The Global Ocean Observing System

Session 2:
2.4 RRR and evolving GBON

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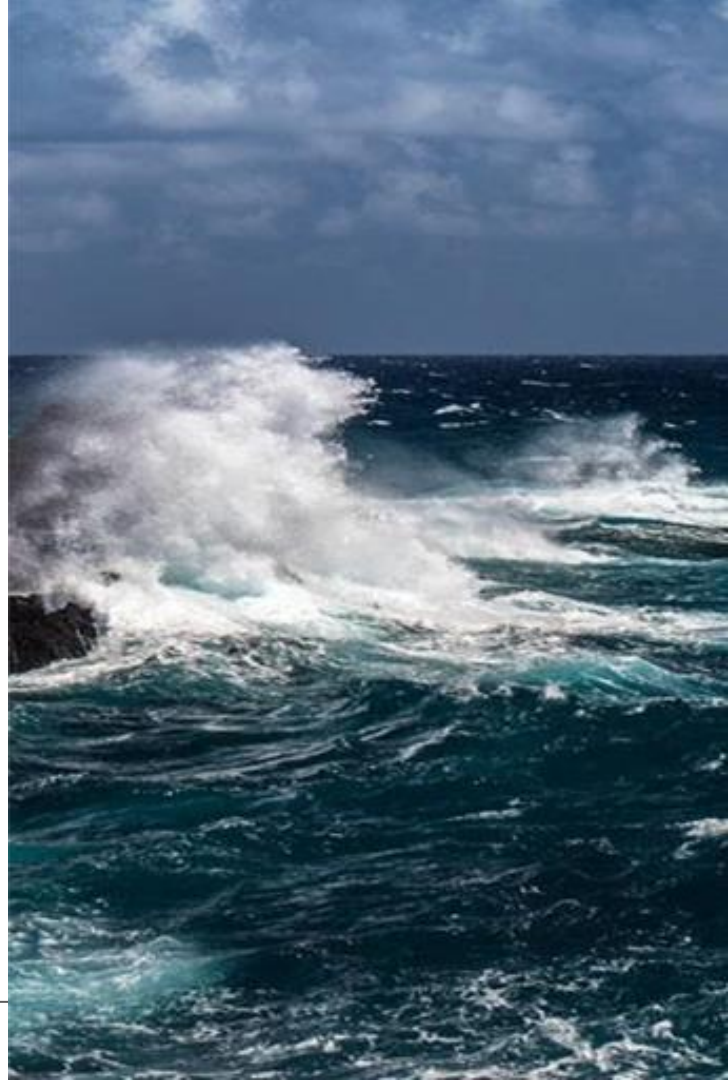
Background – what is RRR

The Rolling Review of Requirements (RRR) is a systematic and transparent process within the WMO Integrated Global Observing System (WIGOS) framework that supports the design and evolution of WIGOS by compiling information on service (user) requirements for observations across various WMO Earth System Application Categories (ESACs). These are then brought together into a summary called a Statement of Guidance (SoG) document.

The RRR involves a review of service (user) requirements for a set of Application Areas (AAs).

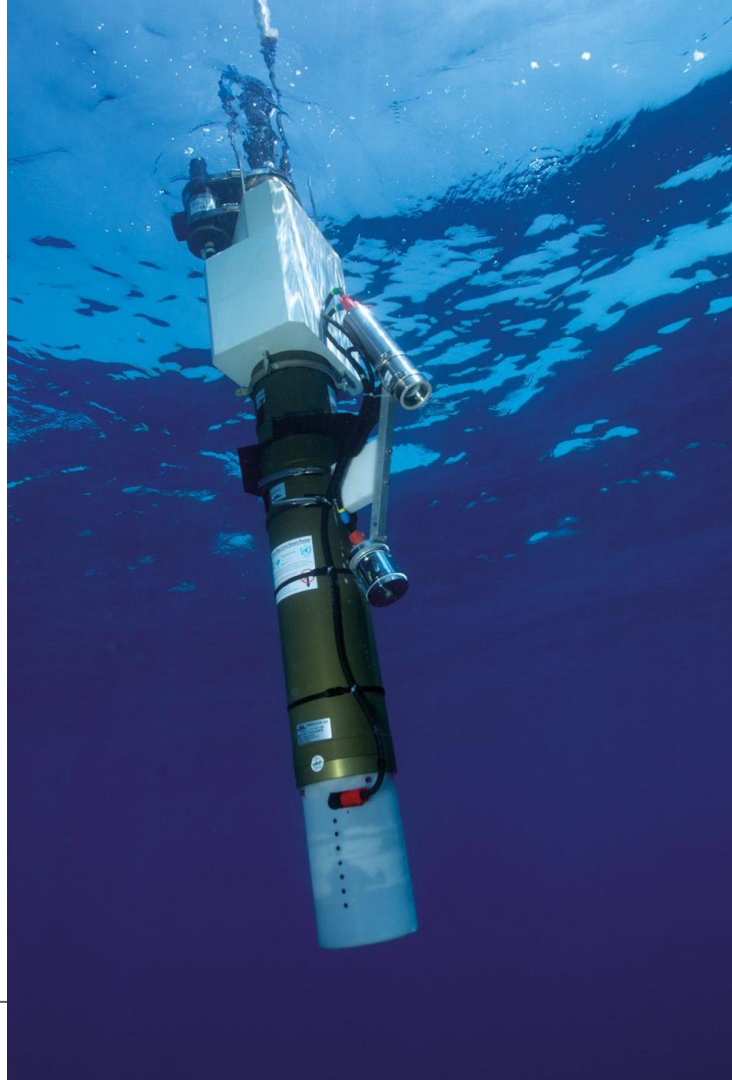
It is also designed to query the needs for existing and developing services, not future services. As the name suggests the RRR is undertaken regularly, and there have been 10 SoGs developed since 2011-2020.



Background – what is GBON

The Global Basic Observing Network (GBON) is a crucial component of the WIGOS framework and was designed to identify the ‘basic’ requirements of global numerical weather prediction (NWP). GBON is mandated, in that WMO Members are responsible for establishing and managing the GBON for areas under their national jurisdiction and for ocean variables are requested to contribute towards maintaining a global network in high seas.

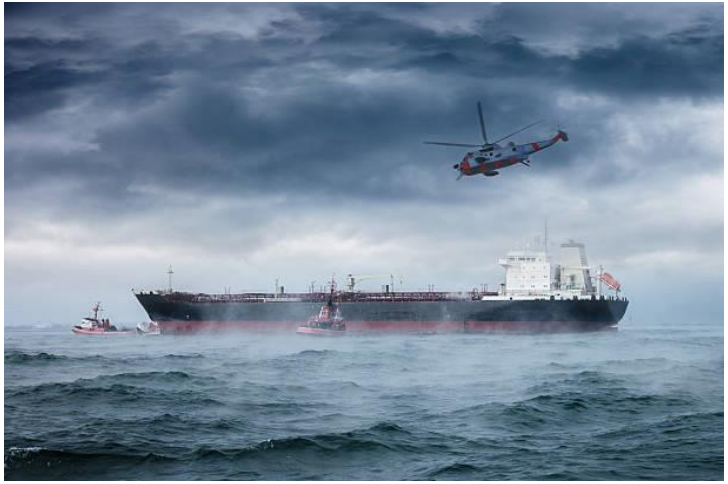
The Systematic Observations Financing Facility (SOFF) was established to enable WMO Members meet their GBON commitments by providing necessary financial, planning, and technical support to less developed countries and SIDs. Currently GBON considers only input from the Atmosphere ESAC, Hydrology is under development and a pathway for Ocean to be a part of GBON is in process.



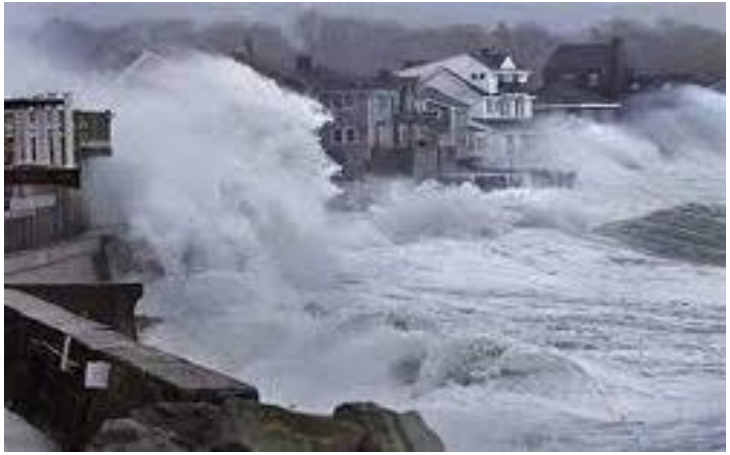
Recent advances RRR

6 AA descriptions approved & published in OSCAR (here):

- 3.1 Ocean Forecasting and Real-Time Monitoring
- 3.2 Coastal Forecasting
- 3.3 Oceanic Climate Monitoring and Services
- 3.4 Tsunami Monitoring and Detection
- 3.5 Marine Environmental Emergency Response
- 3.6 Maritime Safety (ports to open ocean)
- 3.7 Ocean Biogeochemistry



- Variables in OSCAR database – crosswalk variables with EOVs
- Drafting Statement of Guidance (SoG) Ocean ESAC
- Considerable work completed by all AA POCs - taking on a role to consolidate requirements and run gap analyses by variables
- Ocean, Atmosphere and Cryosphere, 3 initial SoGs in prep



Ocean ESAC Application Areas - progress

Activity Area	Definition	Requirements gathering	Gap analysis	SOG
3.1 Ocean Forecasting and Real-Time Monitoring	Complete	Variables in OSCAR. Some new variables and name changes submitted	Completed	Cross-AA summaries by variable groupings
3.2 Coastal Forecasting	Complete	Stakeholder consultations ongoing	Some initial work completed	Some input
3.3 Oceanic Climate Monitoring and Services	Complete	Variables in OSCAR. Some new variables and name changes submitted	Completed	Cross-AA summaries by variable groupings
3.4 Tsunami Monitoring and Detection	Complete	New variables submitted to ET-EOSDE for review	Completed	Cross-AA summaries by variable groupings
3.5 Marine Environmental Emergency Response	Complete	Variables in OSCAR. Some new variables submitted	Completed	Cross-AA summaries by variable groupings
3.6 Maritime Safety (ports to open ocean)	Complete	Variables in OSCAR. Some new variables and name changes submitted	Completed	Cross-AA summaries by variable groupings
3.7 Ocean Biogeochemical Cycles		Due to initiate in 2025		

Activity Areas – Gap Analysis (examples)

Type of Application Area (tick one or more boxes)	Forecasting	☐
	Monitoring	☐X
	Integrated product	☐
	Direct use of observations for services	☐
Point of Contact (Name, Country)	Belén Martín Míguez	
Application owned by (group/body)	OOPC/GOOS/	
Status of observational user requirements in OSCAR/Requirements	DONE	
Date of gap analysis	17 September 2024	

This box shall briefly describe the application area and its observational user requirements.

Oceanic Climate Monitoring and Services covers the set of observations defined by the Global Climate Observing System (GCOS) as essential to detect, model and assess climate change and its impact; support adaptation to climate change; monitor the effectiveness of policies for mitigating climate change; and develop climate information services.

Required variables are defined by GCOS and include 55 variables from three domains: atmosphere, ocean and terrestrial. For the purpose of the AA3.3 14 out of those 55 have been selected:

Gaps are summarised from 2021 GCOS Status Report and draw on the work of the Ocean Observations Physics and Climate panel, and a public review process.

No.	Required Variable (and vert./horiz. domain/s)	Type of gap[1]	Gap description, impact and how it could be addressed	Comments, clarifications, phenomenon observed
1	Sea Surface temperature	1.Geographical	Marginal gaps in coastal regions and areas with persistent high cloud cover	GOOD
2	Sub-surface temperature (called Ocean Temperature in OSCAR)	1.Geographical and vertical 2.Latency	Lack of data below 2000m in open ocean, boundary regions, shelf areas, marginal ice zones, and in enclosed marginal seas Data from EEZs not in real time	MARGINAL

Type of Application Area (tick one or more boxes)	Forecasting	☒
	Monitoring	☐
	Integrated product	☐
	Direct use of observations for services	☐
Point of Contact (Name, Country)	Graigory SUTHERLAND, Canada	
Application owned by (group/body)		
Status of observational user requirements in OSCAR/Requirements	Key variables to be entered into OSCAR/Requirements https://space.oscar.wmo.int/applicationareas/view/3_5_marine_environmental_emergency_response	
Date of gap analysis		

This box shall briefly describe the application area and its observational user requirements.

No.	Required Variable (and vert./horiz. domain/s)	Type of gap[1][2]	Gap description, impact and how it could be addressed	Comments, clarifications, phenomenon observed
1	Surface currents	Geographical coverage Latency Accuracy	Absent from majority of coastal areas. Limited to select regions with HF Radar installations and a few select buoys. Global products are coarse (1/4 deg) and are derived from other observations (altimetery, wind reanalysis) and not directly measured currents.	Important for drift prediction related to MEER. Current status is fair for open ocean applications and poor for most coastal areas.
2	Surface wind	Geographical coverage Latency Accuracy	Some global data available from scatterometers. Available in 12.5 km coastal or 25km global with timeliness of 2.75 h. Wind available from various buoys and coastal weather stations. Not sure about timeliness and availability.	Important for drift prediction and fate and behaviour of oil and other marine pollutants. Current status is fair for open ocean applications and poor for most coastal areas.

Variable		Currents
Impact / need	Surface	Sea surface currents are vital for many ocean forecasting and monitoring application areas. Near-real time and seasonal forecasting, both weather and ocean, benefit from surface current data as they are responsible for transport of heat, salt, passive tracers and pollutants. Information on surface currents also enhances safety of maritime traffic and helps route optimization and increases energy efficiency of shipping. Also, for planning and execution of search and rescue operations at sea information of surface currents is essential.
	Sub surface	Subsurface currents are responsible for the transport of heat, salt, passive tracers and pollutants in the ocean.
Gap Analysis	Surface	Surface currents are available from in-situ and satellite observations. Although the global coverage of satellite data is relatively good its quality does not fully meet the requirements of ocean applications. In-situ observation network including lagrangian drifters, ACDPs and buoys, has sparse spatial coverage. There are gaps, especially in polar, coastal and boundary current regions. Coastal high frequency (HF) radars provide relatively good coverage in coastal regions, where they are present. However, there are some challenges on data availability in near-real time.
	Sub surface	Subsurface current data is available only from in-situ profile measurements, which are very sparse.
Recommendations		· Exploiting future satellite missions dedicated to surface current measurements · Ensuring and improving the quality of remote sensed data. · Increasing the in-situ measurement network would benefit the calibration and validation of satellite data. Increase in in-situ measurement network is most urgently needed in the regions of boundary currents, in coastal areas and polar regions. · Promoting benefits of easy- and open-access data

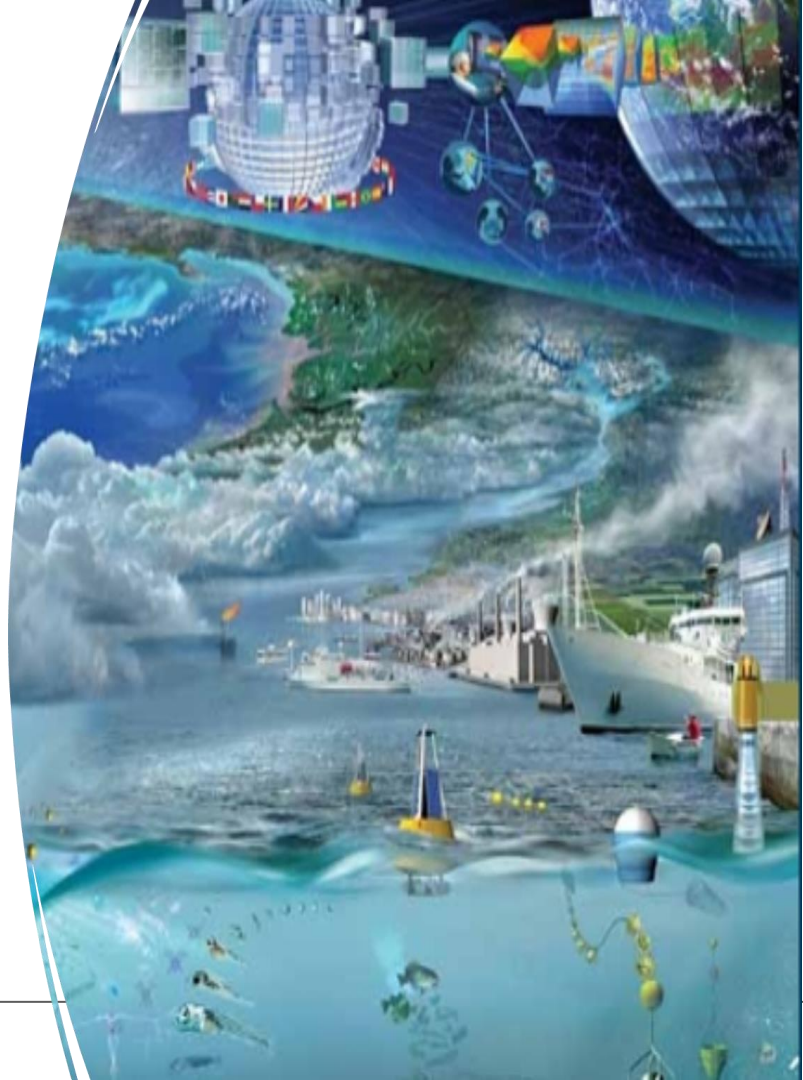
Recent advances GBON

Last session JCB* established two subgroups to work on Observations and Data:

- TT GBON (observations) - Global Basic Observing Network for the Ocean from a WMO and GOOS perspective
- ToRs complete, members under discussion, TT to initiate after April 2025

- GOOS Co-Design Programme is interacting WMO GBON (RBON processes) and with RRR
- WMO is supporting development of Tropical Cyclones, Marine Heatwaves, Storm Surge and Carbon
- Support observing system enhancement for areas without (mature) services or where impact is regional.

*The Joint Collaborative Board (JCB) is mandated to promote high-level collaboration and broad engagement of the relevant bodies of the IOC and WMO.



Next steps

Known 2025

- February complete the Ocean ESAC SoG
- March GOOS/communities review Ocean Atmosphere and Cryosphere ESACs (2 SC member volunteers sought)
- April initiate the JCB TT GBON
- June President of INFCOM signs off the completed SoGs / WMO undertakes communication
- July survey to ground truth the utility of the outcome RRR process – support ObsSea4Clim

Propose 2025

- Q3/4 October hire resources to support the BGC Cycles AA
- Q3/4 GOOS SC Session to discuss GBON as input to JCB GBON TT - analyse output of RRR, co-design process (as known), and others such as CMEMS - towards forming idea of what could constitute an Ocean GBON

2026

- WMO to expand GBON to include the Ocean ESAC (2026?) - with support from JCB GBON work, including defining EEZ and open ocean national responsibilities
- GOOS/WMO develops a model for an Ocean GBON - with support through work of JCB GBON work, including defining EEZ and open ocean, and a generalised approach for requirements setting that leverages existing processes
- Ocean included in SOFF (dependent on more funding arriving, 2027?) - funding for SIDs and less developed countries

2027

- First SOFF ocean projects
- GOOS establishes some early global basic observing system requirements

Existing issues

- Communication on the SoG
- Agreed with WMO
- GOOS

- The path to include more ocean variables in GBON is not clear, post RRR EASAC Ocean completion

- Pass RRR leadership from secretariat to other GOOS leader (WMO support)

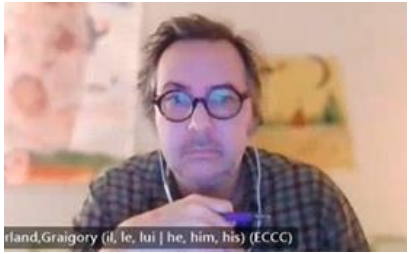
Risks

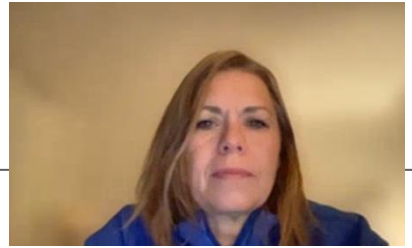
- RRR output not helpful…
- WMO not communicate on SoGs – no visibility for effort
- WMO is providing resources to support Co-Design programme and exemplar development and connection to WMO components and RRR processes. This is foreseen to end 2025
- JCB GBON needs careful thought and resources to develop this work.

Considerations for the SC

- Recommend working with WMO to communicate the outcomes of the RRR work - connected ocean, cryosphere and atmosphere SoGs - recommend
- Working with WMO on a timeline for GBON expansion - set an action
- Does the SC accept an Ocean GBON as a concept that GOOS will commit to define through the JCB GBON TT work, towards GOOS GBON = critical infrastructure
- Suggest a special SC session to consider GOOS/Ocean ‘GBON’ as input to the JCB GBON TT
    - What would it represent? What are the national responsibilities? Based on existing global ocean observing system (now)? Consider recommendations for global existing services from RRR (2025)? considering enhancements from co-design processes (2026)? Consider output from B and C Plans (2027)
- Consider Co-Design as performing an essential role connecting to processes like RRR to support consistent, user orientated, service co-design

ESAC-Ocean Team





The Global Ocean Observing System

Thank you

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Intergovernmental Oceanographic Commission

WORLD METEOROLOGICAL ORGANIZATION

UN environment programme

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