements for OCG “Global Networks”

- Global in scale
- Observe one or more Essential Ocean Variables or Essential Climate Variables
- Observations are sustained
- Community of Practice
- Maintain network mission and targets
- Deliver data that are free, open, and available in a timely manner
- Ensure metadata quality and delivery
- Develop, update and follow Standards and Best Practices
- Undertakes capacity development and technology transfer
- Environmental stewardship awareness



The 12 global Ocean Observing Networks



Argo

A window into the ocean, a 20-year-old ocean observing network of autonomous/robotic profiling floats that has revolutionized the way scientists learn about the ocean.



Data Buoy Cooperation Panel (DBCP)

Coordinates autonomous data buoys to observe atmospheric and oceanographic conditions over ocean areas where few other measurements are taken.



Ship Observations Team (SOT)

Consists of several very successful and enduring data collection programmes involving voluntary observing ships and ships of opportunity.



Global Sea Level Observing System (GLOSS)

A well-designed, high-quality sea level observing network supporting a broad research and operational user base.



The 12 global Ocean Observing Networks



Animal-Borne Ocean Sensors (AniBOS)

A network deploying instruments on seals and other marine animals to provide salinity and temperature profiles and behavioural data.



The Global Ocean Ship-Based Hydrographic Investigations Programme (GO-SHIP)

Research vessels serving scientists interested in physical oceanography, the carbon cycle, marine biogeochemistry and ecosystems, and other data users and collectors.



OceanSITES

A worldwide system of long-term, deepwater moored reference stations measuring many variables and monitoring the full depth of the ocean.



The Global High Frequency Radar Network

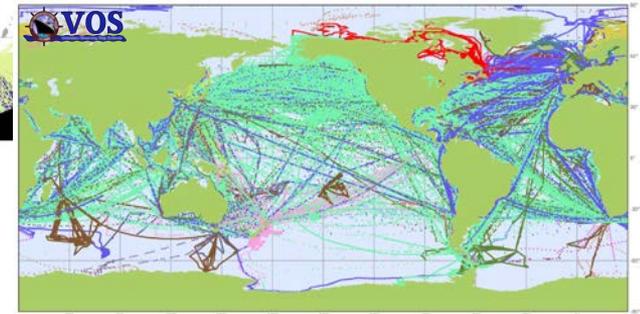
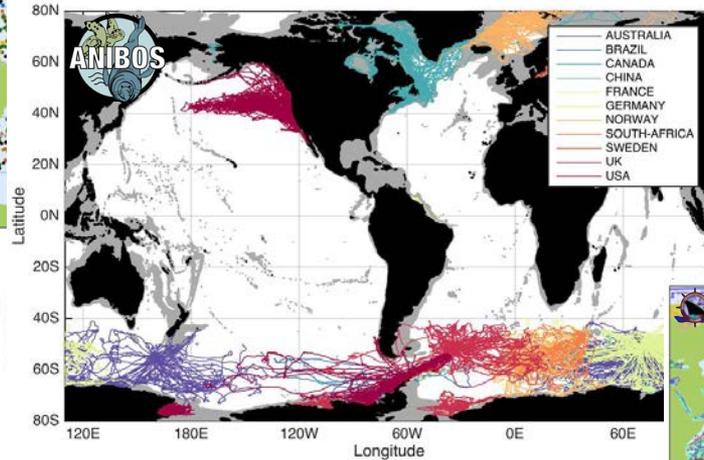
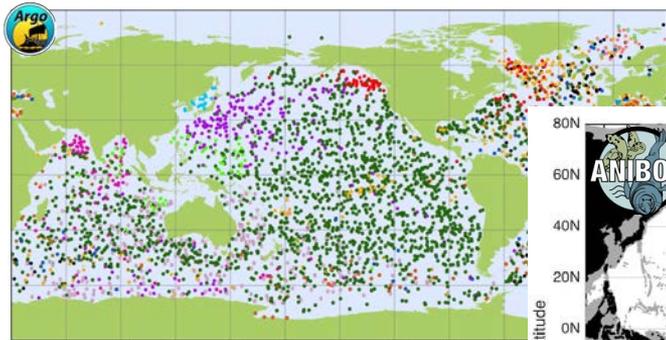
A vision for a global operational system measuring coastal surface currents to support monitoring of marine and coastal ecosystems.

Ocean Gliders

Monitors global glider activity, shares the requirements, efforts and scientific knowledge needed for glider data collection and supports sharing glider data.



Coverage of global Networks



Ship Observations Team

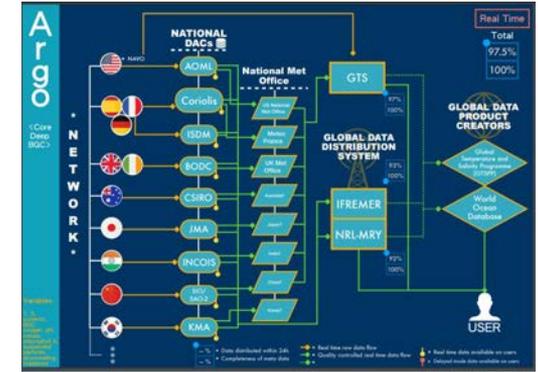
Voluntary Observing Ships (VOS) Scheme
 Yearly Observations by National Program and Data available on GTS

2020



Other OCG activities

- **Data requirements and accessibility**
 - International data flows
 - Findability, accessibility, interoperability, and reusability
- **Capacity Development**
 - Webinar series
 - Virtual training workshops
- **Standard and Best practices**
 - Best known method, technique or proven processes used
- **Environmental stewardship**
 - Encourage environmental assessments to the responsible use and protection of the natural environment through conservation and sustainable practices to enhance ecosystem resilience and human well-being.



PROGRAMMATIC ENVIRONMENTAL ASSESSMENT FOR THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL DATA BUOY CENTER



January 2018



A field and video annotation guide for baited remote stereo-video surveys of demersal fish assemblages. [GOOS ENDORSED PRACTICE]

Langlois, Tim; Goetze, Jordan S.; Bond, Todd; Monk, Jacquomo; Abesamis, Rene A.; Asher, Jacob; Barrett, Neville; Bernard, Anthony T.F.; Bouchet, Phil J.; Birt, Matthew J.; Cappel, Mike; Currey-Randall,



Ocean Observing System Report Card 2021



- 5th edition of the Report Card
- The Report Card focuses on the status and value of global met-ocean observing systems. This year's report will focus on:
 - In Situ and satellite observation status
 - Ocean Oxygen
 - Covid-19 impacts on ocean observing activities
 - Human dimension stories
- <https://www.ocean-ops.org/reportcard2021/>

Covid-19 Impacts: Tracking and mitigating impacts



GOOS *in situ* networks

Covid-19 impact

	June 2020	Projected status December 2020
Ship based meteorological measurements	Minor	Minor
Ship based aerological measurements	Minor	Minor
Ship based oceanographic measurements (XBT)	Major	Major
Sea level gauges	Minor	Minor
Drifting and polar buoys	Minor	Minor
Moored buoys	Minor	Minor
Interdisciplinary moorings	Medium	Medium
Profiling floats	Minor	Minor
Repeated hydrographic transects	Major	Medium
OceanGliders	Medium	Minor
HF radars	Minor	Minor
Animal borne ocean sensors	Minor	Medium

Covid-19 Impacts: Resilience of the Ocean Observing System

- Use of autonomous instruments – delay in impact
- Commercial ships remained operational
- Strong effort by operators – working from home, monitoring data flow, workarounds for remote calibration, etc.
- Community collaboration, with ship operators, across networks, sharing information
- Identified as essential operations



Future Developments in the OCG

- **System monitoring, integration, interoperability:** Harmonize network metadata, frictionless **data flow**
- Developing **new components** of the observing system: addressing gaps
- **User stakeholder engagement:** understanding user needs
- **Integration:** Emerging Networks
- **Managing Risks:** working/operating in EEZs
- **Planning:** Coordinating UN Decade Projects /Programmes
- **System Evolution:** Observing technology development, assessment, and infusion
- **GOOS Projects:** Interactions/coordination towards improved observing systems
- **GOOS BioEco:** Interactions/coordination towards improved observing systems



GOOS work ahead

- **UN Decade of Ocean Science for Sustainable Development** - GOOS has 3 Programmes accepted under the theme of integration:
 - Ocean Observing Co-Design
 - CoastPredict
 - Observing Together
- Transform **GOOS governance** - fit for 2030
- **Strengthen connection down the value chain** - observations to users - through partnership
- **Strengthen connection with national systems**
- **Communicate and advocate** for the range of sustained observations needed
- **Evaluate the observing system** and identify priority gaps
- Work towards the **visión of the 2030 Strategy**



Thank you!



www.gooscean.org