JOINT WMO-IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM)

OBSERVATIONS COORDINATION GROUP

EIGHTH SESSION

Qingdao, China

22 to 25 May 2017

REPORT

JCOMM Meeting Report No. 132

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Weather • Climate • Water


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WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

JCOMM OBSERVATIONS COORDINATION GROUP EIGHTH SESSION

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NOTES

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GENERAL SUMMARY OF THE WORK OF THE OCG-8 SESSION

The Eighth session of the JCOMM Observations Coordination Group (OCG-8) was held at the First Institute of Oceanography (FIO) of the State Oceanic Administration (SOA) in Qingdao, China, at the kind invitation of the FIO and with support of the China Meteorological Association (CMA).

1. Opening of the Session

1.1. Welcome & expectations

The eighth session of the JCOMM Observations Coordination Group (OCG-8) was opened by Dr. David Legler (USA), OCG Chair, at 09:00 on the 22nd May 2017. David welcomed all the participants to the meeting and thanked FIO (SOA) for their wonderful hospitality and recognised their increasing leadership in oceanography.

Mr. Zhi Chen, Deputy Director General, Department of Observation, Forecast and Disaster Mitigation, SOA, welcomed all the participants and stressed that SOA was keen to enhance cooperation, and to learn and contribute to JCOMM/GOOS. A new centre for marine science will open in Xangj, and he anticipated working more closely in the coming years.

Dr. Fangli Qiao, Secretary General of FIO, thanked the meeting organisers (Katy Hill, Emma Heslop, David Legler, Jon Turton, Champika Gallage and Weidong Yu) for their efforts, and noted that it was a great pleasure to host the meeting at FIO. FIO/SOA is the leading ocean institute in China, with a coastal to global scope. The institute recently launched 2 oceanographic research vessels and FIO contributed to TPOS 2020 amongst other programs, thus there are many common interests in ocean and climate observations and opportunity for ongoing and future cooperation.

Dr. Weidong Yu, on behalf of local committee extended a warm welcome to all the participants and

provided logistical information.

On behalf of the Secretary-General of the WMO, Mr Petteri Talaas, and the Executive Secretary of the Intergovernmental Oceanographic Commission (IOC), Dr. Vladimir Ryabinin, the WMO and IOC Secretariat representatives also welcomed the participants to the meeting.

David Legler thanked Weidong Yu and the local team for all their assistance, recalled the objectives of the OCG (TOR's) and the expectations for the meeting, which is largely focused on the review and development of the OCG Work Plan, targeting the development of cross-network initiatives that support the development of the global ocean observing system and to which OCG can add value, and targeting progress towards JCOMM-5 and TPOS 2020. David noted that much progress had been made since OCG-7, with increased engagement with biogeochemical (BCG) community, OceanGlider community, the success of JCOMMOPS, the initiation of network key performance indicators (KPI's) to help communicate on both progress and risks, the development of the first JCOMM Report Card, an authoritative overview of the status of the Ocean Observing System, and progress in coordinating Standards and Best Practice under the new Vice-Chair, Juliet Hermes.

Overall significant progress has been made over the last in 2 years, and OCG is increasingly recognised as a key implementation component for GOOS and WMO. OCG is developing rapidly and although we have made big advances, many gaps remain. This meeting is a key forum to discuss and help shape the areas that OCG will prioritise for the future.

All reports and background documents to this meeting can be found on the OCG-8 website.

1.2. Adoption of the Agenda

The OCG adopted its agenda for the session based on the provisional agenda. The adopted agenda is reproduced in Annex I. The list of participants in the meeting is provided in Annex II.

1.3. Working Arrangements

The meeting agreed its hours of work and other practical arrangements for the session. The Secretariat introduced the documentation.

1.4. JCOMM OCG Work Plan

The JCOMM OCG Work Plan areas formed the basis of the Agenda, with focused discussions on how to progress activities capitalising on cross network synergies in the areas of Requirements, Implementation, Data Management, Best Practices and JCOMMOPS.

Cross network issues, where OCG could play a beneficial role, such as within new technology adoption and expanding/supporting biogeochemical observations were discussed at the meeting and other cross-network issues identified from the reports for future discussion and action.

The updated OCG Work Plan is the main outcome of this meeting, and can be found in Annex III.

2. Regional Observing System Workshop

The morning of the first day commenced with a Regional Observing System Workshop with the aim of increasing understanding of the regional and national ocean observing interests. Identifying activities intersecting with JCOMM OCG mission and work, and developing potential synergies. The presentations provided information on ocean observing activities across the regions from SOA, the Chinese Meteorological Administration (CMA) and the integration with modelling:

- The omitted surface waves in ocean and climate models (Dr. Fangli Qiao, FIO/SOA, China)
- Chinese marine meteorological observation and service (Ms. Chong Pei, CMA, China)
- Western Pacific Ocean Circulation and Climate (Dr. Chuanyu Liu, IOCAS/CAS, China)
- South China Sea observation and regional climate (Dr. Weiqiang Wang, SCSIO/CAS, China)
- Indian Ocean Observation and Monsoon Climate (Dr. Weidong Yu, NMEFC/SOA, China)
- Southern Ocean and Antarctic Observation (Mr. Libao Gao, FIO/SOA, China)

Much was learnt about key regional ocean and ocean/atmosphere phenomena, the observing system infrastructure and contribution to international observing initiatives, and many areas for potential collaboration and exchange were identified. The presentations from all the regional speakers are available on the OCG-8 website.

3. Requirements

Updates and developments within requirements development were heard from GOOS, GCOS and WMO RRR. The TPOS 2020 project was discussed to understand how OCG networks could respond to regional requirements and role of OCG is supporting this. A methodology for mapping global coverage by EOV was discussed utilising the capabilities of JCOMMOPS and WMO RRR.

4. Implementation

Each network provided a report to the OCG prior to the meeting, which provided an update on current networks/activities covering key issues, cross-platform challenges and opportunities, incorporating new technology and future plans. The emerging Animal Borne Sensors network was represented at OCG for the first time. These written reports can be found on the OCG-8 website.

The presentations provided a brief update on the network and focussed on issues for discussion at OCG. Issues were raised and discussed in the context of the OCG Work Plan, actions developed and the cross-network issues summarised later in the agenda. The co-chairs thanked the networks for their thorough reports, which were used to develop a view of cross-network issues.

OCG has been considering what role it could play in supporting the development, assessment, adoption and spread of new in situ ocean observing technologies. Within the network session Matt Mowlem (NOC, Southampton) presented on the landscape and ideas for assessing and integrating new technologies in the global observing system networks. Several gaps that OCG could help fill were identified.

Key outcomes included the identification of cross network areas where OCG could add value in a lead or coordinating role, the adoption of OceanGliders and HF Radar as OCG partner networks, and ongoing OCG support for developing global coordination for a third, Animal Borne Sensors.

5. Data Management & integration

The JCOMM Data Management Program Area (DMPA) Strategy was outlined and discussed, with OCG committing to providing ongoing feedback over the following weeks. Two important OCG data technology initiatives were showcased, data integration with ERDAAP and Open GTS. Both aimed at harnessing new technology to open up access to ocean observing data.

6. Standards and Best Practice

This section was led by Juliet Hermes the new OCG Vice Chair of Standards and Best Practice, firstly providing an update on OCGs work in this area, then addressing a key cross network issue, BGC observations; issues, gaps and needs for BGC standards and best practice.

7. JCOMMOPS

This session provided a review of JCOMMOPS progress, support provided to current networks, including the development of KPIs, JCOMMOPS resourcing and the JCOMM Report Card. A key outcome of this section was the agreement to develop a JCOMMOPS Review in conjunction with stakeholders to assess JCOMMOPS role and how to better support the work of JCOMMOPS over the long term.

8. Cross-network issues and review of OCG-8 actions and recommendations

The cross-network issues identified in the network reports were presented and the OCG-8 actions, decisions and recommendations reviewed.

9. Future Directions

Future events and OCG-GOOS relationship were discussed. A suggestion was made to formalize the GOOS/JCOMM OCG relationship through a GOOS co-sponsorship of OCG, in order to strengthen alignment and feedback, and in anticipation of changes in WMO structure

Presentations and discussion around format and preparations for JCOMM-5, Bali, 22 - 29 October 2017 and the work initiating towards OceanObs'19, which will be a vital and visible forum for the global ocean observing system, an opportunity to update, engage and forward vision.

10. Review & Meeting Wrap up

The OCG-8 Actions, decisions and recommendations were reviewed and are available in Annex IV. An updated list of OCG-7 Actions, decisions and recommendations can be found in Annex V.

The Chair congratulated the Group for the meeting's achievements and warmly thanked SOA for hosting the Session, the participants of the meeting for their contributions, and the Secretariat for their support prior to and during the meeting.

The next OCG Meeting, OCG-9, will be held in Brest France, May 2018, at the kind invitation of JCOMMOPS and IFREMER.

ANNEX I

AGENDA

DAY 1 - Monday 22nd May

1. **Welcome & Expectations**
   1.1. Expectations and objectives of OCG meeting (OCG Chair)
   1.2. Welcome & Arrangements (Local Host, Secretariat)
   1.3. Approval of Agenda

2. **Half-Day Regional Observing System Workshop**

Aims: Increase understanding of regional and national ocean observing interests and activities intersecting with JCOMM OPA mission and work plan. Identify potential synergies.

   2.1. The omitted surface waves in ocean and climate models
   2.2. Chinese marine meteorological observation and service
   2.3. Indian Ocean Observation and Monsoon Climate Study
   2.4. Western Pacific Ocean Circulation and Climate
   2.5. South China Sea observation and regional climate
   2.6. Polar observation and climate change

Journalists engagement after the half day regional observing systems workshop
Group photo morning first day

3. Observing System Requirements

Aims: Review of relevant current targets, discussion of relevance to networks and OPA Work Plan

   3.1. GCOS, GOOS and OOPC: Update on Essential Ocean Variables, GCOS IP actions of relevance to OPA and plans for observing system reviews (Bernadette Sloyan, Katy)
   3.2. WMO requirements for ocean observations - updates (Liu?)
   3.3. TPOS: Role of TPOS implementation/transition team and OCG, how to address TPOS recommendations (Katy and David)
   3.4. Discussion: mapping EOV's and networks, focusing on SST and T at depth as an example, to see how the system functions across networks and identify gaps (Jon Turton)

OCG-8 Meeting dinner to be hosted by SOA on the first day

DAY 2 – Tuesday 23rd May

4. **Implementation**

Aims: Understanding cross-network network progress, coordination challenges, opportunities, risks, enhancements to OPA Work Plan

   4.1. Review across current networks and programs (Brief presentations covering key issues, cross-platform challenges & opportunities, incorporating new technology and future plans. Background documents will have detailed network reports).
   4.2.1 Argo (Toshio Suga)
   4.2.2 DBCP (Jon Turton)
   4.2.3 GLOSS (Gary Mitchum)

4.2.4 GO-SHIP (Bernadette Sloyan)
4.2.5 OceanSITES (Johannes Karstensen or Uwe Send)
4.2.6 SOT (VOS/SOOP) incl. evolution of the VOS/SOOP network (Shawn Smith - remote)
4.2.7 IOCCP (Maciej Telszewski)

4.2. New observing system components:

4.2.8 OceanGliders (Pierre)
4.2.9 HF Radar (Hugh)
4.2.10 Animal marine monitoring (TBD)

4.3. Discussion: Identifying areas where OCG should be addressing synergies across networks (Katy and Emma)
4.4. Discussion: Assessing/integrating new technologies; is there a path to new technology adoption? What different approaches and synergies exist across the networks? Targets/EOV's as drivers? What is the role for OCG? (TBD expert – remote)
4.5. Summary and Actions for OPA Work Plan/JCOMM-5

5. **Data management & integration**

Aims: Develop clear objectives for OCG in relation to data management moving forward; discuss "what next" upon successful demonstration of the open access GTS capabilities

5.1. DMPA Strategy, what is the strategy, how do we engage, and next steps (Eric Freeman)
5.2. Data integration, progress, connection to other activities and global/regional entities (Kevin)
5.3. Open access GTS project - update and discussion on "what next?" (Kevin)
5.4. TT MOWIS - WIS - opportunities (report from Kevin)
5.5. Summary and Actions for OPA Work Plan Work Plan/JCOMM-5

DAY 3 – Wednesday 24th May

6. **JCOMMOPS**

Aims: Review JCOMMOPS progress, reporting via web tools/report to IOC and WMO PR's, increased responsibility to engage with WMO, and assess long-term strategy, incl. resourcing

6.1. Support provided to implementation: current networks, future networks, network KPI's, and KPIs for JCOMMOPS activities (Mathieu)
6.2. JCOMMOPS annual report - targeted at stakeholders (Mathieu)
6.3. Funding & Work Plan: Strategy to secure JCOMMOPS resources beyond 2019. What is the future of JCOMMOPS? Work Plan moving forward, actions JCOMM-5 (Mathieu)

7. **Standards and Best Practice**

Aims: Introduce direction & progress OCG S&BP, discuss cross networks approach, develop plans

7.1. Vision/goals/next steps for JCOMM OCG S & BP activities (Juliet)
7.2. Best practices and standards for BGC (GO-SHIP, OceanSites, bioArgo, gliders, etc.) (Maciej to lead presentation and discussion - coordinate with Juliet)
7.3. Summary and Actions for OPA Work Plan Work Plan/JCOMM-5

8. Cross-JCOMM coordination

Aims: using waves, understand value, feedback to networks, role OPA in supporting service development, other examples

8.1. Waves, Seasonal Forecasts example, linking OPA - DMPA – Services (Nick)
8.2. Actions for OPA Work Plan Work Plan/JCOMM-5

9. **Future Directions**

Aims: Input to forward strategy for OPA

9.1. GOOS Strategy, new networks, relationship OCG (Albert)
9.2. Synthesis of key ideas and work plan priorities

Close meeting before 18:00 – secretariat prepare actions for agreement the following day

DAY 4 - Thursday 25th May

9. Future Directions - continued

9.3 OceanObs 19 (Katy)
9.4 Review preparation JCOMM-5

10. Review & OCG-8 Wrap up

9.3. Review and agree OCG-8 decisions, actions and recommendations
9.4. Dates and location of next meeting

Close meeting.

ANNEX II

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ANNEX III

WORK PLAN: 2015-2020.

2017 UPDATE

OBSERVATIONS COORDINATION GROUP

EIGHTH SESSION

Qingdao, China

22 to 25 May 2017

Work Plan: 2015-2020

2017 Update

Updated following the 8th Session of the JCOMM Observations Coordination Group.

Contents

1. Introduction/Context

The Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) Observations Programme area is one of 3 JCOMM Programme Areas; the others are Services and Forecasting Systems and the Data Management Programme Areas.

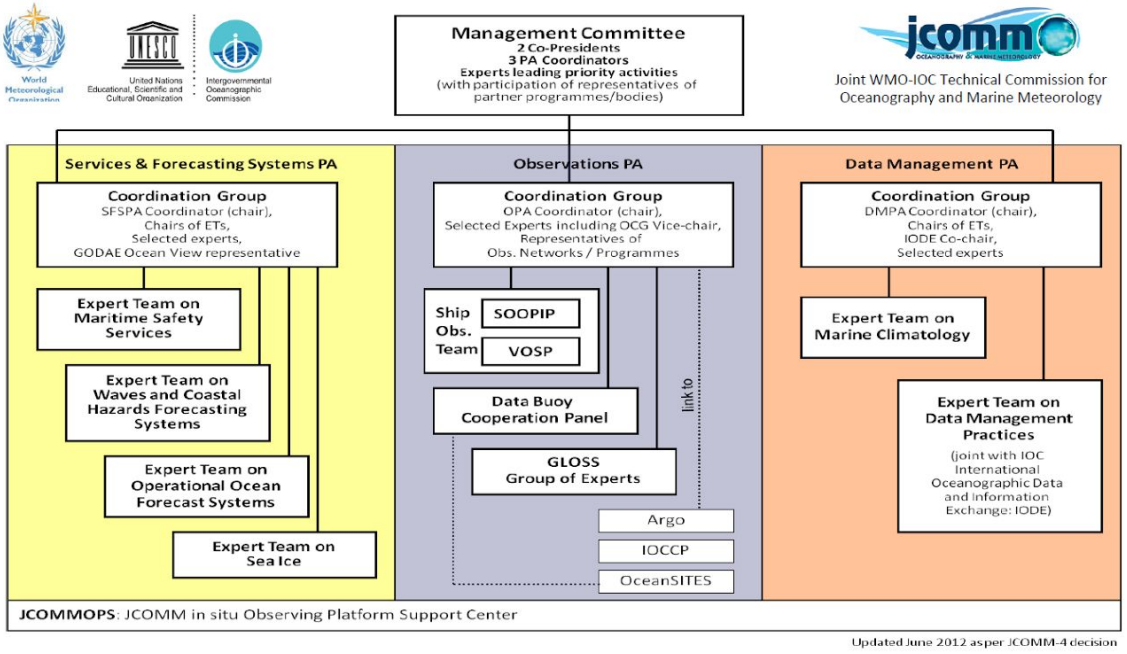

Figure 1. JCOMM organisational structure

The Observations Coordination Group comprises representatives of the major networks involved in observing oceanography and marine meteorology. The OCG Work Plan is to identify areas where we can improve the technical coordination and implementation of the ocean observing system, and capitalize on the strengths and synergies of the major observing networks. While there are core existing JCOMM OCG partner networks, OCG is also actively reaching out to emerging networks.

While the observing networks have their own coordination mechanisms, there are many commonalities between networks and opportunities to build on synergies, increase efficiency and observing system resilience through enhanced inter-network communication; for instance, in reporting status metrics; deployment, logistics and ship time, sensor development and calibration, data flow, metadata standards, and quality control.

The aim of the Work Plan is to set the focus for OCG activities for the coming years, under a core set of work areas that capitalize on the strengths and synergies across the networks, and on technical coordination to meet the requirements for a global ocean observing system. The Work Plan provides a framework for the agenda of each OCG meeting, and the resulting actions, help us to focus intersessional activity. The horizon for the current OCG Work Plan is 2013 - 2020 and it is updated annually following the OCG meeting. This document represents the update 2017 following the OCG Eighth Session (Qingdao, China, May 2017). Articulating the focus areas and coordination activities in this way enables OCG to communicate our role to the broader community

and to any emerging networks or potential partners who may want to engage in the Work Plan activities.

The OCG works closely with the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), which focuses on setting observation requirements and observing systems design. The OOPC also implements a 5 year Work Plan (currently 2013-2018), which targets:

- Evaluating requirements for observations of Essential Climate Variables (ECVs) and Essential Ocean Variables (EOVs), reporting through GCOS and GOOS, and developing variable based observing system performance metrics
- Working with JCOMM OCG on developing network targets in response to requirements for variables, and assessing network performance
- Running systems based evaluations to ensure the observing system in particular domains collectively meets the requirements

The JCOMM in situ Observations Programme Support Centre (JCOMMOPS) is charged with the technical coordination of the individual networks, with the following vision: JCOMMOPS occupies a unique place as the focal point for the practical co-ordination of the in-situ ocean observing system defined by JCOMM. Its role consists of the following core objectives:

- to assist in the implementation and deployment of the observing networks through close interaction with programme managers and platform operators, and through Capacity Development and outreach;
- to assist in establishing, maintaining and verifying mechanisms for the timely exchange of data and metadata, including the facilitation of quality control and archival functions;
- to develop the consistent set of tools needed to monitor the status of the observing system and its attendant data and metadata distribution, so as to identify action areas and improve the overall effectiveness and development of the system.

JCOMMOPS goals and objectives, are complementary to and support the aims of the JCOMM OCG Work Plan, focusing on providing technical support and tracking implementation across the networks, with an emphasis on building on synergies and leveraging opportunities across the networks.

2. Key influencers, horizons & timelines

There are a several programmes and activities to consider when planning OCG activities, to ensure their impact is aligned with the needs and requirements of a global observing system.

The Global Climate Observing System (GCOS), which has a 5-7 year planning and reporting cycle the current GCOS Implementation Plan was developed during 2016 (see 3.1 for details) and describes requirements for the observation of Essential Climate Variables (ECVs), and identifies actions for the next 5 years to meet these requirements (i.e. network targets).

The Global Ocean Observing System (GOOS), is developing a Strategic Map of GOOS, a living document, highlighting the interconnectedness of the system and delivery to key application areas

(Climate through GCOS, Real Time Services through JCOMM and GODAE OceanView, and Ocean Health), see 3.1 for details.

Requirements are also communicated through the WMO Rolling Review of Requirements (RRR) process, to gain the attention of National Meteorological Services (NMS), which contribute to many of the marine and oceanographic observing networks..

Key planning horizons are as follows:

2016 - 2019: WIGOS Implementation Phase.

2017: JCOMM-5 Session. An opportunity to revisit JCOMM and OCG organisational structure and gain support for observational plans and targets.

2019: OceanObs'19: An opportunity to revisit the performance of the observing system and for the community to discuss how to better meet current and emerging requirements (e.g. through new technologies and regional pilot projects such as TPOS-2020).

3. Requirements

To communicate and advocate for the development of the ocean observing system, requirements are developed through a number of fora to ensure that the range of stakeholders and implementers of ocean observations are engaged.

JCOMM OCG works primarily with the OOPC on setting requirements for observations. This requirements setting is an iterative process, which considers cost and feasibility of observations, versus their value or impact. OOPC has its own Work Plan (2013-2018), which is reviewed and updated every year. This focuses on setting requirements, assessing observing system performance by variable and systems based evaluations of the observing system, to guide the transition or expansion of the observing system. To enable the consistent communication of requirements for observations, Essential Ocean Variable (EOV) Specification Sheets have been developed to articulate the requirements for the observation of a variable, its applications, the processes/phenomena that need to be captured, and how the observations of variables come together to meet these requirements. This articulation of requirements is led by the OOPC and will enable the eventual evaluation of the observing system by variable.

Below are summarised the developments in the observing system requirement space, GCOS, GOOS, WMO RRR and regional initiatives, that influence the OCG Work Plan moving forward.

3.1 GCOS, GOOS and OOPC

GCOS have developed Essential Climate Variables (ECV), to assess the adequacy of the earth observing system and develop forward plans to inform science, assessment and policy. The Ocean Observation Panel for climate under GCOS is GOOS OOPC.

2017 Update

The current GCOS Implementation Plan (2016) was approved by the UNFCCC Conference of the Parties (COP 22), Marrakech 2016, and includes essential climate variables (ECVs), indicators and actions to support the Paris Agreement goals. The plan aims to fulfil observations for 6 key areas:

- Characterize the state of the global climate system and its variability
- Monitor the forcing of the climate system, including both natural and anthropogenic
- Support the attribution of the causes of climate change
- Support the prediction of global climate change
- Enable projection of global climate change information down to regional and local scales
- Enable characterization of extreme events important in impact assessment and adaptation and for the assessment of risk and vulnerability

Mitigation and adaptation is seen as an increasing need. The atmosphere, ocean and land have separate systems for observations but all are connected to understand major planet issues – the new GCOS Implementation Plan aims to improve the monitoring of global climate cycles. This includes global water cycle, carbon budget, sea level, global energy balance, changing conditions of the biosphere etc. The Ocean Chapter talks about the needs for ocean observations, strengthening biogeochemical and biological monitoring, actions for data and product delivery, ECV based actions and observing system design and innovation. Plus the need to 'sell' the need for sustained observations to justify national investment. GCOS have a structured planning formula, 1) Adequacy, 2) Requirements, 3) Progress.

GOOS focus is on ocean observations for societal benefit in 3 key application areas: climate, services and ocean health. The planning process is fluid, requirements are articulated and then how to deliver this through a mix of platforms and communities is evaluated. GOOS scientific oversight has 3 Expert Panels, physics (OOPC), biogeochemistry (IOCCP), and biology & ecosystems (GOOS BioEco).

Important components of the GOOS strategy/structure are the Essential Ocean Variables (EOVs), which come from the requirements, readiness level to support the requirements and data availability. The EOVs are divided into physics (also all ECVs and most mature in terms of readiness level), BGC (most are also ECVs and most mature), Biological (only a few are also ECVs, most pilot and early). Other components are observation coordination, undertaken through the JCOMM Observations Programme Area (JCOMM OPA), GOOS Regional Alliances (GRAs), and specific project development, for example AtlantOS, TPOS 2020, the Deep Ocean Observing Strategy (DOOS), and GOA-ON.

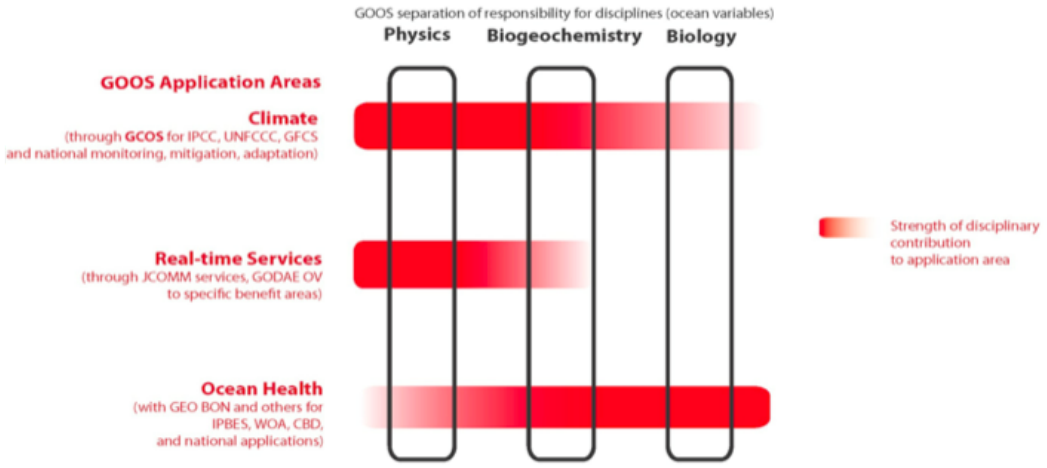

Figure 2: GOOS structure - how the panels deliver to key application areas

GOOS OOPC focus for 2017 - 2019

- Review system for ocean heat and freshwater content
- Closing gaps/expanding – boundary currents
- New variables - air-sea fluxes, ocean surface stress

Key messages for JCOMM OCG:

- GOOS provides an important link to UNFCCC
- GOOS is expanding to deliver observations for climate, services, ocean health
- OOPC provides the information conduit between GOOS and GCOS
- Engagement is needed from networks for; multi-platform observing system design, delivery of observations by variable and assessing performance

1	Action	OOPC to contact OCG in order to gain input to the current ocean heat and freshwater observing system reviews, through this process OCG will also gain insight into the observing systems requirements	Katy Hill	Reviews to OCG Exec	June 2017	3.1

2	Action	JCOMMOPS to track progress of networks against relevant GCOS implementation plan targets. This info will be posted/updated on the JCOMMOPS website	JCOMMOPS	JCOMMOPS website page/s	Sept 2017	3.1
3	Recommendation	GOOS to connect with JCOMMOPS for the development of the Network Specification Sheet database, to ensure knowledge developed in JCOMMOPS is leveraged for consistency across reporting systems	GOOS, JCOMMOPS	Synergy explored	Sept 2017	3.1
4	Action	China to provide the cruise plan for the SO to JCOMMOPS for inclusion in the ship operations database	Weidong Yu	List of planned cruises	July 2017	3.1

3.2 WMO requirements for ocean observations (RRR/OSCAR)

Observing Systems Capabilities Analysis and Review tool (OSCAR[1]) is a component of the Rolling Requirements Review process for recording observational requirements and observing capabilities (both space-based and surface-based), and conducting critical reviews of how well the capabilities address the requirements.

OSCAR has three components: OSCAR/Observational Requirements (well established), OSCAR/Space Capabilities (well established) and OSCAR/Surface Capabilities (under development). OSCAR/Requirements supports the WMO RRR process, with 14 application areas defined each with a designated point of contact: Guimei Liu is the contact for Ocean Applications and presented the update on this area, however ocean observations are important in several other climate and prediction related application areas. OOPC is the designated contact for the climate application area, however JCOMM OCG should aid in developing the structure for how information is passed into this system, so that the information available to OSCAR users is as accurate as possible. This is important as some countries look to OSCAR to guide investments, it is used mainly by the meteorological community but not only them, and is relevant to observing system budgets. For example, Ms Chong Pei, CMA China, highlighted the importance of the RRR in the design of their marine meteorological and terrestrial observing network. However the WMO structure of responsibility for areas that include ocean variables is dispersed and complex.

[1] http://www.wmo-sat.info/oscar/

2017 Update

Guimei Liu, WMO responsible for the Oceans Applications area, would like to gain support from the OCG observing community input to RRR on HF Radar related variables, tsunami related variables (OSCAR/RRR), sea ice variables (OSCAR/RRR), see actions below. In addition WMO secretariat will work on understanding and developing appropriate links for the flow of information on variables and phenomena from OOPC and OCG into OSCAR/RRR (see actions below).

(Also see section 3.4 where the use of the OSCAR in creating EOV based coverage maps was discussed and a pilot for SST and T at depth proposed).

5	Action	OCG (WMO secretariat) to establish the appropriate methods and contacts for OOPC/OCG to feed into RRR across the range of application areas related to oceans/climate	Katy Hill, Champika Gallage	Engagement WMO-RRR to OOPC/OCG	Sept 2017	3.2
6	Action	WMO to review ocean application documents for inclusion of HF Radar information - Hugh to carry back the message to HF Radar network to see how to respond	Hugh Roarty	Advice/contact provided to Guimei Liu	July 2017	3.2
7	Action	DBCP to suggest experts to provide advice to WMO-RRR to enable the addition of tsunami related and sea ice related variables into OSCAR for ocean applications area, e.g. possible sea ice expert team Smolensky, DBCP tsunami team	Jon Turton	Guimei Liu to be provided appropriate contacts	July 2017	3.2
8	Action	OCG to suggest sub-application areas for the currently single ocean application area of the WMO RRR	Emma Heslop, Katy Hill, Champika Gallage, Guimei Liu, Nick Ashton	OCG roundtable call June	June 2017	3.2
9	Action	Provide Guimei with EOV specifications for mapping differences and connection to OOPC	Katy Hill	EOV's and connection to OOPC	June 2017	3.2

3.3 TPOS 2020: Implementation & Transition

TPOS 2020 is a finite lifetime regional observing system re-design project for the Tropical Pacific. It is a distributed effort by many institutes and countries to meet the integrated observing need of the region, under a design umbrella that considers the needs from various communities, including oceanography, meteorology, modelling and satellites, and includes both sustained and experimental observations in a single design that is focused on delivering socio-economic benefits. It was initiated due to the decline in ocean observing capacity in a region dominated by processes that are vital to our understanding and forecasting of global climate, namely ENSO. It ends in 2020, at which time the sustainability of the system will need to have been addressed. This is a regional system that is vital to the global climate on many scales and OCG has been supportive of the development of the project.

2017 Update.

A first report (2016) provided 22 key recommendations and 14 actions, amongst these changes and improvements to the observing system design, with testing through pilot systems and assessment of new technologies, enhancements to capture surface heat and freshwater fluxes (GOOS Recommendations), and to reconfigure the moored array to target equatorial current and the mixed layer. JCOMM is the primary external sponsor, with WIGOS, GOOS and GCOS as key additional stakeholders. The Transition & Implementation Strategy developed from this report has been adopted by JCOMM (MAN-13) and WMO EC (who supported and encouraged OCG to consider this approach in other regions). The 2nd Resource Forum Meeting (2017) endorsed the recommendations and recognised TPOS 2020 is a regional observing system, important to other areas and global issues. With strong support articulated at the meeting, it could be expected that there support for enhancements to the network.

Intersections foreseen with JCOMM OCG:

- Impact of recommendations on networks; Argo, DBCP, Gliders and BGC
- Lessons applicable to other areas (Atlantic, Indian)
- Opportunity for OCG to become a stronger implementation coordination panel:
    - Updating requirements
    - Coordinating pilots
    - Standards & Best Practice for new EOV/instruments
    - Data management, capacity building and services
- Discussion with networks regarding TPOS first report and proposed changes
- Should OCG participate in the Transition & Implementation Task Team (T&I TT)

JCOMM OCG involvement update:

- DBCP tropical array is part of backbone and team involved
- Argo aware of the design recommendations, plan is for 100 additional floats per year, it will be matter of resources, but is being discussed
- Gliders participated with report, but had impression that there was a lack of enthusiasm for integrating new technologies, however this is a review recommendation (see above).
- Kevin O'Brien (NOAA) will assist with dataflow using ERDDAP (see section 5.2)
- Regionally SOA will contribute, 1) through existing network 2) doubling Argo in West Pacific region, and 3) supporting moorings and data flow in West Pacific region

The changes for Argo and DBCP networks will be addressed by the respective network steering committees, with OCG taking an overarching role as required, such as coordination between OceanSITES and DBCP

OCG feedback for TPOS 2020:

- Important to check evolution and continuity of the variables if revisions made, is this part of data management planning?
- If requirements for observing in the tropical Pacific are now revised should these be embedded in WMO RRR?
- TPOS 2020 has a potentially strong impact on regional fishing and local climate etc. how is the project connecting to local concerns, FIO would encourage pilot action in this regard

1.1.1 3.4 Mapping EOVs, assessing cross-network coverage to fulfill requirements

A proposal from Jon Turton (OCG Vice-Chair, Met Office, UK) was put forward for mapping EOVs across networks to gain a view of coverage by variable. Mapping by variable could provide information on gaps and needs and also enable a view of the data available from a user perspective, as users often concentrate on variables, such as wind and waves for maritime operators, rather than the networks they came from.

The proposal uses the requirements from OSCAR by region (given as uncertainty, horizontal resolution and periodicity) and a methodology for estimating coverage already used for the global drifter array (Lumpkin et al., 2016) to create global maps of coverage by EOV. The proposal was discussed and supported across OCG as a good approach. There was some discussion about how this maps with the GOOS approach of coverage of phenomena. However this proposal was seen as a beneficial first step that will also assist in assessing if the requirements in OSCAR are relevant, it is however possible a different discussion is needed across GOOS panels on capturing phenomena. It was decided that a pilot for SST and T at depth would be developed by Jon Turton and JCOMMOPS, with assistance from Kevin O'Brien for additional data access using ERDDAP.

10	Action	Jon to work with JCOMMOPS to scope & develop a demo for showing SST and subsurface T variable based metrics and coverage (based on requirements from the OSCAR database) for quantifying and mapping global EOV coverage (following the approach by Lumpkin et al for drifters). Kevin to provide assistance for historical/other data sets	Jon Turton, JCOMMOPS, Kevin O'Brien	1 page doc on what required / web page demo	July 2017 / Oct 2017	3.4

4. Observing System Implementation

4.1 Review across current networks and programs

To advocate for support for ocean observations, clear network targets need to be developed and communicated through GCOS, GOOS, JCOMM and WMO Rolling Review of Requirements. Clear targets are also needed to enable us to articulate the status and performance of the observing system.

OCG have worked with OOPC and the networks to develop Network Specification Sheets to articulate the role of components of the observing system, highlight interdependencies, missions, and to set targets for implementation. A consistent set of Network Specification Sheets will be made available for JCOMM-5 (October 2017).

In addition the networks have been asked to develop performance indicators (KPI's), in line with their mission targets for the development of the first JCOMM Observing System Report Card, this will be an annual report that provides a high level overview of the status and health of the Global Ocean Observing System (see section 7.3).

JCOMM networks, partner networks, projects and emerging networks were all represented at OCG-8. All networks and projects provided a report to OCG prior to the meeting, which covered the following points:

- Current status, successes, issues and opportunities
- Future plans
- Cross cutting issues
- New technology developments

Reports from the OCG networks, partner networks and projects are available on the OCG-8 website:

http://www.jcomm.info/index.php?option=com_oe&task=viewEventAgenda&eventID=1919

Before the meeting a summary of the cross network issues was compiled for discussion across the networks (see section 4.3), the feedback from which will help guide the ongoing focus of OCG coordination activities. In addition, a specific discussion on the cross network adoption of new technologies was held (section 4.4).

4.1.1. Argo

The present Argo array is healthy, though coverage in the far southern latitudes remains inadequate. Real time data streams are healthy, and delayed-mode data streams are recovering from a major format change. Argo is moving from its original design (3000 floats) to a global more spatially complete design (3800 floats). In addition work is well underway on pilots for other major mission; Deep Argo to address sea level rise and the global ocean heat budget has 4 trial areas N/S Atlantic, Southern Ocean, S Pacific; BGC-Argo (or Biogeochemical Argo) has 3 regional pilots underway in Mediterranean, Southern Ocean and the Atlantic; and regional enhancements, where greater signal to noise is required or better time/space resolution.

Overall the outlook is positive, the core array is healthy and the extensions valuable and feasible. Argo faces immediate challenges in managing the growing complexity of its data stream, in

accessing the global ocean due to either political or logistical barriers, and in driving forward ongoing technology improvements for efficiency. The challenges for longer-term sustainability and succession are also being discussed.

Internal issues:

- Leadership renewal
- Technology evolution and supplier risk
- The operational/research support
- Managing community expectations and fiscal reality.
- Balance between data completeness and ease of vs. adoption of new or novel data streams. New data streams has rapidly raised the complexity of the data system, impacting data management teams and users. As an interim solution, Argo is allowing a new file type – 'auxiliary' – which can be used to distribute non-official Argo parameters e.g. velocity shear. Auxiliary data must still be freely available and documented to some degree, but is not monitored for conformity in content or format.

Cross-network issues:

- Developing and maintaining syntaxes is extremely time consuming. Argo would appreciate progress on the creation and documentation for parameter syntax, technical names and metadata across networks.
- Southern latitude coverage remains inadequate
- EEZ clearance issues impact operational issues around access to remote or politically challenging regions, e.g. Arctic or Marginal Seas access.

The meeting agreed that there were challenges to be faced in consistency on syntax for variables across networks, mainly from BGC-Argo variables, and that the same issues also exist for moorings and GO-SHIP.

There was general agreement that vessel coverage is particularly acute in the Southern Ocean and that coordination to take advantage of all/any ships operating there is to be desired. JCOMMOPS maintains a ship list and is aware of 3 or 4 ships going to the Southern Ocean next year, in addition the advice is if ships are identified then multiple floats should be released, there is probably a need to better promote the visibility of the JCOMMOPS Ship List. Argo noted however that an opportunistic approach is not sufficient to gain coverage, and that a dedicated program (charters and potential merchant ship recruitment through SOT - see 4.1.3) is required to increase coverage.The ice-avoidance algorithm to avoid surfacing in ice in high latitudes is working for the Southern Ocean but needs further refinement for the Arctic.

Support from GRAs has been useful in dealing with issues of EEZ deployment and sampling, Argo noted that it would have been impossible without regional cooperation and communication.

4.1.2 GO-SHIP

GO-SHIP provides approximately decadal resolution of the changes in inventories of heat, freshwater, carbon, oxygen, nutrients and transient tracers, covering the ocean basins from coast to coast and full depth (top to bottom), with global measurements of the highest required accuracy to detect these changes.

There remains a clear lack of fundamental understanding of global ocean heating and cooling rates and carbon content changes, which are vital to for baseline the global heat and carbon budget and setting international assessments of global change etc. The need for high accuracy, global scale inventories undertaken by GO-SHIP remain strong, and new missions such as BGC-Argo rely heavily on GO-SHIP as a reference for calibration.

Update 2017

GO-SHIP is increasingly moving towards additional sampling for BGC and ecosystem support. It is actively working with the biological community to develop protocols so that these parameters can be obtained on GO-SHIP reference sections (decadal core) and GO-SHIP associated sections (more frequent, fewer variables on inventory) for EOVs, without compromising mission (plans, sampling, etc.)

Major advancements have been made in terms of visibility for the GO-SHIP network, which has had an impact on funding and sustainability. The support of Martin Kramp, Ship Coordinator JCOMMOPS was noted, and sustained funding for support of work through JCOMMOPS is being sought.

The hydrographic best practice manual is under review, including work for carbon parameters and sampling protocols. A community paper on GO-SHIP and carbon has recently been published (Talley et al. 2016). Data are submitted with national support for bottle and CTD data to CCHDO, ADCP data will be submitted to centres in Hawaii and France. For surface and biology parameters, work is in progress to find a DC to host and process these data.

The network is now 54 reference lines per decade, with 87% currently funded/likely funded. Increasing the spread of international participation has been one of the GO-SHIPs aims as spreading the responsibility for lines across nations makes the network less vulnerable. This has gone hand in hand with important capacity building work for new GO-SHIP line operators, e.g. the Irish A2 line with support from US, Canada and AtlantOS, and the German A10 line with contributions from France, Brazil, South Africa, Argentina and AtlantOS.

Foci for the next 12 months include:

- Complete planning of the current survey, and begin planning for the next decadal survey
- Involve more countries in GO-SHIP
- Complete the manual on best practices review and publish – IODE/IOC
- Continue to work with biological plankton community to develop variables for sampling
- Track data-flow to CCHDO (Scripps) data archives, 90% of data is received within 2 years, the focus is on quality control
- Develop GO-SHIP KPIs
- With JCOMMOPS complete the inventory of past surveys

Weidong Yu (SOA) noted the recent launch of a new Chinese RV and asked how could SOA get involved with GO-SHIP, procedures for capacity building, etc. Vice-Chair Bernadette Sloyan will discuss this with Weidong (SOA) in more detail over the coming months, however there are potential vacant lines in the region and GO-SHIP is eager to discuss meaningful participation with SOA.

Cross-network issues:

GO-SHIP was asked whether combining BGC data from Argo and GO-SHIP into one product in the future would be useful. GO-SHIP has worked with BGC-Argo on data quality and believes that combined data products would be well received. Argo sampling density will help with higher resolution regional changes and variability that GO-SHIP reference lines do not capture, although challenging it can be done.

11	Action	GO-SHIP Co-Chairs to engage with Weidong Yu regarding potential Chinese involvement in GO-SHIP, sampling currently vacant lines, capacity building etc.	GO-SHIP Co-Chairs	Chinese engagement in GO-SHIP	OCG-9	4.1.2

4.1.3 SOT

SOT comprises the following networks:

- VOS
- SOOP
- ASAP

It was noted that Shawn Smith (presenting for SOT at OCG-8) is the SOT Vice-Chair and that SOT still needs to find a Chair or Co-Vice Chair.

Update 2017

SOT-9 was recently held in London (IMO, March 2017), the key outcomes were:

1. SOT agreed to formalize its management structure by establishing an Executive Board (EB) and Executive Committee (EC), following the example of DBCP. The purpose of the new structure is to improve coordination across SOT, ensure the SOT panel leads and Task Team leads are in communication, and to manage SOT funds.
2. A new key performance indicator task team (TT-KPI) was established, to review the existing SOT KPIs and develop new metrics that better define the status of VOS, SOOP, and ASAP activities. The TT-KPI already provided preliminary metrics (12/06/2017 SOT Vice-Chair) for the JCOMMOPS Report Card, these will be refined over the coming year.
3. SOT has agreed to adopt a unique identifier (ID) scheme for platforms and instrument systems. The new SOT Station ID scheme (list) will be maintained by JCOMMOPS and the platform ID's will be issued according to the wider JCOMM ship list within the WIGOS metadata scheme. This scheme also solves the problem of ship 'masking', as the link between instrument package and hosting ship will be hidden from public view if a ship must be 'masked', meaning the instrument metadata are available, but no ship metadata. It is noted that other JCOMM panels use WMO IDs, but eventually all could be assigned by JCOMMOPS (on behalf of the members). These instrument packages can be mounted on hosting ships which also contribute to other observing panels, all instruments refer to a shared JCOMM ship list, which SOT agreed should use the ICES code as unique identifier.
4. New compliant metadata for WIGOS has been developed for VOS. SOOP and the Automated Shipboard Aerological Program (ASAP) will develop WIGOS compliant

metadata with the aim of being ready by early 2018, the SOOP panel will include pCO2 metadata.

5. Related to the above, SOT-9 agreed that WMO Publication No. 47 (Pub 47) should be frozen at the current version 4.2, archived, and the contents transferred into the JCOMMOPS database. By freezing the current Pub 47 metadata format and creating and implementing a new, composite format, SOT observing networks will be better positioned to make the changes required to comply with WIGOS metadata requirements. By offering the flexibility currently available to other JCOMM observing networks (e.g. DBCP) and not being subject to the current WMO validation procedures, modification of the metadata structure will be much faster and more efficient and will ensure that changes are possible within the WIGOS implementation period. By establishing JCOMMOPS as the main metadata repository, this will not only reduce the need for duplication of effort by national VOS operators, but it will reduce the need for national metadata databases altogether and will ensure that all relevant WIGOS metadata are directly uploaded into the OSCAR database.
6. A proposal to reduce the number of VOS class down to three was approved. The three new VOS classes will be as follows:
    a. Ships that are recruited by a national meteorological service which also supplies the necessary observing instruments, sensors and equipment (*NMHS Operated)*
    b. Ships that are recruited by a national meteorological service but use their own instruments, sensors and equipment (*NMHS Cooperative*)
    c. Third party support ships that are not recruited by a national meteorological service but contribute to the VOS Scheme (*Independent*)

    Changing to these new classes will require modifications to the VOS metadata scheme, how these classes are reported and documented by PMOs. The Task Team on Metadata will develop precise definitions for the three classes and make proposals on how the new third party ships should be administered and supported in the future.

7. The drifter donation program has been discontinued; the process was burdensome for applicants and ultimately unsuccessful. However, SOT may investigate other capacity building schemes for developing countries (e.g. an AWS donation program), in collaboration with OCG and other observing networks.

To discontinue ID masking and encode/decode an EC resolution required, this will be put forward for approval by JCOMM-5 and then EC.

A simpler committee structure was suggested, and it was agreed that the executive board would be the decision making body of SOT and the broader executive committee used for consultation. Additionally there was some discussion around the unique ship ID (now to be managed by JCOMMOPS), WIGOS ID's/metadata and other networks, however the issues are complex and in part related to the future role of JCOMMOPS. The role of JCOMMOPS will be discussed at JCOMM-5 and this issue can be clarified at a future date.

Cross network issues:

A specific panel session was held at SOT-9 focused on developing a roadmap towards the common goal of recruiting additional vessels to support meteorological and oceanographic observations. The panel included representatives from ICS, IHO, WOC, IMO, SOT, IOC, JCOMM SCG, and JCOMMOPS, it addressed the needs of SOT and also examined benefits to other panels within JCOMM (e.g. DBCP etc.) and other stakeholders such as IHO. The general

consensus was that a top-down recruiting approach is a good idea and considerable interest and support was expressed from all the external parties (e.g. IMO, WOC, IHO). The next steps included formulating a working group with representatives from SOT, WMO, IOC, and the agencies from the panel. Since this effort should benefit the wider JCOMM vessel recruitment efforts, other networks were invited to consider membership to this working group. The working group will be charged with developing a "shopping list" for vessel operators (what sensors, measurements, etc. do we wish to make from their vessel) and a roadmap that establishes short and long-term objectives. Additionally, the working group will identify a vessel operator/community for a pilot project in a priority observation area (e.g. Southern Ocean).

SOT-9 also discussed details of metadata requirements to meet the needs for WIGOS implementation across VOS, SOOP, and ASAP. Throughout the discussions the SOT noted that there needed to be consistency between metadata requirements across JCOMM panels (e.g., SOT, DBCP). Is there a need for cross-cutting working group to ensure consistency in metadata collection across JCOMM networks?

There is a need to coordinate amendments to MSC Circular 1293 and the Polar Code which have been proposed by SOT and EC-PHORS, respectively, to ensure that these amendments do not present conflicting messages to IMO/vessel operators. WMO Secretariat has already taken the lead on this coordination, however there are a number of issues to connect, Polar Code review (EC-PHORS), MSC Circular 1293 (SOT), also bathymetry from ships (IHO).

12	Decision	SOT organizational changes (Executive board and Executive committee) agreed to go forward, Executive board to have decision making power	SOT Vice-Chair	Forward to JCOMM-5 for approval	June 30 2017	4.1.3
13	Action	SOT to circulate draft of ship forum report to other networks to see if want to join the proposed ship forum team.	Emma Heslop	Forward report & gain feedback	May/June 2017	4.1.3
14	Decision	Approved: Ship masking and SOT-ID (JCOMMOPS assigned) schemes, freezing Pub47 and moving to WIGOS compliant and more flexible new metadata structure (JCOMMOPS hosted), reducing VOS classes, proceeding to submit to JCOMM-5	SOT Vice-Chair, VOSP Chair, TC	Noted for approval JCOMM-5	June 30 2017	4.1.3

4.1.4 DBCP

The DBCP Panel at its annual meeting agrees the DBCP Work Plan actions and recommendations.

Update 2017

- KPIs for the high latitude buoys in the Arctic and Antarctic regions still need to be defined, a proposal has since been made, but will require the support of JCOMMOPS to implement
- DBCP is supporting the development of two trial drifter GDACs (MEDS, Canada and Meteo-France, France) towards full GDAC capability
- There remains a need for GDACs for moored buoy and wave buoy data
- DBCP is supporting the work to create a single complete global drifter metadata database that when completed will be maintained by JCOMMOPS
- DBCP is working with the space community on improving the quality of drifter SST data for satellite calibration/validation.
- An a paper/strategy for reducing data buoy vandalism is being prepared for JCOMM-V in October 2017
- DBCP/JCOMMOPS need urgently to define the metadata flow for drifters
- DBCP coordination activities are suffering from the delay in recruiting a replacement Data Buoy Technical Coordinator

Linked to this funding has been secured for improving the accessibility of the delayed mode drifter data (Kevin O'Brien/Rik Lumpkin). AOML's processes will be updated to include standard compliant files that will be served through ERDDAP (see 5.2)

Cross network issues:

- Technology development work to develop wave measurements from drifters without drogues is producing promising initial results, this is a potential game changer for wave observations and of interest beyond DBCP
- The tropical Pacific mooring array design (132 moorings) is expected to change in future as a result of the TPOS 2020 project
- DBCP notes that despite the interest in unmanned surface vehicles, the accuracy of the measurements from them for sustained observations has still to be demonstrated.

15	Action	DBCP to clarify with JCOMMOPS the status of drifter metadata flow into JCOMMOPS	Jon Turton, JCOMMOPS	Confirmation from JCOMMOPS	By next DBCP Meeting	4.1.4

4.1.5 GLOSS

GLOSS has been active for 30 years, the management is through a group of experts that meet every 2 years, which means that change is slow.

Update 2017

- GLOSS core network was set up a long time ago, but although the mission has evolved the structure is still set up around the original core network and data streams, it would now be desirable to change structure to one focused around GLOSS missions
- JCOMMOPS connection has been initiated and good progress made, a next step is to provide metadata
- KPI's and trends is being worked on now, the network status report is updated every week but the data not saved, going forward this will be done to provide trend, but the initial year will be an estimate
- GLOSS web pages will be completely re-developed
- Working with GLOSS Data Centers to get a single GLOSS netcdf format for files

The good work of Gary Mitchum in updating GLOSS direction in last few years was recognized by OCG. The GLOSS Chair will work with the GLOSS Group of Experts, with support from OCG, to identify the need for change and develop a new GLOSS implementation plan.

4.1.6 OceanSITES

There are now 304 sites under OceanSITES, comprising 332 platforms across 21 contributing countries. The OceanSITES executive committee has articulated its missions and observing targets for sustained observations in the framework of the GOOS. There are 3 core observing objectives/missions:

- Transport moored arrays (straits and boundaries, BOON)
- Air-sea flux reference sites (located in key locations, e.g. where cloud patterns affect fluxes)
- Global ocean watch (long time series, regions that are representative for certain processes)

Update 2017

- OceanSITES has identified the need to advance collection and handling of metadata of the network. Given the complexity and multidisciplinary nature of the network the full discovery and use of the data requires more a flexible metadata collection and archiving system.
- OceanSITES network coordination activities have suffered recently from a lack in personal, namely the technical coordinator, this will need to be resolved moving forward
- OceanSITES has also played a prominent role in recent regional implementations, e.g. AtlantOS, DOOS (Deep ocean observing strategy), TPOS 2020, GOA-ON.

In the data management area there are new activities using ERDDAP for data visualisation and dissemination (linked to session 5.2). OceanSITES members agree that the value in their data lies strongly in the full time series of the data being collected. ERDDAP is used to easily connect individual deployments into a "stitched/complete" time series, which offers users easy access to the complete data set for a sensor/platform. The individual deployment files, however, must be created and endorsed by the scientists managing the specific platform(s) before they can be presented to the public as a long time series. As ERDDAP is a tool familiar to the modelling community this also helps make OceanSITES data more accessible to this group.

The need is to fill the technical coordinators role was noted and although JCOMMOPS has been active in trying to resolve some of the OceanSITES data and metadata issues it is complex, but not impossible, however that input from OceanSITES is required to move things forward. It was therefore agreed that OceanSites Co-Chair Johannes Karstensen and JCOMMOPS Manager

Mathieu Belbeoch will meet in Brest to look at issues and resolve technical blockages to metadata flow.

To develop cross network observing performance indicators is complex task for OceanSITES, however work will be done to develop KPIs for each mission around coverage of key areas, on occupation relative to design, data delivery and stability. Development is needed promptly on this to support the work of the JCOMMOPS Observing System Report Card, and a short-term action of a Webex with JCOMMOPS and WMO secretariat to discuss the KPIs.

Cross network issues:
OceanSITES is an inherently multidisciplinary network (physics, biogeochemical and ecosystem observations) and frequently used for scientific objectives that utilize data from multiple networks (e.g. combining OceanSITES, GO-SHIP, BioArgo, Satellite SST, SLA, etc.) such that OceanSITES based observations are rarely handled for product generation on a network-only basis. In order to derive network performance and network cost/benefit analysis metrics for traceability of data point origin in onward data distribution should be considered by OCG.

16	Action	OceanSITES to connect with JCOMMOPS (Johannes to visit Brest) to resolve data and network visibility issues	Johannes Karstensen, JCOMMOPS	Johannes to visit JCOMMOPS	End Aug 2017	4.16
17	Action	JCOMMOPS, OceanSITES, DBCP and secretariat to agree to discuss mooring/moored buoy KPI's for the report card	JCOMMOPS, Johannes Karstensen, Champika Gallage	KPIs for report card agreed	July 2017	4.16

4.1.7 International Ocean Carbon Coordination Project (IOCCP)

IOCCP was established as a standing project of SCOR and IOC-UNESCO in 2005. The complexity of the marine carbon cycle and its numerous connections to atmospheric and terrestrial pathways means that a wide range of observations have to be made in order to quantify the role of marine carbon in the global climate system. Over the past decade our ever-increasing understanding of the inter-correlation of marine carbon cycle with carbon-related biogeochemical parameters demands a coordinated, comprehensive biogeochemistry observing system that serves the current needs for information related to issues like ocean acidification, ocean deoxygenation, eutrophication and more. In line with this IOCCP coordination activities have expanded, IOCCP is now the GOOS BGC panel and IOCCP TOR's have been changed to reflect this expanded role. The new TORs expand the mission of IOCCP to all biogeochemical GOOS EOVs.

Update 2017

- To meet the demands of the expanding scope of IOCCP's activities the IOCCP SSG has introduced a co-chairmanship system. From January 2017 Dr. Masao Ishii (JMA-MRI,

Tsukuba, Japan) has joined Toste Tanhua (GEOMAR, Kiel, Germany) in taking responsibility as an IOCCP co-Chair.

- The international coordination of underway CO2 measurements from ships under auspices of IOCCP is progressing well. We continue to focus on formalizing agreements and protocols for measurements with participants in an ad hoc network.
- The activities of the Surface Ocean CO2 Atlas (SOCAT) remain the focal point of data collation, quality control and dissemination; SOCAT has done a great job in making global surface CO2 time series available and the impact of SOCAT is immense (140 peer reviewed articles) from a community effort with no sustained funding. Recommendations from SOCAT are used to further coordination and cooperation between measurement groups, e.g. establishing protocols to quality control air XCO2 measurements, and adding other biogeochemical sensors (O2, pH, and nitrate), in addition to improving quality control of temperature and conductivity/salinity measurements. There is an urgent need to assess whether the new and upcoming pCO2 sensors are meeting rigorous requirements for data accuracy.
- SOCAT Version 4 was publically released on 1 September 2016. This contains 18.5 million surface ocean fCO2 (fugacity of CO2) values with an accuracy of better than 5 µatm, plus calibrated sensor data with an accuracy of better than 10 µatm. These data have been provided by roughly 100 contributors and cover the time frame 1957 – 2015.
- The name of the IOCCP theme ‘Underway CO2 Observations’ has changed to ‘Surface Water CO2 observations’ to incorporate new platforms such as buoys and autonomous vehicules. In time the scope of this will expand further to ‘Surface Water Biogeochemical Observations’.
- IOCCP-JAMSTEC 2015 Inter-laboratory Calibration Exercise of a Certified Reference Material for Nutrients in Seawater was published in June 2016 as IOCCP Report Number 1/2016 and ISBN 978-4-901833-23-3. IOCCP will co-sponsor the next inter-comparison exercise, which will most likely take place in late 2017.
- The IOCCP position paper on Global Ocean Biogeochemistry Data Management, http://www.ioccp.org/index.php/data-and-information-management, received positive feedback indicating the need for a global data assembly and distribution system. The Bjerknes Climate Data Centre has now submitted a proposal to the Research Council of Norway. Data networks and archives holding marine biogeochemistry data have been contacted and collaboration established. Feedback about funding is expected in late spring 2017, if approved a Global Data Assembly Centre for Marine Biogeochemistry will be in place by 2019.

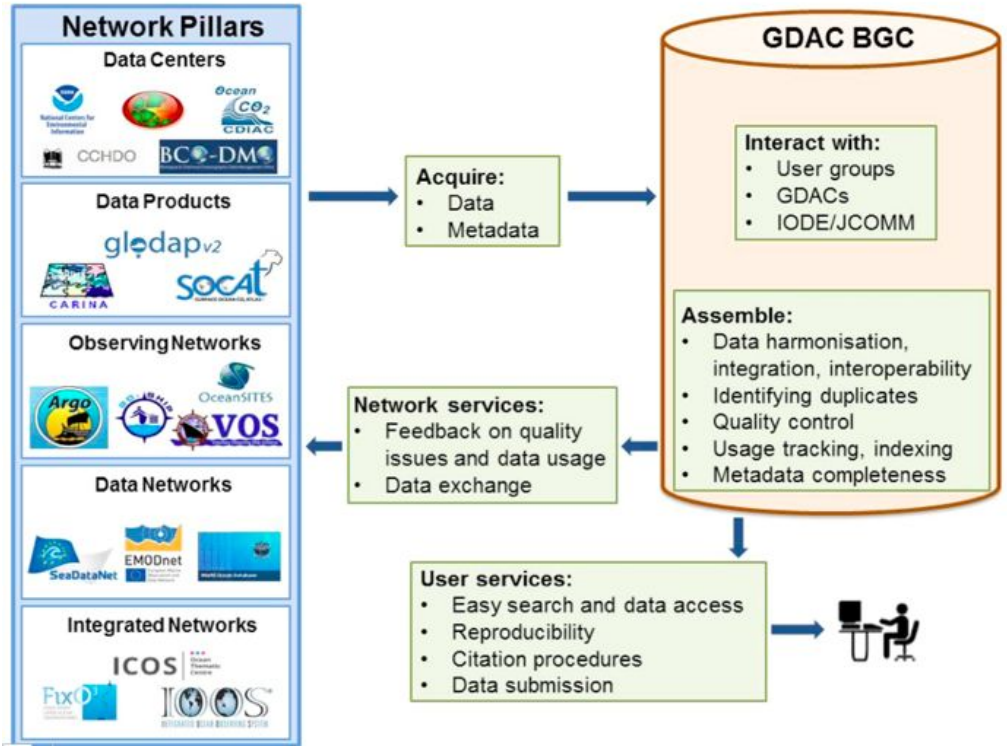

Figure 3: Structure of the IOCCP GDAC, main data centres, data products and networks

Cross network issues

A number of questions and suggestions were posed for OCG-8 to consider around the changing and expanding role of IOCCP, including:

- Would it be better to reporting on carbon measurements through the networks that take the measurements e.g. GO-SHIP, OceanSITES, BGC-Argo, etc.
- A real push is needed to make the OceanSITES BGC data and metadata available (see section 4.1.6 for actions in this regard).
- Should OCG consider broadening the scope of OCG networks to include community activity important for BGC, e.g. IGMETS who are important within IOCCP, but not represented in say OceanSITES.
- Data management and information access needs some thought; should the role of SOCAT expand to take more variables and should this be considered as an OCG area for action? Another example is for the Ocean Data I Interior Synthesis (glodapv2), which is used by CMIP 5, 6 etc. Does OCG want to make sure this is supported and/or expanded?
-

These could be summarized into 3 big questions:

- Mapping BGC networks onto OCG
- Gaps coastal moorings
- DM issues

There is not currently a coordination method for coastal moorings and this is a challenge, OCG are exploring options with the GOOS Regional Alliances (GRAs). Maciej also commented on a

workshop in Bermuda and those that had expressed interest in being a group not reliant on GOOS GRA's, could something be done here in coordination with OCG/JCOMMOPS?

The questions and the scope require further thought and connection, the OCG Chair requested that Maciej create a short wish list of what is wanted in next 4 – 5 years from OCG, that could be discussed by the networks at the next OCG Roundtable, and also to develop a more comprehensive strategy that can be put forward at JCOMM-5.

18	Action	IOCCP (Maciej) to produce a short wish list for OCG on what want for BGC in next few years.	Maciej Telszewski	Deliver / present short document	Report to next OCG roundtable (June 2017)	4.1.7
19	Action	Development a vision for BGC development over 4 – 5 y timeframe, including role of OCG, as input to JCOMM-5 for OCG evolution	OCG Chair, with input from Maciej	Short vision document	August 2017	4.1.7
20	Action	Conversation between OCG and GOOS Regional Forums to assess pathways forward to engage coastal moorings over next 5 years	Katy Hill, Derrick Snowdon, GOOS Regional Forum	Topic discussed on call	Report to OCG roundtable by end 2017	4.1.7
21	Action	What role should OCG have in product development? Develop a vision for products in JCOMM with input from OCG	Nick Ashton, David Legler, support Derrick Snowden	Short doc. outlining ideas/vision	Before JCOMM-5	4.1.7

4.2 New observing system components

4.2.1 OceanGliders

Update 2017

- A website, www.OceanGliders.org, will be set up and populated during 2017 with information on OceanGliders, task teams, glider related outreach and global maps of the glider activity.

- Coordination to ensure engagement with different communities, international such as OOPC, IOCCP, GOOSBioEco, regional such as TPOS2020, AtlantOS, or more thematic, for example BGC, modelling, etc. An additional priority is to engage with the GOOS Regional Alliances that are using or planning to use gliders, e.g. US IOOS, IMOS, IOGOOS, EuroGOOS. Formal cover letters with enclosed Task Team proposals will be distributed to relevant panels.
- OceanGliders would like to engage the support of JCOMMOPS through a technical network coordinator, initially envisaged as a full-time position (budget around 120K$/year), but on discussion this is more likely to be part-time coordinator shared with another network (also see section 7.2 JCOMMOPS Budget). The Steering Team members will try to raise sustained funds to support this from their respective agencies in Australia, Canada, Europe, UK, and USA, etc.
- Since OCG-7 a steering team for the glider component of the GOOS/GCOS has been created called the OceanGlider program, with a focus on sustained glider operations.
- OceanGliders is now recognized by OOPC and approved as a new member of OCG (recommendation to JCOMM-5).
- The first OceanGliders Steering Team meeting occurred in NOC, Southampton UK, September 2016. The second was held at UNESCO, Paris, France, in April 2017. Governance rules for the OceanGlider program have been adopted, a short term Action Plan has been agreed, and plans for the international/regional communities discussed.

The objectives of the OceanGlider program are:

- Strengthen the glider community and facilitate the sustained use of gliders globally
- Launch and maintain an international glider program as a component of the GOOS/GCOS

OceanGliders is organized into 5 Task Teams (TT):

- Boundary Currents (BOON)
- Storms
- Water Transformation
- Polar regions
- Data Management

Initial documents describing the scopes of these TTs have been developed and it is envisaged that new task teams may emerge in the future.

Various immediate actions are underway/planned:

- Gliders Technical Coordinator position at JCOMMOPS will be set up.

Although the network is global and active, with some 20 – 30 gliders typically in the water at any one time gliders and many covering important gaps in GOOS, such as boundary currents and regional seas, there is a need to:

- Agree on targets
- Consolidate glider data management, for example there are 3 global glider data formats, a developing a data translator is one option being considered

- Develop coordination and national development – promote capacity building
- Consider new integrating technology into the network, e.g. sustained sections with deep gliders (4000 - 6000 m)
- Glider BGC Standards & Best Practice requires work/is not yet mature

OCG congratulated OceanGliders on great progress since OCG-7, however although the platform and sensors are generally mature, the network is still immature and there is some need to collect metrics before defining the KPIs and performance targets, perhaps monitoring days in water for TT areas or for GOOS phenomenon, OOPC could also provide some feedback on this. The OceanGlider team was encouraged to bring plans to OCG and GOOS OOPC/BGC panels for feedback as they move forward with ideas for performance indicators. JCOMMOPS support was discussed and it was suggested that OceanGliders could initiate with a part-time coordinator, to ease finding the funding for this activity from the national budgets.

Two requests were made:

- OCG Chair asked that OceanGliders address gender bias in the team
- Weidong Yu (SOA) asked OceanGliders to look at how it could address the issue of glider technology transfer

22	Action	Improve gender balance in OceanGlider steering/exec team - OCG to offer a list of potential candidates	Pierre Testor, OCG Members	Report back to OCG	OCG-9	4.2.1
23	Action	Explore potential gliders technology transfer, capacity building	OceanGliders ST	Report back to OCG	OCG-9	4.2.1

4.2.2 HF Radar

There are approximately 400 stations currently operating and collecting real-time surface current information, 7 countries are providing surface current information (http://global-hfradar.org). The network is divided into 3 regions for radio frequency approval, based on the International Telecommunications Union (ITU) regions, and is growing e.g. Philippines network increasing to 24 stations in the future. The network now operates in 7 of 11 GOOS alliances and is building capacity within the GOOS network.

Update 2017

The network had its 5th meeting in December 2016. Hugh Roarty confirmed that the HF Radar network wants to engage in JCOMM OCG.

Within the United States, there are presently projects underway using HF radar technology for tsunami detection and sea state measurement (wave height, period and direction) for operational

missions within the NOAA National Weather Service in collaboration with US IOOS and several academic institutions.

OCG asked about the development of targets for the network and whether there was some analogy within other networks that could help with this. The role of the performance targets is to help indicate success in reaching observing mission, Gary Mitchum, Chair of GLOSS, suggested that there could be some parallels in how GLOSS had addressed the topic of performance targets that would be of assistance to HF Radar in developing their own KPIs.

HF Radar is now recognized by OOPC and approved as a new member of OCG (recommendation to JCOMM-5).

24	Action	HF-Radar to develop ideas on metrics/KPI's for next OCG	Hugh Roarty, discuss with Gary Mitchell	Noted for approval JCOMM-5	OCG-9	4.2.2

4.2.3 Animal Marine Monitoring/Animal Borne Sensors

In the last two decades, tagged animals have become a new source of oceanographic profiles, especially for the Polar Oceans. A large range of instrument types exists with distinct position and sensor capabilities; some are more useful than others to get oceanographic data. The oceanographic variables routinely measured encompass pressure, temperature, salinity, light and fluorometry, in addition pH and O2 sensors have been tested.

Recently, studies involving animal-borne instruments collected not only oceanographic data for ecological studies, but provide data to the oceanographic community directly. Here the ability to provide data fast (through GTS), in generally observation poor areas, was important, modellers used the observations and could show that the ocean model predictions improved. Although the data are less accurate they are unique, in hostile polar environments and as animals naturally spend time in places of greater ocean activity, the tracking of mesoscale change is naturally improved.

Currently, there is no globally coordinated network of sustained deployments of animal-borne instruments to support ocean observations. There are however four major groups that have started to work more closely together with the goal of forming a coordinated network; the national Animal Tracking Network (ATN) IOOS, the Ocean Tracking Network (OTN), the Integrated Marine Observing System (IMOS), the Marine mammals Exploring the Ocean Pole-to-pole (MEOP). The next step towards the development of a network is to have a joint workshop on data standards and best practices at the 6th Bio-logging Science Symposium in July 2017. An endorsement by the JCOMM OCG would support the value of the development of standards and procedures for animal borne instrument data as well as consolidating the work between the different groups and bodies.

Action areas moving forward include:

- Creating the global community
- Focus on data management

    - Delivery
    - Metadata
- Address sustainability of funding
- Long term - add biological/ecosystem data

OCG encouraged the developments and focus on data delivery and quality. The Met Office demonstration of the value of data in operational ocean prediction models indicates that ideally we need the data in a sustained fashion and so need encourage the community to start self-organizing. Support towards structuring as a self-organizing network was offered by Katy Hill (WMO GOOS) and the Animal Borne Sensors network was asked to report back in a year.

25	Decision	OCG endorses internationally coordinated activities for marine animal profiling and offer support as identified in coming months	Secretariat	Report JCOMM-5	For JCOMM-5	4.2.3
26	Action	Katy to set up meetings, Lars Boehme, Bill Woodward, and Sam Simmons (and others as required) to discuss how to animal borne sensor networks cooperate/structure globally, and to attend the Bio-logging 2017 Symposium in September 2017	Katy Hill, Lars Boehme	Report back OCG roundtable call after Symposium	Sept 2017	4.2.3

4.3 Cross-network issues

Eight overarching issues across the networks were identified from the network reports, these were discussed briefly at OCG-8 and then at an OCG Roundtable in June 2017, in order to develop cross cutting areas of action for OCG forward planning.

The OCG Roundtable was held (19/06/2017) and there was general agreement that all 8 topics identified were important. The conclusion of the discussion was to collapse the original 8 topics to 4 key topic areas to be developed through activities led within OCG or through discussion with other entities. These 4 topics are:

- Coordinate response and assist network access to reviews, OOPC, regional, etc.
- Technical, legal and other issues of location, deployment and access
- Data flow and accuracy, including metadata, data, syntax
- Leadership and succession

27	Action	Emma to circulate draft list of cross network issues, cross-referenced with OCG-8 actions and get feedback on outstanding issues, priorities and next steps. This will be discussed at next OCG Roundtable in order to initiate further OCG actions to address these issues.	Emma Heslop, networks	Discuss at next OCG roundtable or provide feedback	June 2017	4.3

4.4 Integrating new technologies

Matt Mowlem (NOC, Southampton) presented on the landscape and ideas for assessing and integrating new technologies in the global observing system networks. The use of Technology Readiness Level (TRL) scales, from concept to pilot to mature technology adoption, is gaining traction in the community. Three 3 levels are perhaps too simple, so other definitions expand this to say 9 levels, e.g. from NASA, https://esto.nasa.gov/files/trl_definitions.pdf

The other axis for assessment is the need/impact axis, and this is what developers respond to and in this context the GOOS EOVs represent drivers. However although drivers, scientific demand may not be aligned with technological capability and commercial factors, a method to assess this is the creation of technology roadmaps to predict technology advancements over time.

This has for example been done within the AtlantOS Project for sensors and instruments, and emerging networks – see http://noc.ac.uk/science/research-areas/ocean-technology-engineering. The use of technology roadmaps for EOVs could have numerous benefits, as a tool to understand timescales, target development, create dialogue with the developer industry about needs.

Across the networks different methodologies are in place for new technology adoption practice and process; BGC-Argo developed a thorough plan, with short term horizons, well structured; OceanSITES are cross-referenced as the gold standard for measurements and are very important for developers, as early and more current technology is tested.

There are therefore several gaps that OCG could help fill:

- Use of technology roadmaps to forecast future developments
- Coordination across networks
- Demand / impact (some through EOVs)
- Feasibility – comparison / synergies across networks?
- Definition of requirements for systems addressing multiple networks
- Coordinated tech development or purchasing decisions
- Coordination of metrology techniques

- Coordination of trials programs – starting with “easier” networks and building up challenge over time

Key is the use of technical roadmaps to identify gaps, supported by expert groups, and to analyse the technology and gaps, suggest priorities, perhaps lead to reports on technology readiness levels. Through the assessment of particular EOV’s on particular platforms, can develop matrixes that would really help intersection of these 3 axis to help OCG/networks plan and communicate needs across networks. In addition tighter coordination of demands can drive faster development and a better deal.

OCG Chair thanked Matt Mowlem for bringing his expertise and wisdom to OCG, many additional comments of support for the ideas and coordinating role of OCG were received from around across the networks and OCG work areas.

OCG Chair suggested setting up a small working group with networks, Matt Mowlem to scope what we could do in this space and Matt Mowlem expressed his willingness to engage with a small scoping group, to be established by OCG.

28	Action	Set up a scoping group to develop ideas on what role OCG-8 can play to support cross-network new technology development and adoption. Secretariat to send out note describing scoping group to networks (based on discussion elements), networks to identify if they will participate in the scoping group.	Emma Heslop, networks, Matt Mowlem	Decide on group members	June 2017	4.4

Additional Actions:

29	Action	Emma & Katy to revise format of network specification sheets, and send back to network chairs this summer to fill any remaining gaps. Aim to have all complete for JCOMM-5	Emma Heslop, Katy Hill	Send reports & gain feedback	By August 2017	4
30	Action	Discuss with GOOS office regarding digital access to existing network specification sheets, future digitisation and on-going access/updates. Plus identify appropriate newsletter (JCOMM-5)/other methods to	Secretariat	Plan for publishing, circulating and long term updates	By August 2017	4

		advertise their existence				

5. Data Management & Integration

5.1. JCOMM Data Management Programme Area - Data Management Strategy

The JCOMM Data Management Programme Area (DMPA) is developing a JCOMM DMPA Data Management Strategy, to be presented at JCOMM-5 in October 2017. The JCOMM Chairs requested that DMPA gain input from the OCG (MAN-13) in the development of the strategy, and OCG-8 was initial opportunity for JCOMM OCG to engage with the strategy and provide this input.

Eric Freeman (National Center for Environmental Information, NOAA) presenting the strategy stressed that that the input of JCOMM OCG was vital for the success of the strategy. The strategy presented is in a first draft and has been reviewed by IODE experts, and has been designed to respond to current and future strategic and data management plans:

- 2020-2023 WMO Strategic Plan
- IOC Medium Term Strategy 2014-202
- IOC Strategic Plan for Data and Information Management 2017-2021

The vision of JCOMM with regard to metocean data management by 2021 is to provide a framework between WMO and IOC for assuring the collection, processing, integration, dissemination in real-, near-real-time and delayed mode and archiving of as much as possible fit for purpose metocean data of known quality from various sources to meet the needs of WMO and IOC operational and research applications with the view to allow both organizations to fulfill their mandates.

To realize the vision, JCOMM will build on existing infrastructures, best practices and standards, leverage from expertise of both WMO and IOC organizations, seek enhanced collaboration and partnerships with the private sector, promote cost effective modernization of current procedures and the use of new technologies and emerging data mechanisms where appropriate and applicable, as well as update existing practices and standards and develop new ones

The strategy is then organized into 6 themes to deliver the mission and vision

1. Promoting data sharing: research, operational and commercial.
2. Data Collection: real-time and near real-time
3. Data integration, access, rescue and preservation
4. Data dissemination
5. Data discovery
6. Capacity development

The strategy then developed actions for each of the 6 themes.

Strong feedback from the OCG members led to an active discussion about the strategy, which can be broken down into the following areas:

- Generally OCG considered the emphasis of the document was too WMO (and to a lesser

extent IOC) focused

- The strategy needs to recognise the substantial data management efforts within OCG at the network level, e.g. GDACs and within the community (e.g. GRAs, European data portals).
- The use of the word metocean to cover marine and oceanographic data in the document was not favoured, as this signals marine meteorological data to the oceanographic community. The original terminology of oceanographic and marine meteorological data was recommended.
- There is some inconsistency and overlap between the themes
- The view is too top down, there is a system in place and the strategy should identify gaps and where JCOMM can add value, if the gaps are not addressed then no change will occur and the resources are not available to implement new systems with a top down approach.
- Keep the strategy at a higher level, the actions are for an implementation plan and should be left out of the strategy
- Technology is rapidly changing, any suggestion of providing a single ocean data portal is not realistic, this should be recognised, ocean data will be accessed through a multitude of tools and portals, and this should be welcomed

The next steps were for the secretariat to seek additional feedback and create a consolidated feedback for the DMPA, and participate in subsequent data management strategy calls.

31	Action	OCG secretariat to gain networks feedback on v0.32 of the DMPA Strategy. Written feedback required by June 5, Katy Hill to bring comments together for June 9 and to participate on next DMPA call on June 13. Derrick and Kevin to join this call if possible.	Secretariat, Katy Hill, Derrick Snowden, Kevin O'Brien	Deliver comments and feedback DMPA	09 July 2017	5.1

5.2. Improving the interoperability of disparate ocean network data

This work is in support of the JCOMM OCG plan to improve interoperability and integration of disparate ocean data, to improve data/metadata where possible, and make visible. The ERDDAP data platform is now being used across several networks to successfully integrate and provide access to ocean datasets, focus on improving datasets not replacing them, using interoperable platforms to help build products as well as give access to original data. Data can be integrated across platforms or EOV's and provides a rapid implementation platform for data availability for new projects such as TPOS and groups such as US IOOS.

Examples of successful ERDDAP data projects include:

- OceanSITES – creating long timeseries from deployment files
- Global Drifter Program – having all data from drifting buoys in a common data and metadata format enables access from many clients

- GLOSS - Collecting single observing system observations and through metadata combining for single point access
- Demonstrating integrating oceanographic data in ERDDAP along EOV's raised important questions
    - EOV datasets require detailed metadata
    - Need quality information to fully understand the value of the observations

On-going work:

- Continue implement ERDDAP data platform: Sea Level/Tide Gauges, Global Drifter Program
- Real Time data decode of BUFR data & work with GTSPP to provide CTD and XBT BUFR data
- Continue exploration of integrating across EOVs – work with EOV-like products such as GTSPP, WOD, ICOADS to determine the best way to move forward in cooperation, rather than duplication
- Engage with TPOS and add more detailed and technical information about data flow and integration recommendations to second TPOS report.
- Engage with GOOS RAs and AtlantOS project to ensure compatibility with projects like TPOS and JCOMM platform-network data integration.
- If recommended by JCOMM OCG, move forward to define and implement agreed-upon data based metrics.
- Work with US IOOS to prototype integration of regional and global data streams.

The projects were useful to the networks and OCG members agreed that the approach was excellent and could be adopted more widely. It was suggested that JCOMMOPS could perhaps help with tutorial that they could send to users.

Following recent experience with downturns in data availability from TAO and the Global Drifter Array, it is agreed that we need to be more proactive in identifying risks to the sustained observing system, and approaches to mitigating them. In particular, we need to identify where a systems wide risk management framework would be beneficial.

32	Action	Work with international animal tagging community to bring instrument data into ERDDAP	Kevin O'Brien, Lars Boehme to coordinate	Report back to OCG	OCG-9.	5.2

5.3 Open access GTS Project

A pilot project to take well understood physical ocean data from known platform types and inject the data in near real-time onto the GTS for distribution globally, and then to retrieve it from the GTS

and made available through interoperable web services for public access was undertaken.

The goal of the pilot project was to prototype a workflow providing ocean data producers a simpler method of distributing real time data through the GTS infrastructure and ocean data consumers a simpler method of accessing that data.

The requirements for the pilot were that the data needs a BUFR template and WMO ID for the GTS to understand the platform. The first pilot was undertaken using drifter data and with international partners: NOAA/OSMC, NOAA/NDBC, Puertos del Estado, Spain, National Institute of Oceanography and Experimental Geophysics (OGS), Italy, International Arctic Buoy Program, and the US Integrated Ocean Observing System (IOOS). The initial test, with approximately 8-12 platforms, including encoding and decoding data (utilizing ERDDAP and RESTful services), is in the process of being implemented and will be demonstrated at JCOMM-5. End users have already expressed interest (e.g. US IOOS is considering adopting the system to streamline services).

OCG applauded the work and noted that any methodology to get more ocean data into GTS should be supported. Many regions do not have a facility to get data to GTS.

There are not many BUFR templates presently available for oceanographic data and so to fully exploit this capability would need the development of BUFR templates for more ocean observing platform types.

33	Recommendation	Demo of 'open access GTS' project for JCOMM-5 to make clear the importance of this development for users and suppliers of data to GTS, and represent some of discussion captured at OCG-8	Kevin O'Brien			5.3
34	Action	Discuss future trajectory of Open GTS project on a quarterly call	Kevin O'Brien	Agree forward work plan	After JCOMM-5	5.3

5.4 TT MOWIS – WIS

Task Team MOWIS has a mission to convince some existing data centres to become WIS data production centres – WIS DCPC. A process has been set up to assess if a data centre is able to fulfil this role. This idea is that becoming a WIS DCPC will make the data available to a wider audience and gives the data centres greater visibility. In the future a data centre will be able to register to become a DCPC or NC and a formal JCOMM WIS procedure will be followed, this however has yet to be formulated and approved by JCOMM MAN, IOC and WMO. Currently TT MOWIS is seeking a test data centre for the process.

For OCG it is likely that this activity will fall under the DMPA and so no further action is required.

5.5 Ocean Data Management challenges – IOOS experience

The US has had a focus on promoting coordination through data, helping to bridge the gaps between federal agencies and regional Observing Systems. IOOS principals are based on concepts such as; data sharing assumed and supported through APIs, no single format will satisfy all customers, there are out there that IOOS has not yet met, expose the data for use and let proliferation happen.

Not all regions sample the same variables or use the same platforms; it is up to the region, in collaboration with their stakeholders, to define the observing components. NDBC is the only agency mandated to try and get data for ingestion onto GTS. For data ingestion they have found that tools enable compliance better than documents, so as they create tools these are published on GitHub, which also improves programmer skill.

Deliver through several external catalogues and new is the Environmental sensor map, a visualization tool that might become a science tool, as it enables a visualization of how many sensors are in operation across the network in a map format. There are 119,000 sensors in the catalogue.

With reference to the work of OCG, the glider Global Data Assembly Centre (GDAC) has been developing ERDDAP based services as way to bring glider activity together and IOOS support the Open GTS Project.

What should OCG consider:

- Vocabularies are important – dull but fundamental
- The pace of change of information systems outpaces operational networks
- JCOMMOPS could provide unique IDs

Argo agreed with the comment on vocabularies and would really like to see ongoing synchronisation for parameter names, meta and technical data. Argo is maintaining its own syntaxes tables and tries to make it synchronise with ODIP, however technical and metadata needs a lot of work and having cross network agreement and burden sharing would be really useful. Examples of the tables Argo maintains are here: http://www.argodatamgt.org/Documentation.

‘The more we can standardise instrument names, parameter names, … The better for future users’

6. Standards & Best Practices

A key priority of OCG is to promote the creation and timely updating of JCOMM best practice documentation. Many of the networks have a focus on the development of best practices for their network (i.e. Argo, GO-SHIP). However, driven by the need to be able to deliver ocean observations by variable, there is a need to be able to characterize and quantify the observational approaches and uncertainties across the networks, and there are also opportunities to capitalize on the best practice efforts of the individual networks to the benefit of the broader observing system. Therefore, many of the actions in this area are focused on the development and sharing of

network best practice activities, and the coordination of best practice development and inter-comparison activities by variable.

6.1 Vision, goals and next steps

The new Standards & Best Practice (S&BP) Vice-Chair, Juliet Hermes, has undertaken a broad study of existing standards and best practice documentation, developing several spreadsheets to look at the available information by platform and variable. She has also connected with various regional and national initiatives that are actively working in the area of ocean observations S&BP, including GRAs, RMICs, AtlantOS and private sector.

Vision:

- Identify, coordinate and promote development of standards and best practices documents across the ocean observing (including biogeochemistry) and marine meteorological platforms of JCOMM, partner networks and activities.
- Catalogue and review them, identify gaps and areas where a holistic approach across platforms and variables can be taken. Create a review, publication and evaluation process, encourage use and provide training in support of delivering multi-platform datasets by variable of known quality

Goals:

1. Build on/develop and share existing best practices and standards, from expertise of both WMO and IOC organizations, and JCOMM OCG in collaboration with regional initiatives (GRA, RMICs, AtlantOS, etc.) and the private sector. Find the gaps and overlaps.
2. Collect the needs and requirements of users, and establish the review, publication and evaluation processes of BPs.
3. Provide support for new areas and new technologies and sensors e.g. gliders
4. Coordination of best practice development and inter-comparison activities across platforms and by variable - increased consistency of data parameters, conventions and standards across platforms to enhance integration and interoperability
5. Develop ‘metadata’ of best practices
6. Promote, ‘publish’ and where necessary recommend training

OCG feedback was that the next steps should focus on working with the networks to identify what is available and where the gaps reside, and if expertise or best practice from other networks could help fill those gaps. Also mentioned as potentially interesting were professional qualifications, Rutgers with a marine technology degree course (potential documentation) and IMarEST for certification. Currently the standards and best practice documents are scattered; for example glider documentation is scattered across projects and centers, SCOR mainly worked on oxygen with gliders, BGC much developed but not always in one place, FixO3 is more sensor based best practice, for Argo it is platform and manufacturer specific. Need to consider S&BP by network, observation method/sensor and by variable.

Summary:

As a first phase it is seen as very worthwhile to locate the network recommended S&BP documents, collate in one place and analyze gaps.

A second phase could look at differences in how measurements are made and what commonalities there are across networks, view S&BP in variable space

A third phase might look at dealing with uncertainty and traceability, with metadata as key for information on calibration, accuracy, and uncertainty.

35	Action	Networks to identify contacts to work with Juliet Hermes to identify key S&BP documents.	Network chairs	Names of contacts provided to Juliet
36	Action	Secretariat to look at how to assist Juliet update/populate S&BP section on JCOMM website	Emma Heslop, Champika Gallage	Call to discuss with Juliet

6.2 Standards & Best Practice for Biogeochemical observations

6.2.1 Biogeochemical-Argo Experience

Ken Johnson presented the development of biogeochemical standards and best practice within the Biogeochemical-Argo (BGC-Argo) Program.

Argo starts with data management and the principal that all data is accessible, PIs are responsible for adjustment in delayed mode (DM). BGC-Argo has adopted the same process. BGC-Argo sensors include oxygen, nitrate, pH, Chl-a, backscatter and down welling radiance. Work has gone into protocols to give good quality documents for outside community, the protocols are based on peer-reviewed publications and international working groups. They are working to have documents for processing, real-time and delayed mode QC (see table below).

Current status: The O_2 community worked together and through SCOR working group to improve O_2 measurements, to the level that they become competitive ship measurements. BGC-Argo dependent on GO-SHIP for high quality data used to assess calibration; there has also been great interaction between the two networks, also with SOCAT and ocean color sensing. For Chl-a measurements there is a paper in Limnology, however to date BGC-Argo do not have a central location for all best practice documentation.

Table 1 : Access to the various documentation developed for each biogeochemical-Argo core variables with respect to their data management and quality control.

#	Processing at the DAC level	RT-QC	DM-QC
O_2	DOI 10.13155/39795	DOI 10.13155/40879	DOI 10.13155/40879
NO_3	DOI 10.13155/46121		
pH			
Chla	DOI 10.13155/39468	DOI 10.13155/35385	
b_{bp}	DOI 10.13155/39459		
Irradiance			

Legend	Done	On-going	To be done

Carval T. & al (2015). Argo user's manual V3.2. http://doi.org/10.13155/29825
Schmechtig, C. Thierry, V. The Bio Argo Team (2016). Argo quality control manual for biogeochemical data. http://doi.org/10.13155/40879

Figure 4. BGC-Argo scheme for standards and best practice protocol availability

37	Action	Juliet to contact Ken Johnson (BGC-Argo) to gain input on BGC S&BP	Juliet Hermes	Input received	June 2017	6.2

6.2.2 BGC Standards & Best Practice - Issues, Gaps and Needs

One clear gap is in capacity development. IOCCP has been trying to address this through summer schools, 100's people apply however this is training only 30 people at a time. Standards and Best practices are good foundation for capacity building, however could JCOMM do more? Gary Mitchum (GLOSS) commented that capacity building was also major gap in GLOSS and suggested its likely essential across platforms.

7. JCOMMOPS

JCOMMOPS occupies a unique position as the focal point for practical coordination of the (in-situ) ocean observing systems defined by JCOMM. Over the last 15 years it has been evolving and much was achieved in 2016 with 'full' team, but the organization remains fragile due to the funding model.

JCOMMOPS core activities are to:

- Assist in the implementation and deployment of the observing networks through close interaction with program managers and platform operators, and through capacity development

and outreach.

- Assist in establishing, maintaining and verifying mechanisms for the timely exchange of data and metadata, including the facilitation of quality control and archival functions.
- Develop a consistent set of tools to monitor the status of the observing system and its data and metadata distribution, in order to identify action areas and improve the overall effectiveness and development of the system.

7.1. Support provided to implementation

Update 2017

The organization now consists of 5 permanent staff, plus web developer (subcontracted), students and an intern. Funding streams are of order $700 k from 12 members states, French local authorities, and some additional EU projects work (AtlantOS, SeaDataNet).

Highlights:

- Monitoring maps are used in variety of places, giving networks and others a view of gaps, weaknesses, strengths and balance, across different axes of detection
- Performance indicators – have developed vocabulary and harmonized algorithms, interactive, customizable, and embeddable. Available for Argo (targets) and DBCP (measures), other networks developing KPIs for the report card (JCOMM-5)
- Manage transparency of implementation (EEZ)
- Cruise plans are available, JCOMMOPS could be used as a hub for planning and connecting ship activities across networks, including commercial and sailing
- Outreach - 1st ocean observers workshop, June, Brest
- Mobile app soon

Challenges:

- Bring all services/websites/metadata to the ‘Argo standard’
- Build up the integrated view of observing system (EOVs, global/regional)
- Stabilize and formalize the structure (JCOMM-V approval)
- Maintain core services even with staff turnover
- Expand monitoring and coordination to include new emerging networks and regional projects (gliders, marine mammals, HF Radars, polar systems, TPOS 2020)
- Communicate to seek community ownership on monitoring tools

7.2. JCOMMOPS Budgets and Funding

JCOMMOPS is now able to make a consolidated view of the budgets and funding available to OCG.

The current system of funding is complex and this has led to a lack of clarity on how the

JCOMMOPS funding is structured, where there are weaknesses and how this could be improved into the future to ensure sustainability and greater stability for JCOMMOPS, and greater transparency and accountability for the funders and the networks.

The JCOMMOPS funds are distributed across 5 different trust funds; the IOC/JCOMMOPS, IOC/Extra (AtlantOS), CLS, WMO/DBCP and WMO/JCOMM trust funds. Across these funds JCOMMOPS captured what the different networks are providing and what is available as core JCOMMOPS funding. The details of this are available in the JCOMMOPS Budget presentation, link below slide 5, and figure 5.

(http://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=19481).

		Argo (k$)	DBCP (k$)	OcSITES (k$)	SOT (k$)	GO-SHIP (k$)	JCOMMOPS (k$)	TOTAL (k$)	Comments
Regular Contributions		**181**	**135**	**50**	**92***	**10**	**126**	**594**	*47k$ in DBCP TF but not spent for SOT (in 2016 only 2k$ were spent for SOT travel)
Costs	Staff	107	76	32	73	18			Staff salary shared according % time allocation (ex. Argo: 66.7% of 160=107)
	Mission	15	15	5	10	5			20k$ for each TC; Mission costs to be reviewed
	Rent/IT						90		
Diff1 (contrib-costs)		*70*	*44*	*15*	*9*	*-13*			Regular contributions-costs
Costs	Overhead						42		
	Head						53		33.3% of TC Argo salary
	Extras mission						15		It covers 5k$ for Engineer, 5k$ for TC Sc. Comm., 5k$ for Head
	TC Sc. Comm.						50		
	Ship						18		16.66% of TC SOT/GO-SHIP
	DBCP/OcSITES						22		16.66% of TC DBCP/OceanSITES
	Activities						5		Ex: Organise meeting, Report cards printing, etc.
Diff2 *(contrib-costs)*							*-169*		Regular contributions to JCOMMOPS-JCOMMOPS costs
Distribution diff2		38	33	14	38	9	38		169 is shared in 3 parts (56k$) and then allocated to each Programme using % time allocation
Obligations 2018		160	124	51	121	32	164	**652**	For each Programme: sum of all costs +diff2
2018 Network efforts				**+1**	**+29**	**+22**	**+38**		

Figure 5: Summary of the contributions to JCOMMOPS

A top-level summary of the contributions is as follows (in K €): Argo: 181, DBCP: 135, OceanSITES: 50, SOT: 92, GO-SHIP: 10, JCOMMOPS: 126. This gives a total of 594 K €, a little short of the required JCOMMOPS running costs which are approx. 652K €/annum. This shortfall will not cause problems in 2017, as there are some funds in reserve, but will need to be considered moving forward.

This analysis highlights some key issues:

- Different levels of funding across the networks suggest that some re-adjustment is suggested to give greater balance, Argo funding 1/3 of the office.
- 50% of funding is from the US, funding should be more spread
- The fund structure needs to undergo some re-organization to reduce complexity, inconsistencies and enable greater clarity

The networks found this consolidated view of the JCOMMOPS budget to be helpful, providing a clearway forward on how to understand the funding and gain support for requesting an increase or more diverse funding, or for dialogue with the network community about what is required. The JCOMMOPS joint funded service, especially the website, really works well. The networks are in a better position, with greater visibility and this will help the community to work towards equable and sustainable contributions in the future. It was suggested that a more detailed look at the budget will be held with the networks over the next weeks, when networks have the chance to digest so that we move towards closing the specific gaps and needs and to discuss how to meet these needs.

Some of the issues raised are in the process of being resolved. The WMO secretariat reported that the DBCP coordination position vacancy notice should be out in the next couple weeks, hopefully with someone in place for the DBCP meeting in November 2017. WMO will seek the assistance of an experienced consultant to cover the 11-month sabbatical of the Ships Coordinator. Some of the re-organization of the trust fund structure is already underway with the secretariat. The old trust fund should continue to be used, as new trust funds will have to pay higher administration charges, increasing from the current 3% to 7%. Therefore the current Trust fund will remain but be altered. For example the DBCP Trust fund is the repository for both SOT and DBCP funding, however to date there is no method of clearly identifying these funds separately. The proposal is that the member states providing funding will be asked to state the component (%) allocated to each network, each network will then have a specific line within the fund, and an agreed component (%) will be allocated to JCOMMOPS. This proposal will go forward to be agreed by the DBCP Executive Board, but no problems are envisioned.

Although these specific solutions will simplify some issues, the funding model remains complex and exposed to potential large inter-annual fluctuations. Therefore above and beyond these measures it was recommended that a JCOMMOPS review is undertaken in conjunction with stakeholders to understand if there are different ways to look at the management structure and funding. The most immediate action will be to write the TOR for this review.

38	Action	Outreach - 1st ocean observers workshop – June Brest Secretariat put 1st ocean observers workshop (June, Brest) brochure on JCOMM & GOOS web site	Emma Heslop, Champika Gallage	Brochure on JCOMM & GOOS websites	Early June 2017	7.1
39	Action	Organize a specific JCOMMOPS budget call in the next 6 weeks (once networks have the chance to digest JCOMM OCG information post OCG-8). Purpose of call to a) review budget and clarify any outstanding issues, b) review/plan FY2017 budget, c) identify actions moving forward (Emma to check access to all documentation –	Networks, OCG exec, secretariat & JCOMMOPS	Call resolve outstanding issues, 2017 budget, next steps	By mid July 2017	7.2

		organise with JCOMMOPS)				
40	Action	Add additional day to the next OCG meeting, to specifically focus on JCOMMOPS budget, planning and oversight.	OCG Chair & secretariat	Extra day organised	OCG-9	7.2
41	Action	OCG Exec to develop the TORs for a JCOMMOPS review and future vision document (vision for post OceanObs 19), one of the fundamental topics to address is the funding structure, looking at methods/ideas to ensure greater stability in core funding levels and what is the value of securing this. Important to engage stakeholders (WMO, IOC, GOOS) in the review and vision moving forward.	Chairs, Secretariat with WMO and IOC.	TOR's and timetable for review	Nov 2017	7.2

7.3. JCOMM Annual Report Card

The JCOMM Observing System Report Card will be completed across the summer to be ready for distribution at JCOMM-5. Format will be 3 x A4 pages recto-verso (*i.e.* two pages horizontally folded in 3 parts), see below. The target audience is high-level decision makers in government, agencies, WMO and IOC. The aim is to communicate on the health and status of the observing network in an authoritative way, to demonstrate the work of JCOMM OCG in coordination and to provide a visible demonstration of JCOMMOPS practical and technical coordination work. The design will feature visual content in order to be attractive and not overly hard to assimilate, while concise tables and text keep the card authoritative. The card can act as an introduction that leads people to a JCOMMOPS web site that is dedicated to explain the Report Card. The aim is that the Report Card will be published annually.

The layout was generally well received, however a number of points were made regarding the layout and content of the main foldout page lower panel, which provides information on the networks, coverage, KPIs and themes. The main points can be summarised as follows:

- Network map: a large map is seen as attractive and desirable element of the page design, with the networks represented by different colours, with a key.
- Platform Types: System to be represented by platform types, e.g. drifting buoys, moored buoys, ship measurements etc., in order to make the system more understandable/intuitive to target readers, funders and policy makers. Some categories will therefore have more than one network associated to them. These platforms will have descriptions available around the map and these descriptions will include the names, logos and brief information on the associated

JCOMM networks (see below for emerging networks). List of networks:

- Surface drifters – DBCP
- Moored buoys – DBCP & OceanSITES
- Ship Based measurements – SOOP & VOS
- Reference lines – GO-SHIP
- Seal Level gauge – GLOSS
- Profiling floats – Argo

- Emerging networks: will have a separate call out box on the same page to note and describe the emerging networks and the additional observing system coverage that they represent, to highlight emerging important data streams. This will include Bio and Deep Argo, gliders, HF Radar, Animal Borne Sensors. These networks however will not be in the KPI Table (see below).

- KPI Table: an earlier scheme with 2 types of KPI (network KPI and country participation) with trend indicator was seen as too complex to be easily assimilated by the target audience. After discussion the OCG recommended that the table have a single KPI by platform and associated network/s (on 1 line). This single KPI should focus on 'how is the network doing'. However as this single indicator on its own could be misleading a more detailed description that would give a detailed breakdown and description of what the top level KPI represented and the status across the underlying more detailed KPIs, e.g. something like, ‘overall network is xxx, however the trend in VOS is x% up and particularly notable is the increased coverage in the Arctic, while there is a slight decline in SOOP coverage, although the number of countries participating has increased, etc.’. This description will be on the JCOMMOPS website and should be consistent with the network description. Thus each network will use the indicators that they have developed to create this background description that gives a clear view of the different aspects and trends of the network, plus produce an 'overall' (top level view) indicator for the network as a whole, which is a summary of these - this is the single network indicator & trend that goes in the table. Some networks have a less complex task as they can go from KPI to summary indicator, but for example DBCP and OceanSITES will need to develop a single top level KPI for moored buoys. KPIs to be represented by coloured dots and arrows with a link to send people to the details on the JCOMM website.

- The themes were discussed and it was agreed that the descriptions should to be streamlined, text of order 160 characters was requested – essentially 3 sentences.

- Revised layout: With the revised layout, the themes would need to be articulated with minimal text as they could now be located on just one side of the map, with the platform descriptions on the other.

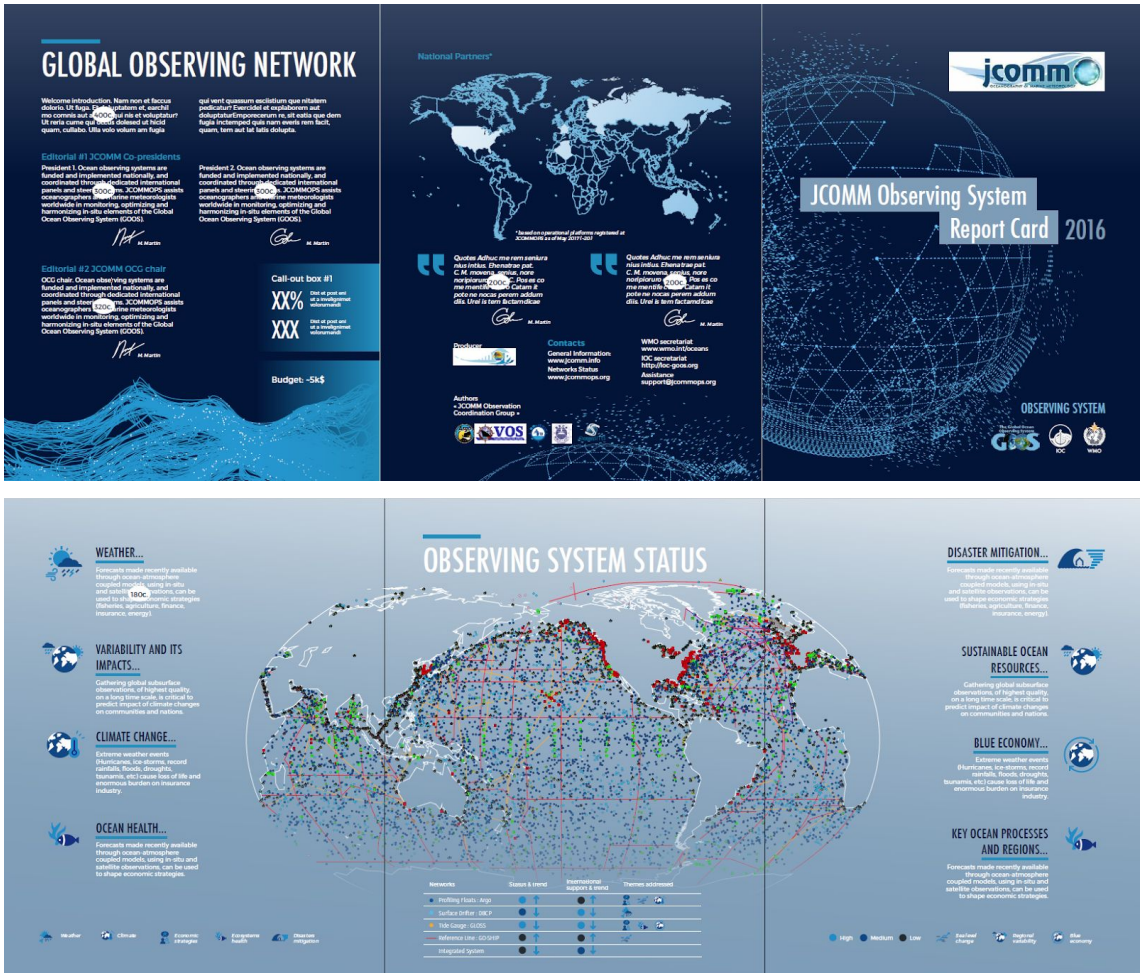

Figure 6. Report card layout and design. Above the 'outside' of the card, below the 'inside'/main foldout page featuring KPI table and key themes that the networks address.

42	Action	Network chairs to provide a single 2-dimensional indicator (status and trend) for the report card, with an accompanying description of what this indicator represents. Indicators should be defensible and repeatable. This background material will be used online to add detail and depth to the single indicator. Opportunity to show the more subtle variation in network status.	Network chairs	Indicators provided	End of June 2017
43	Action	Explanation of report card metric/indicator (see above) to be added to JCOMMOPS Website, including higher granularity component metrics, background etc. (recall the teaser role of the Report Card).	JCOMMOPS	Context website in place	JCOMM-5

44	Action	Identify a small group of network representatives, IOC, and WMO representatives to develop communications for the Report Card ahead of JCOMM-5, e.g. develop talking points/headlines for circulation to communications teams on release Report card, etc.	OCG Chair & secretariat	Team in place	June 2017
45	Action	Chair/secretariat to provide JCOMMOPS with a written summary of changes to the central page of the report card (page with map) that were discussed during item 7.3, for clarity and guidance	OCG Chair, secretariat	Written summary	June 2017

8. Cross-JCOMM coordination - observations to services

8.1. Linking OPA, DMPA & SFSPA

Nick Ashton (Met Office) presented some challenging ideas about the connection between the Observations Programme Area (OPA) and the Services, Forecasting Systems Programme Area (SFSPA). Coordination across JCOMM has improved, as seen in the attendance of both Data Management Programme Area (DMPA) and the SFSPA to the OCG-8 meeting. However JCOMM remains some distance away from being a streamlined and interconnected system.

The Services team sought feedback from some of the services as to what they required:

- Sea-ice team requested increased VOS coverage in polar regions and floating ice cryonet stations
- Open water team, traditionally based on wind and wave data, however additional data is gaining in importance such as visibility. For this team the following are important; point based spatial coverage, reliability of information, short delivery timescales

From Services (SFSPA) perspective:

- For marine environment the RRR is not fit for requirements, there is work to do to fix this
- The OCG appears to be a disparate group of networks and it is unclear if everyone can see the output from the networks all the time
- A more robust framework for communication is required between the JCOMM programme areas – OPA, DMPA, and SFSPA. For example JCOMM SFSPA receives a request from a service how can get feed back from OPA to assess feasibility
- Best practices and discussions need to keep the end product in mind, i.e. quality management in end product

From the observing system (OCG) perspective:

- Many observing networks, where activities are often undertaken end-to-end (from data collection, to processing and quality control, to use), find it hard to connect to the WMO model where they are separated into different silos
- The observing network wants to increase the number of users and so it is important to understand more about the needs of users of the Met Services, Argo data for example Argo data are used in operational ocean prediction models and coupled models for long-range (seasonal) forecasting
- Many networks are supported by research organisations and have traditionally had longer term time horizons for data delivery, this is changing and also marine met services have much shorter time horizons for data delivery. The observing community is working very hard to deliver more timely data to marine users.

The solution is seen as being through a more robust communication framework between the 3 work areas, which currently are working independently. The communications need to be enhanced by a common goal and practically working together to achieve those aims, this could be achieve through working together on specific regional projects, for example in the tropical pacific where seasonal forecasting could be enhanced, in coastal forecasting, and in polar region forecasting.

9. Future Directions

9.1 GOOS strategy, new networks and relationship with OCG

GOOS priorities are, climate, services, and ocean health. A value chain is seen from observations to data use, encompassing both data that is provided operationally for forecasting, warning systems and marine services as well as data that is analyzed to provide information and knowledge to inform policy, assessment and decisions.

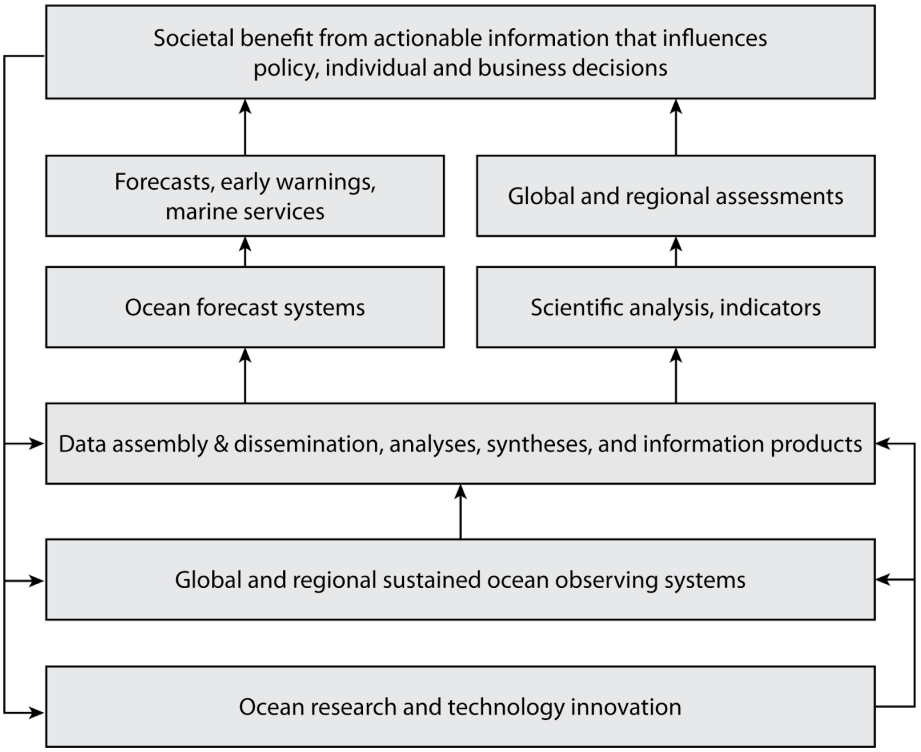

Figure 7: Value chain for ocean observations (from AtlantOS)

GOOS Strategic goals and priorities are:

- **Vision/mission:** working together to deliver sustained ocean observations and information for safety, sustainability, wellbeing and prosperity
- **Strategic goals [collective outcomes]:** Connected value chain including research, sustained observations, data management, models/assessments and end users, to achieve societal goals related to: climate, operational ocean services, ocean health.
- **Strategic priorities [GOOS component]:** Engagement with users and ocean observing community, Advocacy, Refining requirements, Observations coordination, Data and integration, Coordinating delivery.

Recommendations: to improve links, engagement, avoid duplication of structures:

- Proposal to JCOMM-5: JCOMM OCG Terms of Reference to include an explicit reference to GOOS (and WIGOS), and include the possibility of taking on tasks consistent with the OCG mandate and broad work plan from GOOS (and/or WIGOS)
- Representation on the GOOS Steering Committee of chair or vice-chair of OCG (GOOS SC decision)
- Future-proofing OCG contributions to GOOS and WIGOS in case of change to JCOMM
- More explicitly connecting up the value chain

The OCG chair commented that OCG is asked to be responsive to a number of requirements, GOOS, GCOS, WIGOS, this is a big list and the key is how be responsive and still function efficiently for all.

Connecting to users/services, one team is ETOOFs and some GRAs are more operationally focused (EuroGOOS, US IOOS).

9.2 JCOMM-5 Technical Conference

Conference: Toward an Integrated Metocean Monitoring, Forecasting and Service System, Patra Bali Hotel, Bali, Indonesia, 23 to 24 October 2017. Abstracts open from June 15th close July 31st 2017. Posters will be up all week.

Aims:

- Provide an overview of the advances in marine meteorological and oceanographic (metocean) observing systems, data management and services developed
- Forum to interface the JCOMM management and expert groups with the IOC-WMO member state activities and enable them to interact with a large community of stakeholders worldwide, gathered at the JCOMM-5 Session

OCG:

- Need to identify experts who could represent observing community at the technical conference.
- Aim to highlight progress, vision for the future, how enabling current and future research,

technology development and educational outreach
- Can industry be involved/present? Have we got local gliders/Argo floats that could be on display

9.3 JCOMM-5 Conference outline and preparation

Outline:

- Saturday 21st – Sunday 22nd October: Women's Marine Leadership Workshop
- Saturday 21st – Sunday 22nd October: Commission for Atmospheric Sciences (CAS) Technical Conference: "Science Summit on an Earth System approach towards seamless services"
- Monday 23rd – Tuesday 24th October 2017: Marine Technical Conference "Towards an Integrated Met-ocean Monitoring and Forecasting System"
    - Side Events: TPOS 2020, JCOMMOPS
- Wednesday 25th – Sunday 29th October 2017: JCOMM-5
- Monday 30th October: 14th JCOMM Management Committee meeting

JCOMM-5 Agenda OCG Component, 3 main topics:

- **7.1 OCG vision:** corresponding governance model and work plan in the next inter-sessional, including future priorities for the Observations Programme Area. Decisions: invite Members/Members States to approve OPS Strategy; to approve the new OCG structure and work plan, inclusion of new networks, JCOMM Open GTS pilot project, and relationships to GOOS, TPOS 2020, etc.
- **7.2 Implementation of the meteorological and oceanographic observing system**: including Implementation goals and targets. Decision on updated targets, recommendation: support of member states and Coordinated technical support for observing programmes (e.g. JCOMMOPS)- Recommendation to approve the new ToR for JCOMMOPS, that includes new functions such as issuance of WMO platform IDs, collection and provision of metadata to WIGOS.
- **7.3 Observing Best Practices and Standards**: Decision: to consider contributing towards specific activities (e.g. documentation, RMIC, etc.) and adopting these standards/best practices) and significant changes in implementation of Met/ocean Observing Systems. Decision: Ship certificates; Recommendation: Use of Inmarsat Code 41; Recommendation: OPA networks to comply with WIGOS Metadata Standards and submit Metadata to WIGOS.

Information documents have to be ready by 30th June for translation into 5 languages. Other documents, e.g. background documents to be prepared by end August.

The OCG team commented on several ideas to for the conference and attracting attention to the observing system, amongst these; can industry be involved/present? Are there local gliders/Argo floats that could be on display?

46	Action	Champika to work with David to annotate the draft agenda for JCOMM-5	Secretariat, David, Katy	Call	June 2017	9.2

47	Action	Develop draft JCOMM-5 OCG Report and circulate to OCG members by approx. mid June, for fast turnaround for JCOMM-5 June 30 deadlines	Secretariat, OCG exec	Forward report & gain feedback	June 16 2017	9.2
48	Action	Based on input from networks, identify the key decisions required at JCOMM-5, for the OCG-8 Report	OCG Exec	List of decisions	Mid June 2017	9.2
49	Action	Submit award Nominations for JCOMM-5 (OCG secretariat to distribute guidance to OCG Exec: see award TORs – MAN-13 report)	Champika Gallage, OCG Exec	List of nominees	Mid June 2017	9.2

9.4 OceanObs'19

OceanObs'19 - Oceans of Opportunity - September 2019, Honolulu, Hawaii, USA

Focus will be on connecting observers to end-users (see first draft of schema below).

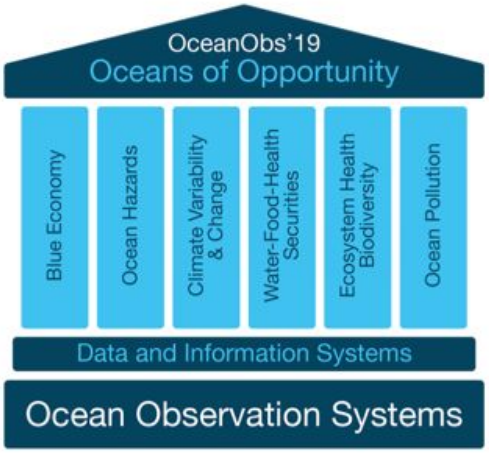

Figure 8: Initial outline schematic for OceanObs '19

50	Action	Katy to clarify requests from Oceanobs'19 for info from networks: a) A POC for each observing network, provide guidance on what required here and b) type of information required from the requested links to key user groups & links to key developing country scientists	Emma Heslop, Katy Hill	Clarification provided	By August 2017	9.3

10. Future Directions

10.1 Review & Wrap up OCG-8

Addressing issues raised at MAN-13 (January 2017):

- Wave paper - suggested that content go into one of the 3 topic areas for JCOMM-5 Report, however subsequently agreed when planning the documentation (20/06) that this would be a presentation on a waves vision for the JCOMM Tech Conf, with a poster on the WET (wave measurement evaluation and testing) activity, both of which could include some recommendations which could be taken forward as the recommendations from the Tech Conf. and focus on a short concept paper consistent with the poster and presentation.
- Polar paper - not enough time to prepare
- Parallel meetings SOT/DBCP not considered worthwhile as involve different people and technology, although joint recruiting for ships is important it is not worth combining meetings for this alone. Suggest dedicating a couple of hours at each meeting for crosscutting issues, other on-going links are also being explored
- Animal borne sensors encouraged to self organise, with some JCOMM OCG support, will return to OCG-9 and will be included in list of emerging networks
- More measurements of greenhouse gases - not covered in SOT meeting, see action below
- Update of OCG TORs underway
- TPOS 2020 implementation, regional activities and data management completed
- JCOMMOPS to regularly inform on capacity development activities – check why JCOMMOPS action
- Jon to call Paulo Ruti and see how/if contribute to report on polar activities

51	Action	OCG Chair to contact member of the greenhouse gas community who reached out and introduce to discuss issue with SOT	OCG Chair David Legler, SOT Vice Chair Shawn Smith	SOT have connection to new community	2017	10.1

10.2 OCG-7 decisions, actions and recommendations

See Annex 3 for table of OCG-7 decisions, actions and recommendations, updated August 2017.

10.3 OCG-8 decisions, actions and recommendations

See Annex 2 for table of OCG-8 decisions, actions and recommendations, updated August 2017.

10.3 Dates and location of next meeting

The next OCG Meeting, OCG-9, will be held in Brest France, May 2018, at the kind invitation of JCOMMOPS and IFREMER.

ANNEX 1: LIST OF ACRONYMS

AOML	Atlantic Oceanographic and Meteorological Laboratory (NOAA)
ASAP	Automated Shipboard Aerological Programme (SOT)
ATN	national Animal Tracking Network (ATN), US IOOS
AWS	Automatic Weather Station (SOT)
BGC	Biogeochemical
BOON	Boundary Ocean Observing Network (OceanGliders)
BUFR	Binary Universal Form for Representation of meteorological data
CCHDO	CLIVAR and Carbon Hydrographic Data Office (NOAA, NSF)
Chl-a	Chlorophyll-a
CLS	Collecte Localisation Satellites (France)
CO2	Carbon Dioxide
COP 22	22nd annual Climate Change Conference (UNFCCC).
CTD	Conductivity, Temperature and Pressure
CMA	China Meteorological Administration
CMIP	Coupled Model Intercomparison Project (WCRP)
DBCP	Data Buoy Cooperation Panel (WMO-IOC)
DC	Data Centre
DCPC	Data Collection and Production Centres (WMO WIS)
DM	Delayed Mode (data)
DMCG	Data Management Coordination Group (JCOMM)
DMPA	Data Management Programme Area (DMPA)
DOOS	Deep Ocean Observing Strategy (GOOS)
EB	Executive Board (DBCP)
EC	Executive Council (WMO) or Executive Committee (SOT)
EC-PHORS	EC Panel of Experts on Polar & High Mountain Observations, Research & Services

ECV	Essential Climate Variable
EEZ	Exclusive Economic Zone
EOV	Essential Ocean Variable
EuroGOOS	European GOOS RA
FixO3	Fixed-point Open Ocean Observatories
GCOS	Global Climate Observing System
GDAC	Global Data Assembly / Acquisition Centre
GDP	Global Drifter Programme
GEO	Group on Earth Observations
GEOMAR	Helmholtz Centre for Ocean Research Kiel
GLOSS	Global Sea-level Observing System (JCOMM)
GOA-ON	Global Ocean Acidification Observing Network
GODAE	Global Ocean Data Assimilation Experiment (GOOS)
GOOS	Global Ocean Observing System (IOC, WMO, UNEP, ICSU)
GOOS BioEco	GOOS Biology & Ecosystem Panel
GRA	GOOS Regional Alliance
GTS	Global Telecommunication System (WWW)
GTSPP	Global Temperature and Salinity Profile Programme (NOAA)
HF Radar	High Frequency Radar
ICES	International Council for the Exploration of the Sea
ICOADS	International Comprehensive Ocean-Atmosphere Data Set (USA)
ICS	Institute of Commercial Shipping
ID	Identification Number
IGMETS	International Group for Marine Ecological Time Series
IHO	International Hydrographic Organization
IMO	International Maritime Organization
IMOS	Integrated Marine Observing System (Australia)

IMarEST	Institute of Marine Engineering, Science & Technology
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IOCCP	International Ocean Carbon Coordination Project
IODE	International Oceanographic Data and Information Exchange (IOC)
IOGOOS	Global Ocean Observing System in the Indian Ocean
JAMSTEC	Japan Agency for Marine-Earth Science and Technology
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JCOMM-5	Fifth Session of JCOMM (Indonesia, October 2017)
JCOMMOPS	JCOMM *in situ* Observations Programme Support Centre
JCOMM-MAN	JCOMM Management Committee
JMA-MRI	Japan Meteorological Agency - Meteorological Research Institute
KPI	Key Performance Indicator
MAN-13	13th Session of JCOMM Management Committee, January 2017, Geneva
MEDS	Marine Environmental Data Service (Canada, now ISDM)
MEOP	Marine mammals Exploring the Ocean Pole-to-pole
MSC Circular	IMO Circulars
NC	National Centres (WMO WIS)
NDBC	National Data Buoy Center (NOAA, USA)
NMHS	National Meteorological and Hydrological Service
NOAA	National Oceanic and Atmospheric Administration (USA)
NOC	National Oceanographic Centre (UK)
NODC	National Oceanographic Data Centre
NSF	National Science Foundation (USA)
OceanSITES	OCEAN Sustained Interdisciplinary Timeseries Environment Observation System
OCG	Observations Coordination Group (JCOMM)
OCG-7	JCOMM OCG Seventh Session, Esporles, Mallorca, April 2016
OCG-8	JCOMM OCG Eighth Session, Qingdao, China, May 2017

OCG-9	JCOMM OCG Ninth Session, Brest France, May 2018
ODIP	Ocean Data Interoperability Platform
OOPC	Ocean Observations Panel for Climate (GCOS-GOOS-WCRP)
OPA	Observations Programme Area (JCOMM OCG)
OSCAR	Observing Systems Capabilities Analysis and Review (WMO)
OSMC	Observing System Monitoring Center (NOAA, USA)
OTN	Ocean Tracking Network
PA	Programme Area (JCOMM)
PI	Principal Investigator
PMO	Port Meteorological Officer
POGO	Partnership for Observation of the Global Oceans
PP-WET	JCOMM Pilot Project on Wave Measurement Evaluation and Test moored buoys
QA	Quality Control
QC	Quality Control
QUARTOD	QA/QC of Real-Time Oceanographic Data (US IOOS)
RMIC	WMO-IOC Regional Marine Instrument Centre
RRR	Rolling Review of Requirements
RT	Real-time (data)
RV	Research Vessel
S&BP	Standards & Best Practice
SC	Steering Committee
SCG	Services Coordination Group (JCOMM)
SCOR	Scientific Committee on Oceanic Research
SeaDataNET	Pan-European infrastructure for Ocean & Marine Data Management
SFSPA	Services and Forecasting Systems Programme Area (JCOMM)
SLA	Sea Level Anomaly
SOA	State Oceanographic Administration (China)

SOCAT	Surface Ocean CO2 Atlas
SOOP	Ship-Of-Opportunity Programme
SOOPIP	SOOP Implementation Panel (JCOMM)
SOT	Ship Observations Team (JCOMM)
SSG	Scientific Steering Group (IOCCP)
SST	Sea-Surface Temperature
TAO	Tropical Atmosphere Ocean Array
TC	Technical Co-ordinator
TOR	Terms of Reference
TPOS 2020	Tropical Pacific Observing System (to 2020) project
T&I TT	Transition & Implementation Task Team (TPOS 2020)
TT	Task Team
TT-KPI	Task Team for Key Performance Indicators (SOT)
TT-MOWIS	Task Team for Integrated Marine Meteorological and Oceanographic Services (WIS)
TT-WM	Task Team on Wave Measurement
TRL	Technology Readiness Level
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USA	United States of America
US IOOS	U.S. Integrated Ocean Observing System
VOS	Voluntary Observing Ship (JCOMM)
WCRP	World Climate Research Programme
WIGOS	WMO Integrated Global Observing System
WIS	WMO Information System
WMO	World Meteorological Organization (UN)
WOC	World Ocean Council

WOD World Ocean Database (NOAA)

WWW World Weather Watch (WMO)

XBT Expendable Bathy Thermograph

ANNEX IV

ACTIONS FROM OCG-8

OCG-8 decisions, actions and recommendations (Updated August 2017)

Key: Green = Complete, Yellow = in progress, Red = due. Bold = for discussion at a round table

No	Type	Notes	Lead	Deliverable	Timeline	Comment	OCG8
1.Requirements for Observing System							
1	**Action**	OOPC to contact OCG in order to gain input to the current ocean heat and freshwater observing system reviews, through this process OCG will also gain insight into the observing systems requirements	Katy Hill	Reviews to OCG Exec	2017-June-		3.1
2	**Action**	JCOMMOPS to track progress of networks against relevant GCOS implementation plan targets. This info will be posted/updated on the JCOMMOPS website	JCOMMOPS	JCOMMOPS website page/s	2017-September-		3.1
3	**Recommendation**	GOOS to connect with JCOMMOPS for the development of the Network Specification Sheet database, to ensure knowledge developed in JCOMMOPS is leveraged for consistency across reporting systems	GOOS, JCOMMOPS	Synergy explored	2017-September-		3.1
4	**Action**	China to provide the cruise plan for the SO to JCOMMOPS for inclusion in the ship operations database	Weidong Yu	List of planned cruises	2017-July-		3.1

5	**Action**	OCG (WMO secretariat) to establish the appropriate methods and contacts for OOPC/OCG to feed into RRR across the range of application areas related to oceans/climate	Katy Hill, Champika Gallage	Engagement WMO-RRR to OOPC/OCG	2017-September-		3.2
6	**Action**	WMO to review ocean application documents for inclusion of HF Radar information - Hugh to carry back the message to HF Radar network to see how to respond	Hugh Roarty	Advice/contact provided to Guimei Liu	2017-July-		3.2
7	**Action**	DBCP to suggest experts to provide advice to WMO-RRR to enable the addition of tsunami related and sea ice related variables into OSCAR for ocean applications area, e.g. possible sea ice expert team Smolensky, DBCP tsunami team	Jon Turton	Guimei Liu to be provided appropriate contacts	2017-July-		3.2
8	**Action**	OCG to suggest sub-application areas for the currently single ocean application area of the WMO RRR	Emma Heslop, Katy Hill, Champika Gallage, Guimei Liu, Nick Ashton	OCG roundtable call June	2017-June-		3.2
9	**Action**	Provide Guimei with EOV specifications for mapping differences and connection to OOPC	Katy Hill	EOV's and connection to OOPC	2017-June-		3.2
10	**Action**	Jon to work with JCOMMOPS to scope & develop a demo for showing SST and subsurface T variable based metrics and coverage (based on requirements from the OSCAR database) for	Jon Turton, JCOMMOPS, Kevin O'Brien	1 page doc on what required / web page demo	2017-October-		3.4

		quantifying and mapping global EOV coverage (following the approach by Lumpkin et al for drifters). Kevin to provide assistance for historical/other data sets					
2. Implementation							
11	**Action**	GO-SHIP Co-Chairs to engage with Weidong Yu regarding potential Chinese involvement in GO-SHIP, sampling currently vacant lines, capacity building etc.	GO-SHIP Co-Chairs	Chinese engagement in GO-SHIP	OCG-9		4.1.2
12	**Decision**	SOT organisational changes (Executive board and Executive committee) agreed to go forward, Executive board to have decision making power	SOT Vice-Chair	Forward to JCOMM-5 for approval	2017-June-	In JCOMM-5 documentation for approval	4.1.3
13	**Action**	SOT to circulate draft of ship forum report to other networks to see if want to join the proposed ship forum team.	Emma Heslop	Forward report & gain feedback	2017-June-		4.1.3
14	**Decision**	Approved: Ship masking and SOT-ID (JCOMMOPS assigned) schemes, freezing Pub47 and moving to WIGOS compliant and more flexible new metadata structure (JCOMMOPS hosted), reducing VOS classes, proceeding to submit to JCOMM-5	SOT Vice-Chair, VOSP Chair, TC	Noted for approval JCOMM-5	2017-June-		4.1.3
15	**Action**	DBCP to clarify with JCOMMOPS the status of drifter metadata flow into JCOMMOPS	Jon Turton, JCOMMOPS	Confirmation from JCOMMOPS	By next DBCP Meeting		4.1.4
16	**Action**	OceanSITES to connect with JCOMMOPS (Johannes to visit Brest) to resolve data and network	Johannes Karstensen, JCOMMO	Johannes to visit JCOMMO	2017-August-	Visit to Brest completed, issues addressed	4.16

		visibility issues	PS	PS			
17	**Action**	JCOMMOPS, OceanSITES, DBCP and secretariat to agree to discuss mooring/moored buoy KPI's for the report card	JCOMMOPS, Johannes Karstensen, Champika Gallage	KPIs for report card agreed	2017-July-	Done in context of the Report Card development	4.16
18	**Action**	IOCCP (Maciej) to produce a short wish list for OCG on what want for BGC in next few years.	Maciej Telszewski	Deliver / present short document	Report to next OCG roundtable (June 2017)	Provided to OCG Roundtable in June	4.1.7
19	**Action**	Development a vision for BGC development over 4 – 5 y timeframe, including role of OCG, as input to JCOMM-5 for OCG evolution	OCG Chair, with input from Maciej	Short vision document	2017-August-		4.1.7
20	**Action**	Conversation between OCG and GOOS Regional Forums to assess pathways forward to engage coastal moorings over next 5 years	Katy Hill, Derrick Snowdon, GOOS Regional Forum	Topic discussed on call	Report to OCG roundtable by end 2017		4.1.7
21	**Action**	What role should OCG have in product development? Develop a vision for products in JCOMM with input from OCG	Nick Ashton, David Legler, support Derrick Snowden	Short doc. outlining ideas/vision	Before JCOMM-5		4.1.7
22	**Action**	Improve gender balance in OceanGlider steering/exec team - OCG to offer a list of potential candidates	Pierre Testor, OCG Members	Report back to OCG	OCG-9		4.2.1
23	**Action**	Explore potential gliders technology transfer, capacity building	OceanGliders ST	Report back to OCG	OCG-9		4.2.1

24	**Action**	HF-Radar to develop ideas on metrics/KPI's for next OCG	Hugh Roarty, discuss with Gary Mitchell	Noted for approval JCOMM-5	OCG-9		4.2.2
25	**Decision**	OCG endorses internationally coordinated activities for marine animal profiling and offer support as identified in coming months	Secretariat	Report JCOMM-5	For JCOMM-5		4.2.3
26	**Action**	Katy to set up meetings, Lars Boehme, Bill Woodward, and Sam Simmons (and others as required) to discuss how to animal borne sensor networks cooperate/structure globally, and to attend the Biologging 2017 Symposium in September 2017	Katy Hill, Lars Boehme	Report back OCG roundtable call after Symposium	2017-September-		4.2.3
27	**Action**	Emma to circulate draft list of cross network issues, cross-referenced with OCG-8 actions and get feedback on outstanding issues, priorities and next steps. This will be discussed at next OCG Roundtable in order to initiate further OCG actions to address these issues.	Emma Heslop, networks	Discuss at next OCG roundtable or provide feedback	2017-June-		4.3
28	**Action**	Set up a scoping group to develop ideas on what role OCG-8 can play to support cross-network new technology development and adoption. Secretariat to send out note describing scoping group to networks (based on discussion elements), networks to identify if they will participate	Emma Heslop, networks, Matt Mowlem	Decide on group members	2017-June-	Delayed to after JCOMM-5 documentation complete	4.4

		in the scoping group.					
29	**Action**	Emma & Katy to revise format of network specification sheets, and send back to network chairs this summer to fill any remaining gaps. Aim to have all complete for JCOMM-5	Emma Heslop, Katy Hill	Send reports & gain feedback	2017-August-	Underway	4
30	**Action**	Discuss with GOOS Office regarding digital access to existing network specification sheets, future digitisation and on-going access/updates. Plus identify appropriate newsletter (JCOMM-5)/other methods to advertise their existence	Secretariat	Plan for publishing, circulating and long term updates	2017-August-	Underway	4
3. Data Management and Integration:							
31	**Action**	OCG secretariat to gain networks feedback on v0.32 of the DMPA Strategy. Written feedback required by June 5, Katy Hill to bring comments together for June 9 and to participate on next DMPA call on June 13. Derrick and Kevin to join this call if possible.	Secretariat, Katy Hill, Derrick Snowden, Kevin O'Brien	Deliver comments and feedback DMPA	2017-July-	Feedback provided on calls and written	5.1
32	**Action**	Work with international animal tagging community to bring instrument data into ERDDAP	Kevin O'Brien, Lars Boehme to coordinate	Report back to OCG	OCG-9		5.2
33	**Recommendation**	Demo of 'open access GTS' project for JCOMM-5 to make clear the importance of this development for users and suppliers of data to GTS, and represent some of discussion captured at	Kevin O'Brien				5.3

		OCG-8					
34	**Action**	Discuss future trajectory of Open GTS project on a quarterly call	Kevin O'Brien	Agree forward work plan	After JCOMM-5		5.3
4. Standards & Best Practice							
35	**Action**	Networks to identify contacts to work with Juliet Hermes to identify key S&BP documents.	Network chairs	Names of contacts provided to Juliet	2017-June-		6.1
36	**Action**	Secretariat to look at how to assist Juliet update/populate S&BP section on JCOMM website	Emma Heslop, Champika Gallage	Call to discuss with Juliet	2017-June-	Repository likely IODE new SBP - JCOMM-5 recommendation DMPA (6.2)	6.1
37	**Action**	Juliet to contact Ken Johnson (BGC-Argo) to gain input on BGC S&BP	Juliet Hermes	Input received	2017-June-		6.2
5. JCOMMOPS Strategy & Development							
38	**Action**	Secretariat put 1st ocean observers workshop (June, Brest) brochure on JCOMM & GOOS web site. Outreach - 1st ocean observers workshop – June Brest	Emma Heslop, Champika Gallage	Brochure on JCOMM & GOOS websites	Early June 2017		7.1
39	**Action**	Organize a specific JCOMMOPS budget call in the next 6 weeks (once networks have the chance to digest information post OCG-8). Purpose of call to a) review budget and clarify any outstanding issues, b) review/plan FY2017 budget, c) identify actions moving forward (Emma to check access to all documentation – organise with JCOMMOPS)	Networks, OCG exec, secretariat & JCOMMOPS	Call resolve outstanding issues, 2017 budget, next steps	By mid July 2017	individual calls, 1 call not possible with time zones and holidays.	7.2
40	**Action**	Add additional day to the next OCG meeting, to	OCG Chair &	Extra day organised	OCG-9		7.2

		specifically focus on JCOMMOPS budget, planning and oversight.	secretariat				
41	**Action**	OCG Exec to develop the TORs for a JCOMMOPS review and future vision document (vision for post OceanObs 19), one of the fundamental topics to address is the funding structure, looking at methods/ideas to ensure greater stability in core funding levels and what is the value of securing this. Important to engage stakeholders (WMO, IOC, GOOS) in the review and vision moving forward.	Chairs, Secretariat with WMO and IOC.	TOR's and timetable for review	2017-November-		7.2
42	**Action**	Network chairs to provide a single 2-dimensional indicator (status and trend) for the report card, with an accompanying description of what this indicator represents. Indicators should be defensible and repeatable. This background material will be used online to add detail and depth to the single indicator. Opportunity to show the more subtle variation in network status.	Network chairs	Indicators provided	End of June 2017		7.3
43	**Action**	Explanation of report card metric/indicator (see above) to be added to JCOMMOPS Website, including higher granularity component metrics, background etc. (recall the teaser role of the Report Card).	JCOMMOPS	Context website in place	JCOMM-5		7.3

44	**Action**	Identify a small group of network representatives, IOC, and WMO representatives to develop communications for the Report Card ahead of JCOMM-5, e.g. develop talking points/headlines for circulation to communications teams on release Report card, etc.	OCG Chair & secretariat	Team in place	2017-June-	Report Card content developed	7.3
45	**Action**	Chair/secretariat to provide JCOMMOPS with a written summary of changes to the central page of the report card (page with map) that were discussed during item 7.3, for clarity and guidance	OCG Chair, secretariat	Written summary	2017-June-	Summary provided in early July	7.3
6. Future Vision							
46	**Action**	Champika to work with David to annotate the draft agenda for JCOMM-5	Secretariat, David, Katy	Call	2017-June-	Draft agenda completed	9.2
47	**Action**	Develop draft JCOMM-5 OCG Report and circulate to OCG members by approx. mid June, for fast turnaround for JCOMM-5 June 30 deadlines	Secretariat, OCG exec	Forward report & gain feedback	2017-June-	OCG Work Plan Circulated in July, reminder early Aug	9.2
48	**Action**	Based on input from networks, identify the key decisions required at JCOMM-5, for the OCG-8 Report	OCG Exec	List of decisions	2017-June-	OCG-8 Reports completed end July	9.2
49	**Action**	Submit award Nominations for JCOMM-5 (OCG secretariat to distribute guidance to OCG Exec: see award TORs – MAN-13 report)	Champika Gallage, OCG Exec	List of nominees	2017-June-	Forwarded July	9.2

50	**Action**	Katy to clarify requests from Oceanobs'19 for info from networks: a) A POC for each observing network, provide guidance on what required here and b) type of information required from the requested links to key user groups & links to key developing country scientists	Emma Heslop, Katy Hill	Clarification provided	2017-August-		9.3

ANNEX V

UPDATED ACTIONS FROM OCG-7
OCG-7 decisions, actions and recommendations (Updated August 2017)

Key: Green = Complete, Yellow = in progress, Red = due. Bold = for discussion at a round table

No	Action	Lead	Timeline	Comments
1. JCOMM-5				
	JCOMM-5 Session, October 2017; Chairs will distill conversation, suggestions, and identity input to be provided to MAN-13. ;	Chairs	MAN-13 (Oct 2016)	Suggestion (from OCG/SFSPA Waves telecon) that programme area chairs discuss with co presidents potential for focussed cross Programme area activities/ to improve connections. Programme area chairs to raise with co presidents.
2. Requirements				
1	ACTION: Bob Weller to look at the Sensible and Latent Heat Fluxes EOV Specification: should this include radiative fluxes? (Shortwave/longwave). For discussion/agreement with Mark Bourassa	Bob Weller, Mark Bourassa	2nd May	In progress through OOPC
2	ACTION Nick Ashton, Bob Weller, Jon Turton to look at Swail et al. document on requirements for Wave Observations. Draft suggestions to scope a possible Waves obs workshop to reconcile expressed wave requirements vs possible observations, and recommend OCG observing activities in OCG (proposal to be circulated for for discussion at upcoming Roundtable and presentation at JCOMM MAN, October 2016).[KH1]	Nick Ashton, Bob Weller, Jon Turton, Val Swail	MAN-13	Telecon complete and way forward identified (focussed activity on observations and best practices through DBCP, plus broader cross programme area discussion)

3	ACTION: RRR and EOV specifications should be as consistent as possible; and, communications between OCG/OOPC and RRR is not ideal to encourage consistency. OOPC/OCG is updating requirements. RRR to be sent updated EOV specification sheets and asked to identify major differences for discussion by OOPC/OCG (Guimei Liu).	Guimei Liu and OOPC	OOPC-20, OCG-8	Ongoing and addressed with new action from OCG-8 - Action 5
4	RECOMMENDATION (OOPC/GOOS SC/OCG): Requirements setting and development activities need continued discussion to insure requirements reflect inputs from developmental projects such as. TPOS 2020, DOOS, OOPC planned BCs activity. Moreover, the requirements need constant attention and review by OOPC, OCG, WMO/RRR, etc. (Secretariats to encourage dialogue amongst groups, and further develop and document, improved transparent processes GOOS and OOPC and OCG are using regarding requirements)	OOPC		
3. Networks				
Argo				
5	RECOMMENDATION: OOPC to consider status of Argo pilot activities, role in multiplatform mix for key phenomena (this is being pursued through TPOS 2020, Boundary Currents/shelf seas activities).	OOPC		
6	RECOMMENDATION: Ensure	Argo ST	Ongoing	

	planning for Argo pilots is informed by activities in TPOS 2020, EMODNET, AtlantOS, etc.			
7	RECOMMENDATION: OCG to assess and encourage increased consistency of data parameters, conventions, and metadata standards across networks to enhance integration and interoperability.. (Address in part through Data Management interoperability pilot activity, best practices documentation, and through an agenda item at OCG-8: chairs to monitor progress).	OCG Chairs.		
DBCP/OceanSITES				
8	**DECISION: OCG accepts proposal that OceanSITES is a Community of Practice and are welcomed to continue participating in OCG meetings and activities (chair to communicate).**	OceanSITES Chairs/OCG Chair	OceanSITES (April 2016)	
9	ACTION: Clarify relationship between OceanSITES and DBCP as overlapping activities, including areas of collaboration/commonality. OceanSITES are encouraged to engage in DBCP to improve best practices and share technologies, etc. (OCG and DBCP Chairs and Oceansites Co-Chairs to discuss at upcoming meetings: OceanSITES April 2016, DBCP 32, October 2016).	DBCP, Ocean SITES Co-Chairs	OceanSITES (April 2016), DBCP (October 2016)	OceanSITES decided to be an activity independent from DBCP (similar to Argo), while staying connected to DBCP through OCG and specific joint activities where relevant
10	RECOMMENDATION: In the absence of OceanSITES plans	OOPC, OCeanSITE		OceanSITES missions articulated as: Transport moored

	motivating time series observations, or identifying the requirements that sensors on moorings are addressing in EOV specs (e.g. air-sea fluxes and ocean transports), OCG suggests to OOPC (and other GOOS Panels) that through evaluations activities, they engage the research community to develop and synthesize such plans to establish targets for OceanSITES (possibly organizing around air-sea fluxes; transport arrays, regional observing systems and developmental activities (e.g. SOOS, AtlantOS, TPOS, GRAs), and multidisciplinary time series stations)).	S Co-Chairs		arrays (straits and boundaries, BOON), Air-sea flux reference sites (located in key locations, e.g. where cloud patterns affect fluxes), Global Ocean Watch (long time series, regions that are representative for certain processes). KPIs being developed.
GLOSS				
11	ACTION: JCOMMOPS and GLOSS to discuss timeline for connecting GLOSS metadata information into JCOMMOPS infrastructure	Mathieu Belbeoch, Gary Mitchum	JCOMMOPS Roundtable, May 2016	Should be reporting back at May Round table.
12	DECISION: OCG endorses incremental expansion of high-quality GLOSS core network beyond initial slate of stations to other stations that could be improved to meet the higher level of standards.			
13	ACTION: GLOSS to write a 2-pager, explaining and justifying the expansion, for approval from OCG and discussion with OOPC	Gary Mitchum	OCG-8 (noting OOPC need input this month for GCOS IP).	The focus of this effort was to support the update to the GLOSS Implementation Plan. This 2 pager became redundant as a separate entity, as it was incorporated into the updated Implementation Plan. The update to the GLOSS Implementation Plan was approved at the most recent

				GLOSS group meeting (07/2017)
14	ACTION: GLOSS to keep OCG and OOPC apprised of changes to GLOSS (OCG-8 GLOSS report)	Gary Mitchum	OCG-8	OCG-8 Report delivered
GO-SHIP				
15	RECOMMENDATION: OCG encourages activities to broaden capacity development in support of GO-SHIP, including multinational collaborations for occupying GO-SHIP lines and training activities, leveraging and coordinating with similar programs like POGO.	Bernadette Sloyan, Rik Wanninkhof, Martin Kramp	OCG-8	
Ship Observations Team (SOT)				
16	ACTION: Teleconference (SOT Chair, VOS/PMO Coordinators and others) to flesh out issues regarding. coordinating shipboard activities to minimize disruption to VOS crew and operators.	Chris Marshall, Martin Kramp,	21 June 2016 OCG telecon to include Martin	Initial discussion between Chair and Ships TC. Summarise and discuss next steps at May round table. Most important tool for this is the JCOMMOPS ship list, now in place and using ICES ship codes as unique ID for the (opportunity) ships. But it is important that ALL observing networks use as of now this list, which makes coordination and harmonization of ship contributions across all networks now possible. OCG please promote the use of the ship list.
17	ACTION: Multiple Networks are using/would like to use commercial ships as observing platforms (Argo, Drifters, CPR, SOOP-XBT, VOS, pCO2, radiation, etc). There is	Chris Marshall, Martin Kramp,	Report to OCG-8, SOT (April 2017)	Martin engaging with networks to develop a survey on activities and engagement with Voluntary/Ships of Opportunity. Surveys were presented to SOT-9 (see TT Recruiting

	potential benefit to coordinating, packaging up needs, and coordinating these plan and coordinating engagement with potential ships. An initial telecon will focus on the scope/scale of this issue (Chris Marshall, Sarah North, Rik Wanninkhof, Martin Kramp, to organize discussion during next JCOMMOPS round table, , and possible actions to be taken up at SOT meeting (April 2017), and recommendation to OCG-8)			report) however work on conclusions not finalized. Good response on VOS survey, but only limited success of JCOMM wide survey with only around 10 participants. A panel discussion and several side meetings were held at SOT-9 under what was termed a Ship Forum. The team agreed to formulate a working group (see body of this OCG report) to establish a “shopping list” for vessels and to outline short and long term actions/goals.
Gliders				
18	Recommendation: OCG very pleased with progress made by Glider group. The glider group to rename their group in response to concerns regarding current acronym.	Pierre Testor	OCG-8	
19	ACTION: Distribute draft glider group TOR and membership to OCG for feedback and approval (OCG secretariat, complete by JCOMMOPS RoundTable call in May)	Secretariat	JCOMMOPS Round Table May 2016	Done
20	ACTION: OCG to consider and provide feedback on draft proposal for a global array of gliders to observe Boundary Current regions. The proposal includes network specification re. role of Gliders in Global Sustained observing System (as input to OOPC Boundary Currents activity).	OCG Members	June 2016 (ahead of Glider meeting in September 2016)	OceanGliders TT Boundary Currents id 1/5 TTs - OceanGliders Boundary Ocean Observing Network document available
IOCCP				
21	ACTION: SOT to discuss/agree including	Chris Marshall,	JCOMMOPS Round Table	YES, but new action on CO2 community to work on

	SOOP-CO2 as a component of SOT. Report on at next JCOMMOPS roundtable.	Sarah North, Rik Wanninkhof, Martin Kramp, Rebecca Cowley	(May 2016)	corresponding metadata format (Rik)
22	ACTION: Request JCOMMOPS to work with IOCCP to scope possible IOCCP support at JCOMMOPS, in particular for tracking of observation implementation. Estimates of resources at JCOMMOPS, and potential impacts of proposed IOCCP actions on outstanding activities also needs to be articulated	JCOMMOPS and IOCCP/Rik and Maciej		
TPOS 2020				
23	ACTION: OCG members to participate in public review of interim plan, mid 2016 (Katy to circulate opportunity later this year).	Secretariat to circulate	Around July 2016	
24	ACTION: OCG members to be kept informed regarding potential role of JCOMM OCG in TPOS 2020 transition activities, including any possible Transition Team task team	Chair, TPOS 2020 Co-Chairs, Secretariat.		OCG will be updated. T&I TT formed under JCOMM.
COASTAL: GRA Connection				
26	ACTION: Discuss EuroGOOS can assist in release of Data from European Tide Gauges (Gary Mitchum, Glenn Nolan).	Gary Mitchum, Glenn Nolan		Discussed at last GLOSS meeting, but no progress made, issue ongoing but action completed.
27	Recommendation: OOPC to engage GRAs re. Open Ocean-Shelf (Boundary Currents) evaluation activity	Bernadette Sloyan, John Wilkin to contact GRF		Take reference of RRR

		Chair		
28	Recommendation: OOPC to present Boundary Currents activities to GRAs (e.g. Webinar, through a GRA telecom, attendance at a GRF meeting? (action TBD for John))	John Wilkin, Tim Moltmann		
COASTAL: HF Radar				
29	ACTION: DBCP to consider whether the HF Radar should be considered as part of the DBCP Waves pilot project in part to address questions regarding validation of HF Radar wave information	Jon Turton	DBCP-32, October 2016	The Task Team on Wave Measurement (TT-WM) looks to coordinate intercomparisons of wave measurements from different platforms, including satellites. it does not specifically mention HF Radar, however the community is welcome to participate if they wish to.
30	RECOMMENDATION: OCG Exec and GEO-HF Radar COP to explore potential for HF Radar to engage in OCG work plan (and related) activities such as:	OCG Chair, Hugh Roarty	OCG-8	revisit HF Radar in November.
	· Standards and best practices (drawing on existing best practices experience and documentation, and potential for OCG to review/approve HF Radar guides)			
	· Calibration/ validation, and quality control by EOV (i.e. DBCP Waves: PP-WET) (see Action 29)			
	· Engaging in the OOPC boundary current activity (action to be discussed with OOPC)			
	· Connection with Services Area (ETWCH/ETOOFS) (action to be discussed with			

	SFPA/Nick)			
31	ACTION: GEO HF Radar COP and JCOMM OCG exec to consider whether JCOMM HF Radar to be proposed as a Joint JCOMM/GEO group.	OCG Chair, Hugh Roarty		Proposed as JCOMM OCG partner network - JCOMM-5
32	ACTION: Review ocean applications part on HF radar in WMO Statement of Guidance	Guimei Liu, Hugh Roarty	Timeline?	Ongoing and addressed with new action from OCG-8 - Action 5
7. Engaging new networks.				
33	ACTION: Initiate dialogue with animal tracking community to discuss potential for JCOMM OCG engagement.	Sam Simmons	OCG-8	Call in March 2017
34	ACTION: Consider invitation to the animal tracking community (sensor data collection) to discuss coordination activities, standards/best practices, data and QC, EEZ issues and other areas of potential intersection with OCG. (secretariat)	Secretariat	OCG-8	Completed, invited to OCG-8 and supported as an emerging network
8. JCOMMOPS				
35	ACTION: JCOMMOPS web tool needs an easier-to-find front page description/introduction to JCOMMOPS (JCOMMOPS)	JCOMMOPS		
36	ACTION: Develop and distribute a regular update on status of the JCOMM observing system by the start of 2017:	JCOMMOPS, Secretariat to solicit representatives from networks	JCOMM-5	Work in progress with the JCOMM Report card, will be released and promoted at JCOMM-5
	o Identify a team from OCG to develop draft design/focus of the report (each network to nominate a representative; Secretariat to solicit for			

	representatives			
	o Secretariat to develop a proposed mailing list to IOC members and WMO JCOMM members			
37	RECOMMENDATION: OCG Urges registration/adoption of Unique IDs for platforms and requests JCOMMOPS to work with networks to make a formal change request to JCOMM V (JCOMMOPS)	JCOMMOPS		Prepared for SOT, see SOT report to OCG8
38	ACTION: Networks to decide whether they want network brochures in consultation with JCOMMOPS, and as appropriate, develop brochures for distribution.	JCOMMOPS	**JCOMM-5**	Network Specification Sheets produced to be updated fro JCOMM-5
39	ACTION: Advance development of Risk Assessment metrics. Secretariat to distribute latest draft of white paper to OCG exec for further revision	Secretariat	Ahead of a JCOMMOPS Round Table	KPI Metrics under development for all partner networks
40	ACTION: Start tracking progress by all OCG networks towards use of BUFR in reporting real-time data on the GTS (JCOMMOPS to solicit/compile info, and impediments including lack of appropriate template)	JCOMMOPS, Jon Turton	Ongoing. Report to OCG-8	SOT migration not terminated, monthly maps issued for TDC and TAC on monthly basis, but tracking difficult because of present non-unique / masking ID schemes. This will be change with new scheme adopted SOT-9 and to be confirmed at JCOMM-5
9. Best Practices.				

41	ACTION: OCG Representatives to provide feedback on RMIC Proposal for a Framework of the Global Ocean Observations Standard System (including Guides for calibration seawater dissolved oxygen and nutrients).	Secretariat	1st May	done
42	ACTION: OCG to consider request for RMIC Coordination Committee and communicate decision to JCOMM-Man (during upcoming OCG call)	OCG Chair/Vice Chair	Ahead of a JCOMMOPS Roundtable	Contact with RMICs will be coordinated through the OCG Vice Chair for Standards and Best Practice
43	ACTION: IOCCP to provide links to Best Practices Documentation and development activities; i.e. SCOR Working Group on Nutrients:	Maciej, RMIC/AP		Rik: Recommended to coordinate with SCOR WG147: "The SCOR Working Group 147 “Towards comparability of global oceanic nutrient data (COMPONUT)“ announced that the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) will start to provide Nutrient Certified Reference Materials (CRMs) with the new SCOR-JAMSTEC logo, with a new cost structure making them more accessible for the global science and research community. These will be available for sale in early summer 2016, based on the framework objectives of SCOR WG#147 (http://www.scor-int.org/SCOR_WGs_WG147.htm). Contact points: Michio Aoyama (r706@ipc.fukushima-u.ac.jp, Malcolm Woodward (m.woodward@pml.ac.uk) Maciej: SCOR WG 142 has been funded to review and improve oxygen data standards

				from mobile platforms. ToRs, composition (which includes most of the senior people who work on oxygen data from mobile platforms) and work plan can be accessed here: http://www.scor-int.org/SCOR_WGs_WG142.htm
44	ACTION: Secretariat to collate list of Standards and Best Practices documentation used within the community from the Network/Element Specifications.	Secretariat (Katy) with guidance from Bob Weller, Bernadette Sloyan.		:
45	ACTION: Secretariat to identify list/links to relevant IOC/WMO level best practices/regulatory documentation.	Secretariat (Long)		Work in progress with OCG Vice-Chair for S&BP & RE-ADDRESSED WITH NEW ACTION OCG-8 - Action 35
46	ACTION: Schedule further discussion of accepting non JCOMM standards manuals as JCOMM Technical Reports during upcoming JCOMM quarterly telecom	OCG Chair/Vice Chair	Ahead of a JCOMMOPS Round Table	See S&BP plan, under the management of the Vice Chair
47	ACTION: Discuss/respond to request to accept QARTOD manuals as JCOMM Technical Reports, during upcoming JCOMM quarterly telecom	OCG Chair/Vice Chair	Ahead of a JCOMMOPS Round Table	See S&BP plan, under the management of the Vice Chair
48	RECOMMENDATION to JCOMM-MAN: Input is sought on identification and focus of RMICs, and JCOMM OCG requests consultation when RMICs are proposed.	OCG Chair,	MAN-13	
10. Data Management.				
49	ACTION: Refine the vision for Data Integration EOV activity in a few pages (max) and distribute to OCG members	Steve Worley, Kevin O'Brien	OCG-9	Moving toward EOVs is already a current DM concept and ongoing work is related to the OCG-8 Action 10 - EOV

				mapping pilot with JCOMMOPS, Kevin O'Brien and Jon Turton
50	ACTION: Networks to nominate a representative to become part of a small team to further scope the proposed EOV-focused Data Integration Activity. This team to work with OCG Exec in development of initial proposal to be reviewed by Networks.	OCG Members to nominate	when Data Vice Chair appointed - post JCOMM-5	Networks have nominated people to become contacts for S&BP, maybe a data nomination is still useful but need Vice-Chair Data to coordinate.
51	ACTION: Report on Data Integration EOV activity to DMPA meeting (June) by Webex (Kevin O'Brien, Steve Worley)	Kevin O'Brien, Steve Worley	DMPA Meeting, June 2016	Kevin O'Brien attended the JCOMM DMCG meeting in Oostende in June, 2016
52	ACTION: Report on Data Integration EOV activity to US IOOC (Interagency Ocean Observation Committee), and GOOS GRA Chair	OCG Chair, Secretariat	OCG-9	Ongoing related to the OCG-8 Action10 - EOV mapping pilot with JCOMMOPS, Kevin O'Brien and Jon Turton
53	ACTION: Seek interest from OCG networks in Open access GTS activity (David to distribute description; Networks to contact Nadia/David, cc Secretariat).	OCG Chair, JCOMM Co-President		Engagement from a number of partners in the Open Access GTS project and IOOS interest in using the system post-pilot, broader support to be sought at JCOMM-5 when pilot is presented