The Global Ocean Observing System
www.goosocean.org

Global Ocean Observing System Strategy the role of Standards and Best Practices

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Sixth RMIC RA-II (Asia Pacific) Workshop, December 2021

Underpinning a wide range of applications

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.

Building on the GOOS 2030 Strategy

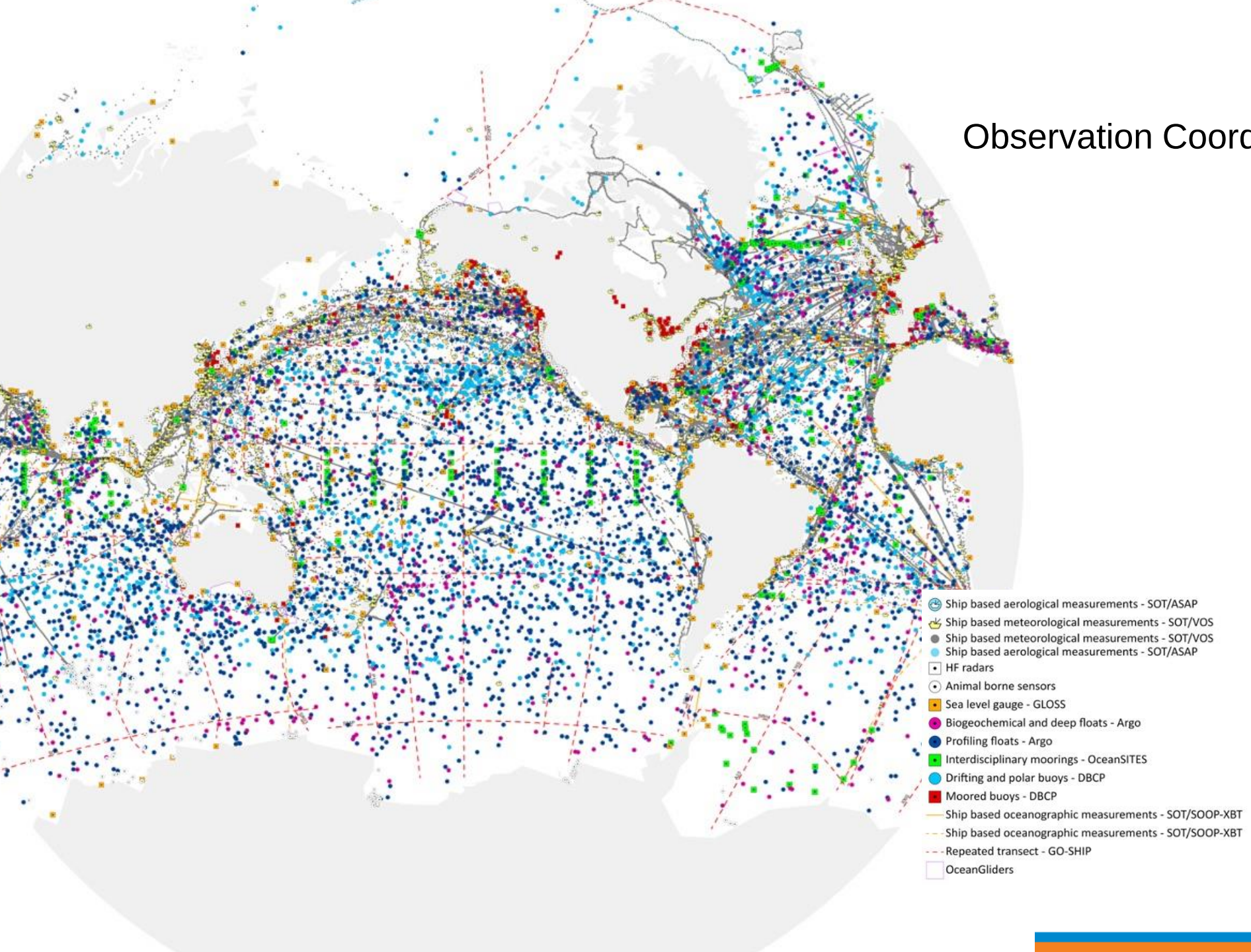
Vision
A truly global ocean observing system that delivers the essential information needed for our sustainable development, safety, wellbeing and prosperity

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

goosocean.org/2030strategy

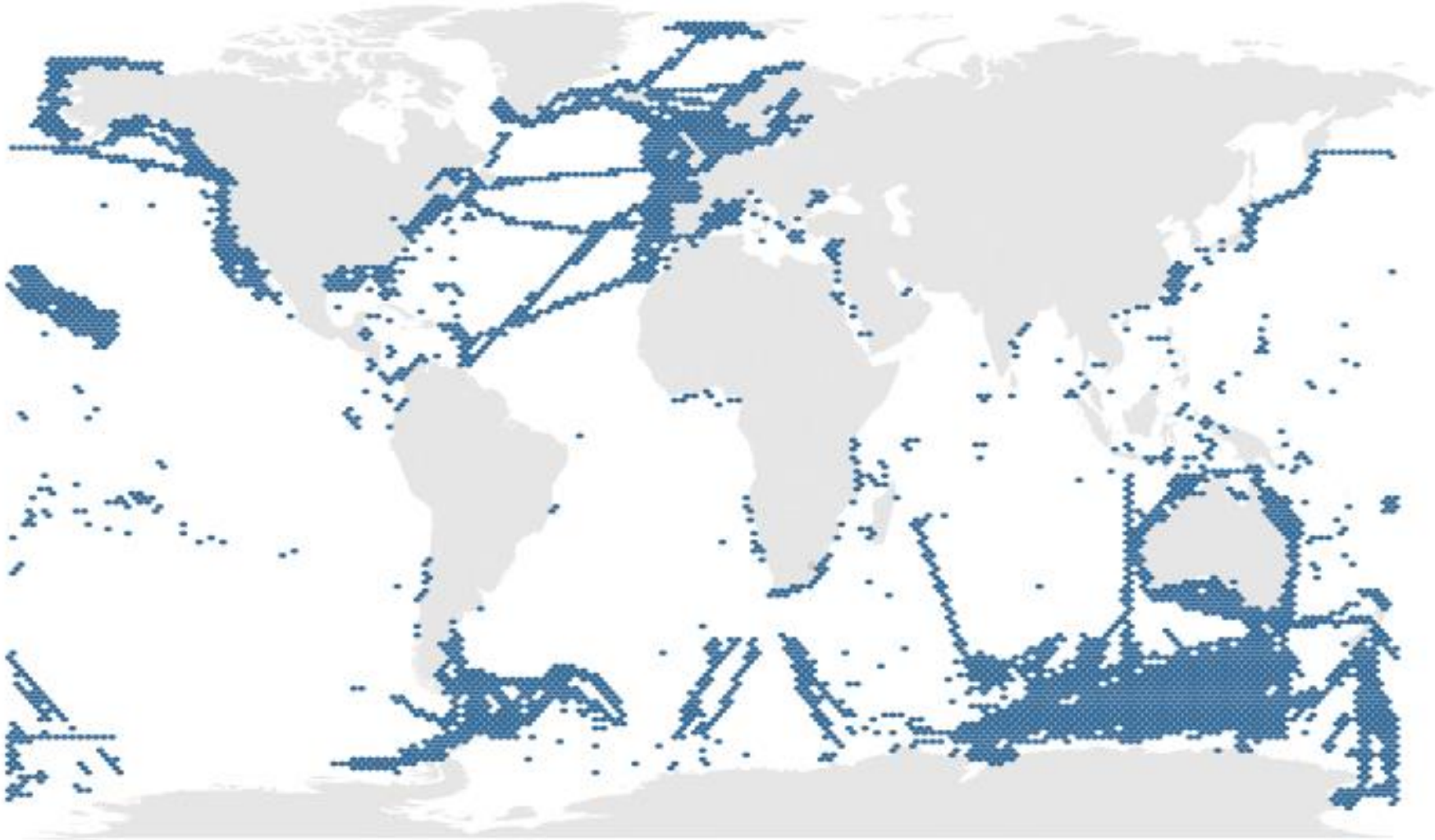
GOOS today

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

www.ocean-ops.org/reportcard2020



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

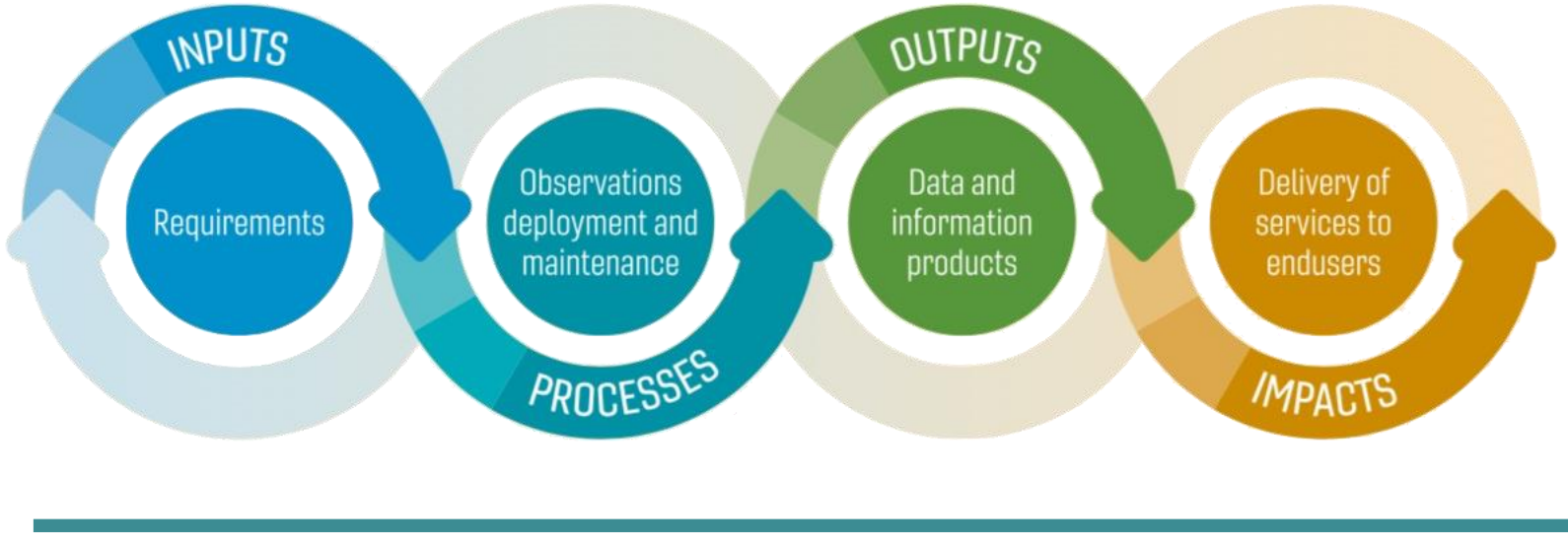
* Survey 643 observing entities identified, 371 responded, 203 programs were active, long-term (5 years or more) and sampled at least EOVs systematically but spatial data were only available for 192 observing programs (Satterthwaite et al. 2020 in prep)

Biology and Ecosystems Panel

Essential Ocean Variables (EOVs)
Expressing requirements: high impact, high feasibility

Physics	Biogeochemistry	Biology and Ecosystems
• 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	• Oxygen • Nutrients • Inorganic carbon • Transient tracers • Particulate matter • Nitrous oxide • Stable carbon isotopes • Dissolved organic carbon	• 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) • Invertbrate abundance and distribution (*emerging)
Cross-disciplinary		
• Ocean colour	• Ocean sound	• Marine debris (*emerging)

A key infrastructure building partnerships for delivery



Standards and Best Practices - a foundation

- Quality and consistency of observations and information
- Efficiency (don’t re-invent the wheel)
- Transparency - traceability, reproducibility and uncertainty quantification
- Resource for training and capacity development

GOOS today

Ocean Observing Report Card 2020

GOOS *in situ* networks[1]	Implementation	Data & metadata			Best practices[6]	GOOS delivery areas[7]		
	Status[2]	Real time[3]	Archived high quality[4]	Meta-data[5]		Opera-tional 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	★★★	★☆☆	★☆☆	★★☆	✓	✓	✓

Ocean Best Practices System

Steps to developing an ocean best practice

SCOPE AND RECRUIT

Confirm the need
- Consider best practices training
- Review similar methods
- Survey the community
- Develop scoping report

Form a working group
- Identify leaders
- Invite contributors and institutions
- Be inclusive
- Set scope of method

DEVELOP AND RELEASE

Develop content
- Assess/integrate related methods
- Consult in working group
- Create strawman
- Complete final draft

Review final draft
- Invite full community review
- Respond and revise
- Maintain adjudication record

Release
- Publish at repository
- Notify stakeholders
- Promote to target audiences

REVISE AND RATIFY

Invite feedback
- Survey users
- Publish in journal
- Assess uptake via repository
- Consider new version

Obtain community endorsement for an accepted best practice!
- Obtain GOOS endorsement
- Obtain institutional endorsement
- Include in permitting recommendations
- Maintain and update

The Global Ocean Observing System

IODE

The ocean best practices system can provide

- A searchable repository
- A journal theme
- Training
- User support, outreach

Benefits of using a best practice

- Collaborative opportunities
- Efficient use of time
- Improved systems interoperability
- Data comparability and collatability
- Greater trust in data
- Streamlined regulatory approval
- Higher funding success

The Ocean Best Practices System is supported by UNESCO Intergovernmental Oceanographic Commission, Global Ocean Observing System, and the International Oceanographic Data and Information Exchange.

www.oceanbestpractices.org

GOOS Observation Coordination Group (OCG)

50+

Identified BP, SOP, Manuals

4

Networks in cross-sensor work

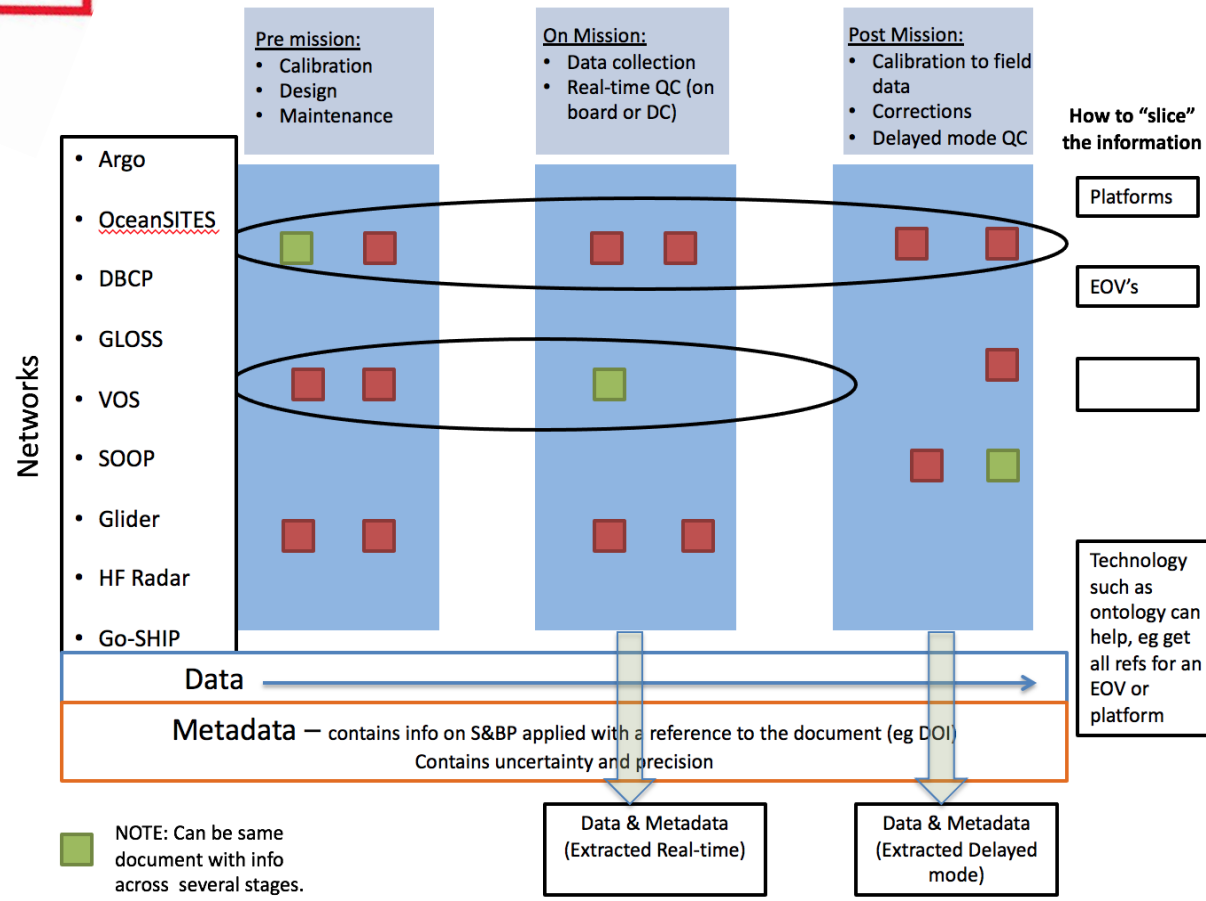
Endorsement

393

Downloads Endorsement Guide

3

GOOS Endorsed Best Practices



Building a robust community supported process for Best Practices and Standards
What role for RMICs looking forward?

RMICs Role

- Suggestion – GOOS could benefit from RMIC expertise through improved confidence in observations resulting from robust and well-defined sensor metrology.
- An example of such a comparison is the DBCP - which through the OCG established functional connections with RMIC.
- What is the suitable connection GOOS OCG or WMO SC-MINT

OceanOPS

Sixth RMIC RA-II (Asia Pacific) Workshop, December 2021

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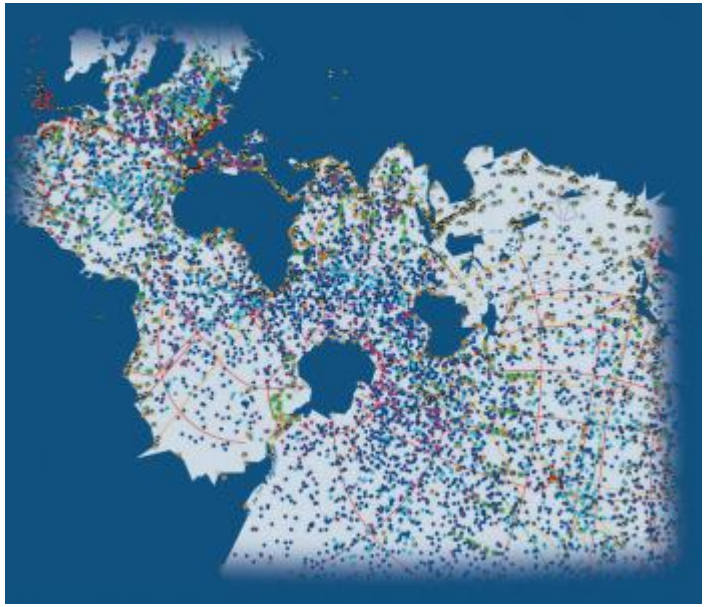
5-year Strategy (https://www.ocean-ops.org/strategy/)

Vision, Mission

VISION

To be the international hub and center of excellence that provides vital services in monitoring, coordinating, and integrating data and metadata, across an expanding network of global oceanographic and marine meteorological observing communities.



MISSION

To monitor and report on the status of the global ocean observing system and networks, to use its central role to support efficient observing system operations, to ensure the transmission and timely exchange of high quality metadata, and to assist free and unrestricted data delivery to users across, operational services, climate and ocean health.

Strategy

GOALS

Five high level goals are identified for OceanOPS to achieve its vision over the next 5 years (2021-2025). These goals focus on the core functions of OceanOPS, address the evolving needs of the ocean and marine meteorological observing communities, and identify the internal evolution needed to achieve this vision.

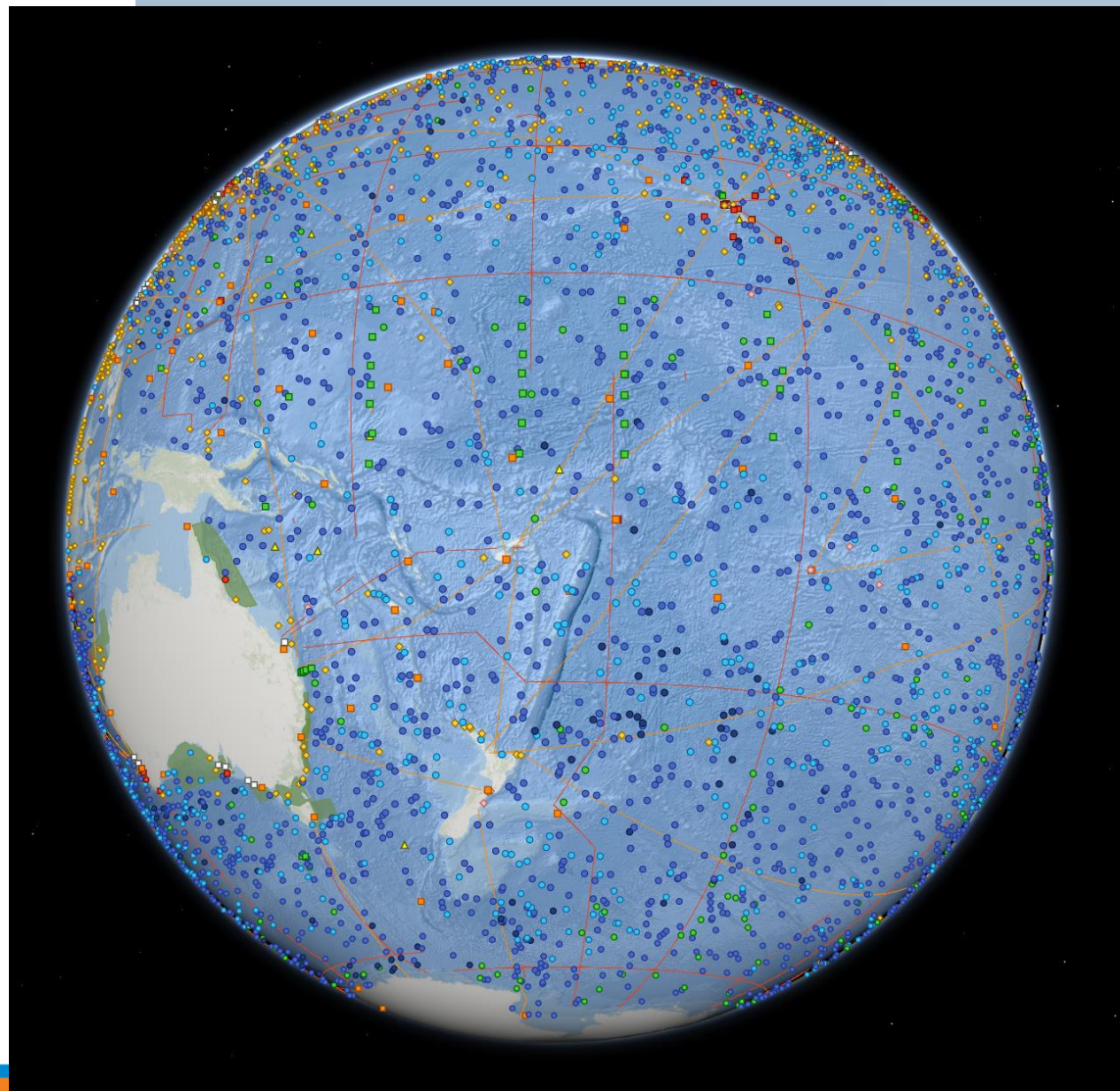
Goal 1

Monitoring for the improvement of global ocean observing system performance

Objective 1.1
Develop analysis tools and metrics for all OCG networks.

Objective 1.2
Analyze networks trends and report to the different stakeholders.

Objective 1.3
Implement and report "system level" metrics for monitoring the adequacy of the system versus requirements and applications.



Strategy

Goal 2

Lead metadata standardization and integration across the global ocean observing networks

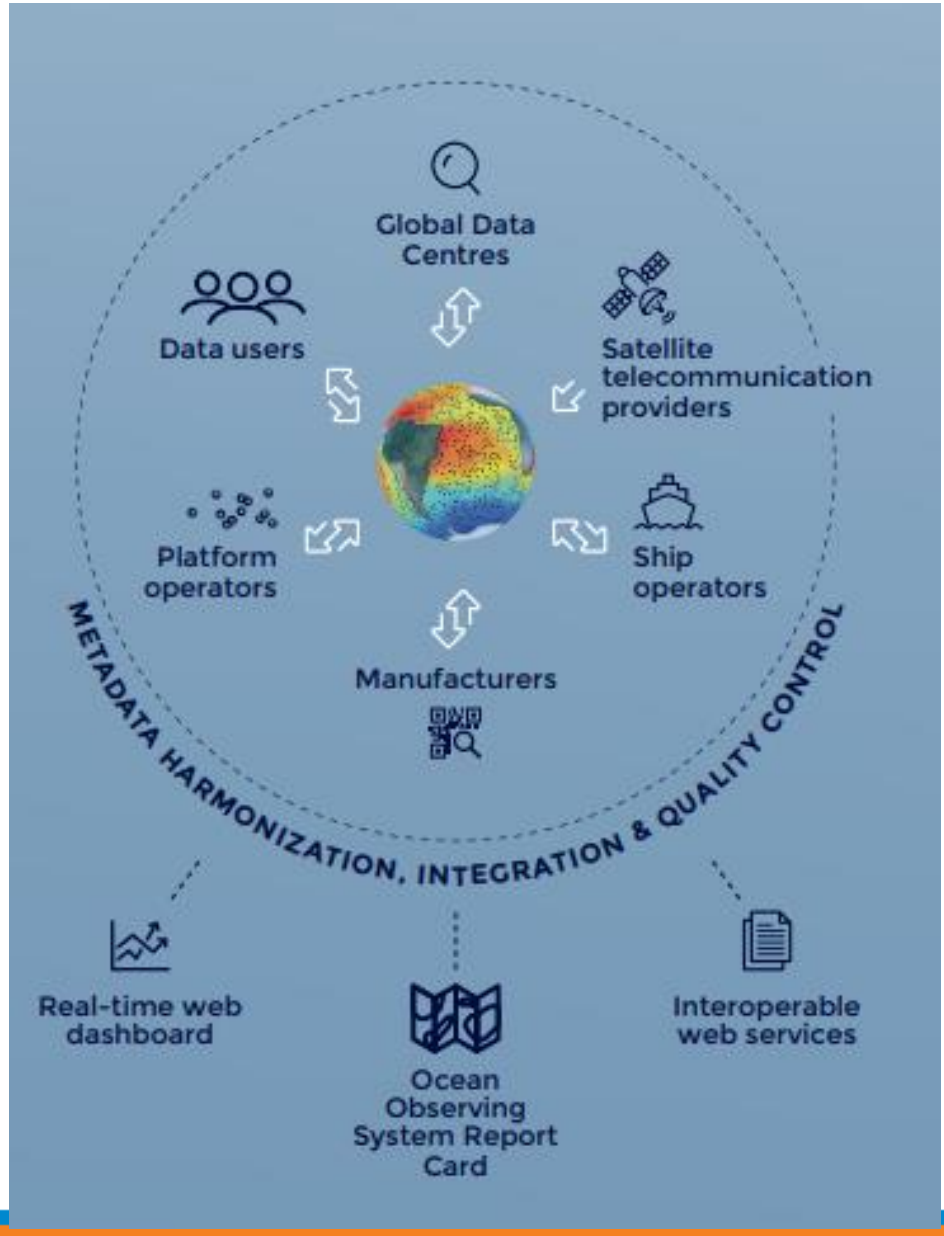
Objective 2.1
Set and disseminate the standards and best practices for metadata harmonization across the OCG networks.

Objective 2.2
Develop the web services required for machine-to-machine metadata exchange and access.

Objective 2.3
Provide a harmonized and high-quality standard of metadata across all OCG networks.

Objective 2.4
Assist users on data access and available data services.

Objective 2.5
Connect OceanOPS services with IOC and WMO international data systems.



Strategy

Goal 3

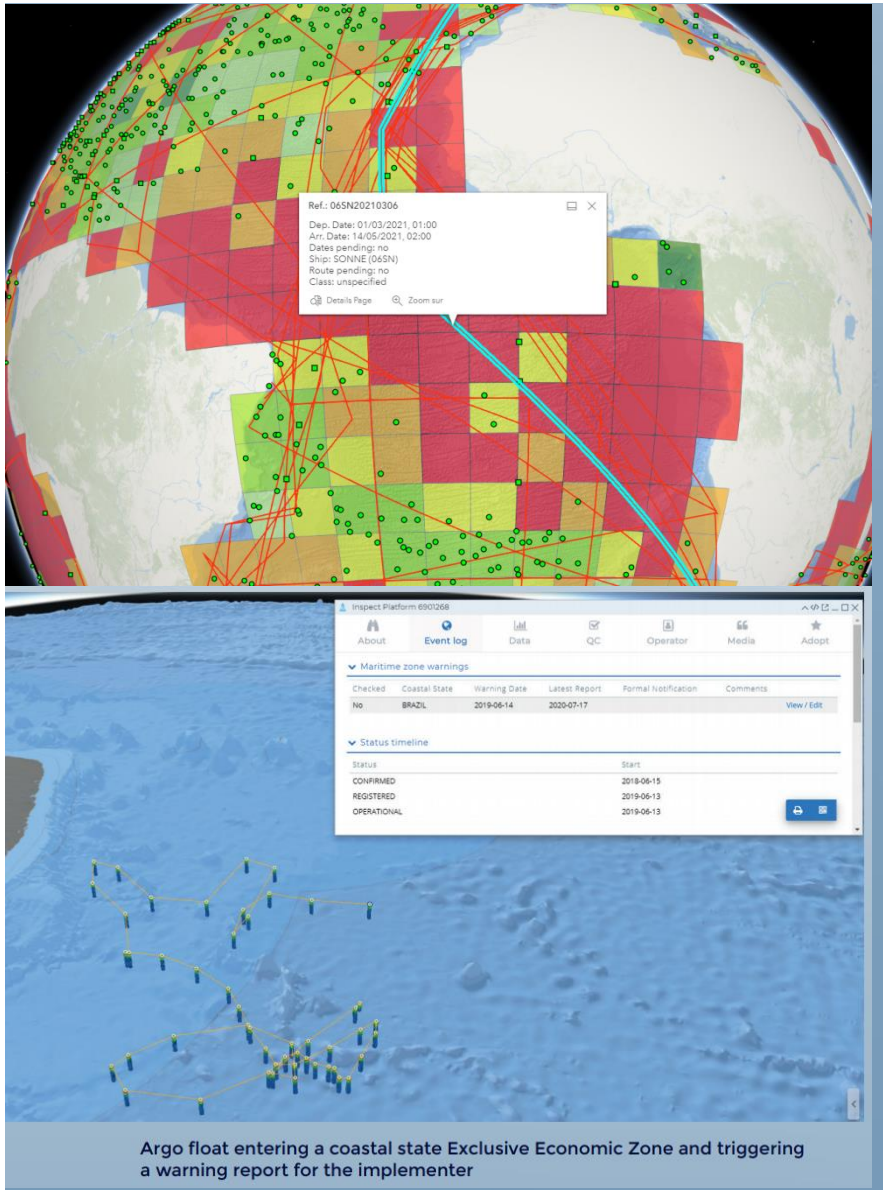
Support and enhance the operations of the global ocean observing system

Objective 3.1
Encourage and support the planning of observing networks implementation to enable synergies and opportunities.

Objective 3.2
Develop partnerships and pilot projects to facilitate deployments/retrieval of instruments, including with civil society and industry.

Objective 3.3
Promote Standards and Best Practices on instruments (installation, deployment, recovery, metadata, exclusive economic zones issues, etc.).

Objective 3.4
Maintain appropriate (web-based) services to facilitate routine platform operations, including in areas under national jurisdiction.



Argo float entering a coastal state Exclusive Economic Zone and triggering a warning report for the implementer

Strategy

Goal 5

Shape OceanOPS for the future

Objective 5.1
Develop agreements with OCG networks, emerging networks and other end-users for the system to set boundaries and expectations for OceanOPS.

Objective 5.2
Strengthen infrastructure in host country, workforce, and budget towards sustainability.

Objective 5.3
Evolve the business model, team structure, and associated funding approaches towards integration, simplification, and robustness.

Objective 5.4
Enhance communications to foster community understanding and engagement.

Metadata flow, Standardization&Integration

GOOS

TAGS
Site
Networks
Sub networks

IMPLEMENTERS
Agencies and role (Data centre, Funding agency, …)
Program
Contacts
Misc. (Weblinks,

Interoperability

IDENTIFIERS
WMO
WIGOS id
Serial number
Internal id

https://www.ocean-ops.org/
https://www.ocean-ops.org/metadata

EOV
Instrument specs
System capabilities

HARDWARE
Telecom
Sensor
Configuration
Firmware

OPERATIONS
Deployment
Retrieval
Servicing
Ships
Cruises

Planning
Common denominator

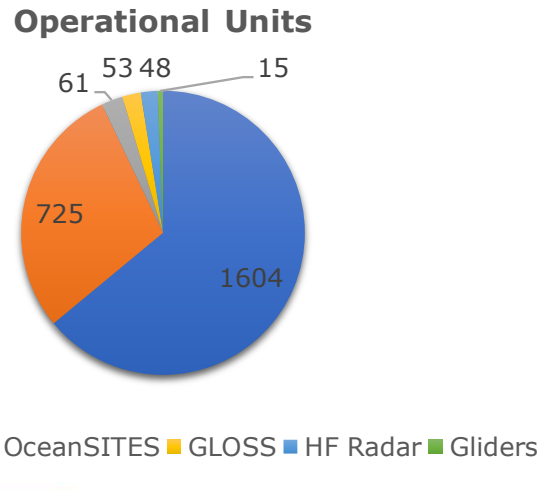
INDUSTRY
Manufacturers
Telecom providers

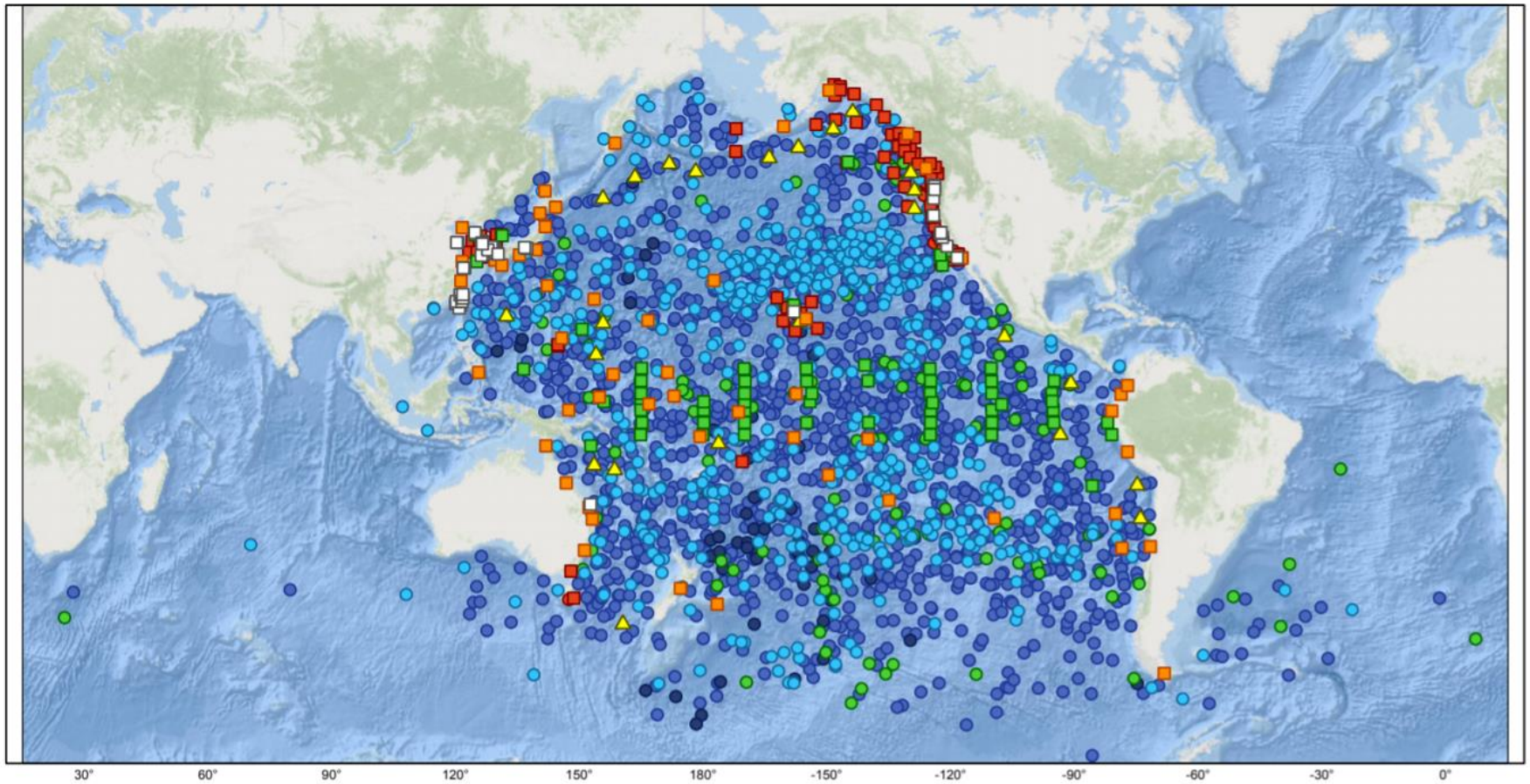
GLOBAL DATA CENTRES
GDAC / GTS

OBS
Stats
QC Feedback
EOV

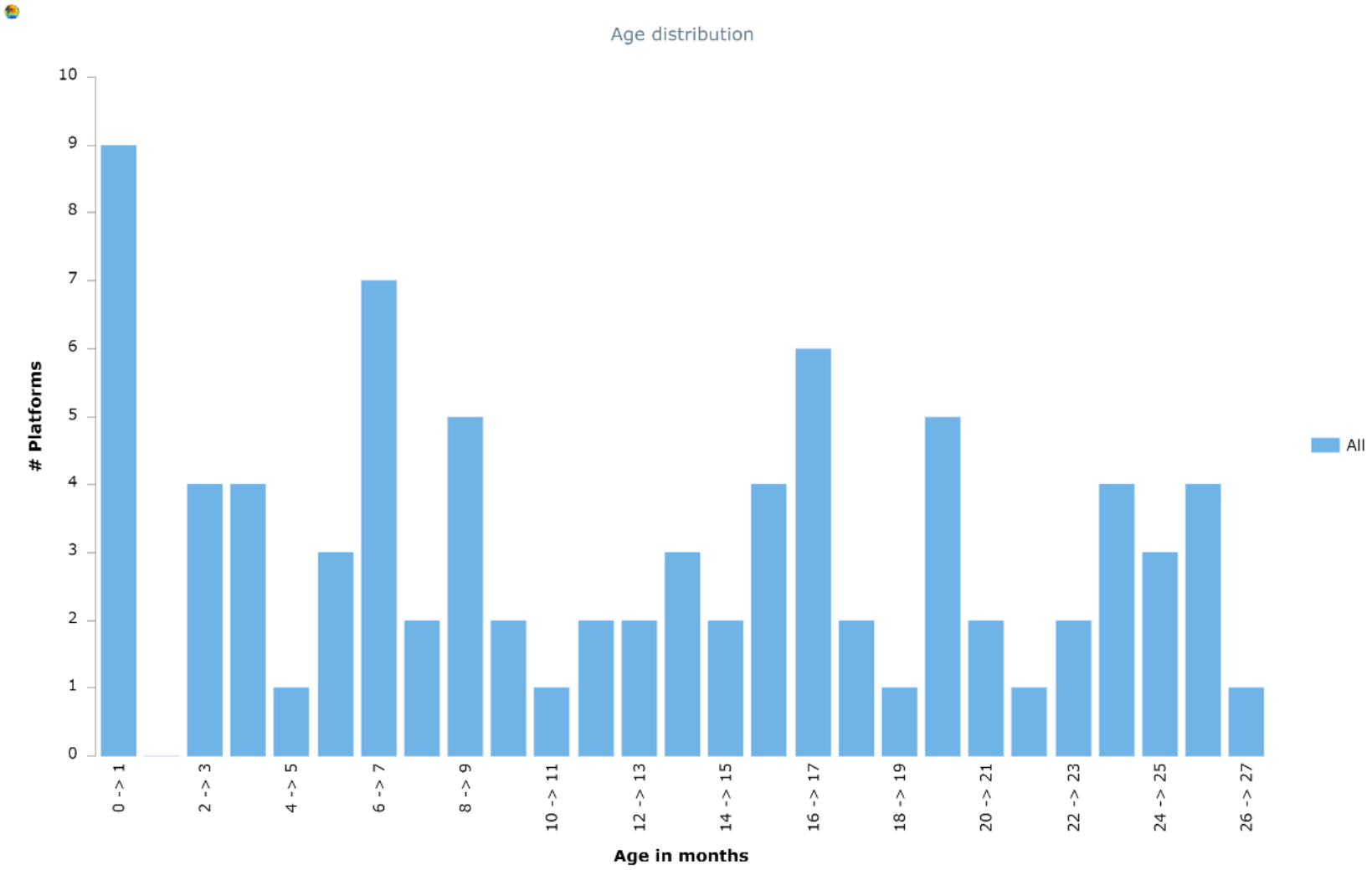
User perspective
System delivery

Integrated Monitoring



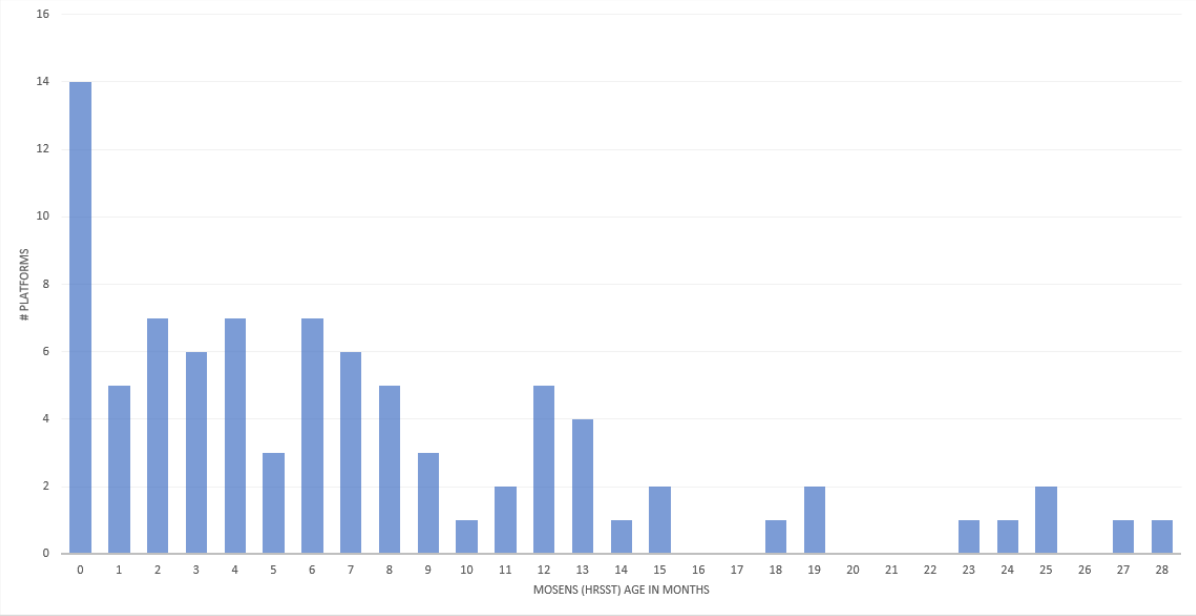


Monitor Instrument Performance, Age

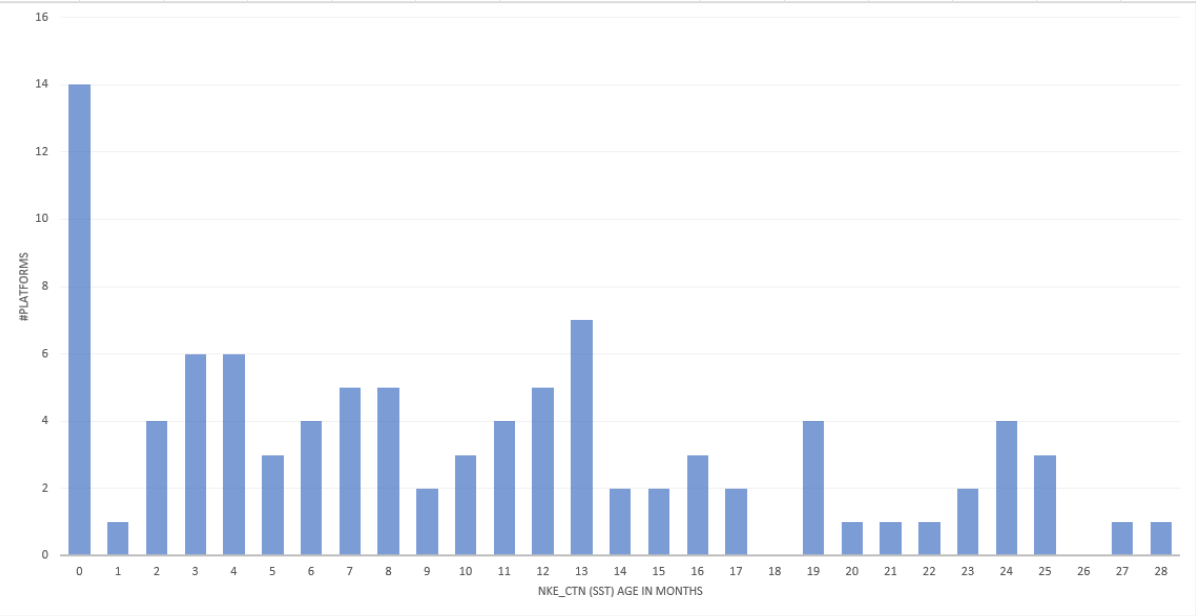


Monitor Sensor Performance

HRSST



SST



UN Ocean Decade Odyssey Project

Umbrella Project for Citizen Science and Private Sector Initiatives

- Recent domain highlights
  - Sailing4Science: Vendée Globe / IMOCA partnership
  - Fugro commitment in GOOS and Seabed 2030 efforts
  - Kongsberg trials with ship navigation and management system as AWS
  - Ponant touristic icebreaker with underway equipment

- Application Drivers
  - OceanOPS
  - GOOS co-chair Toste Tanhua
  - OCG vice-chair data Kevin O'Brien

- Tools
  - Dedicated dashboard, website, brochure, certificate
  - Steering committee
  - Communication plan
  - …

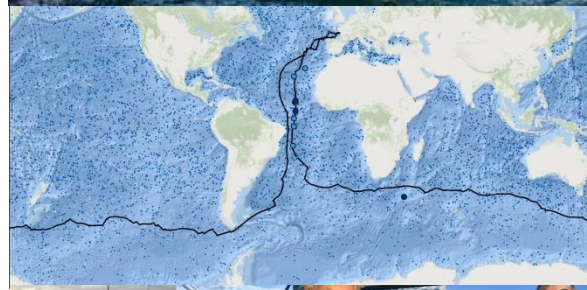
- Goals
  - Transform the GOOS: Complement existing networks and operators with third party contributors
  - More data with increased number of instruments, observations, ships and data coverage
  - Alternative funding of instruments and ship time
  - Innovative and harmonized data streams and formats (including OpenGTS, netCDF)
  - Standards / OBP for citizen science/private sector participants on alternative vessels / platforms
  - Single point of contact, efficient coordination
  - Advocacy and outreach of ocean science, solutions and observing

SDGs
- 13, 14, 17

Outcomes
- 4, 5, 6, 7

Challenges
- 7, 9, 10

Objectives
- 1.1, 1.3, 1.4, 2.4, 2.5, 3.1, 3.2



Спасибо

Thank you

Gracias

Merci

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