

GOOS Ship Observations Team (SOT)

Prepared/submitted by the SOT Committee

Executive Summary: In *major advancement*, some SOT leadership members participated in the “2nd WMO-IMO Symposium on Extreme Maritime Weather: Bridging the Knowledge Gap Towards Safer Shipping”, which was a great opportunity to build better collaboration between SOT and the IMO shipping industries. Although the values of SOT observations were shown, it became clear better connections between these two communities are highly desired.

As a WMO/IOC capacity development, the SOT conducted a successful cross-network (SOT/DBCP) training webinar focused on data quality. The Vessel Recruiting Best Practices was endorsed by GOOS and published. VOS GDACs received nearly 76% of all VOS data in delayed-mode during 2024. Version 4.6 of the Turbowin+ software was endorsed and released. SOT faces several *challenges that WMO/IOC/OCG could potentially help to mitigate*.

The 1st one is the declining financial contribution from member countries; this directly impact SOT activities through reduced funds allocated to both SOT, in particular with the implementation of the Service Level Agreements with the OceanOps; historically OceanOps carries many functions for the SOT teams. The 2nd challenge is still lack of a solution for the coming end-of-life support for the widely used VOS observation software, Turbowin. Recent activities have included:

- Raising the profile of this issue at INFCOM (Q2 2024) and during the [2nd IMO Symposium](#) on “Extreme Maritime Weather: Bridging the Knowledge Gap Towards Safer Shipping”.
- EUMETNET currently funding a contract to carry out a market analysis and provide insights into potential challenges and risks for developing the new system.

1. Highlight the key network successes

a. VOS Panel (Joel Cabrie):

- i. VOS Vanuatu: Following on from the capacity development PMO workshop in Fiji in 2023, PMO Fremantle has been working with PMO Vanuatu under the PMO Buddy Program to assist Vanuatu to recruit their first VOS ship.
- ii. Cross-network (SOT/DBCP) data quality webinar presented to 140 participants from 50 countries to help improve overall data quality of surface marine observations from VOS ships and buoys.

b. SOOPIP (Tamaryn Morris and Justine Parks)

- i. Collaboration with GTSP, GOSUD, IQuOD and the XBT Science team at joint meeting in Bologna, October 2024
- ii. New BUFR template developed and accepted by WMO to include salinity data for XCTD
- iii. 29 Active XBT Lines were maintained.

c. ASAPP (Rudolf Krockauer)

- i. Globally, up to 25 ships perform upper air soundings. 75-80% of around 3800 annual soundings are provided by the 16 ships of the European ASAP fleet (E-ASAP).

- d. Task Team on Recruitment, Promotion and Training (TT-RPT) (Joel Cabrie)
 - i. Cross Network Data Quality Webinar (SOT/DBCP): The TT ran a data QC webinar in conjunction with DBCP members for VOS ships and data buoys.
- e. Task Team on VOS Delayed Mode Data (TT-VOS DM) (Axel Andersson)
 - i. VOS GDACs received nearly 3.5 million observations in 2024 (~75%)
- f. Task Team on Metadata (TT-Metadata) (Emma Steventon)
 - i. Issues and requests for OceanOps/reference table updates were successfully managed via GitHub.
 - ii. The SOOP metadata is still a work in progress, but metadata reference tables have been optimized for SOOP, and in addition to XBT stations first underway stations are now in OceanOPS.
- g. Task Team on Instrument Standards and SatComm Systems (TT-ISSC) (Jean-Baptiste Cohuet)
 - i. ISO standard: The TT-ISSC contributed to finalize the ISO standard “Ships and marine technology — General specification for shipborne meteorological instruments”. The standard has been published in 2024 under the reference ISO 23745:2024
 - ii. GBON : The TT-ISSC provided the GBON tender specifications for ship-based observations, in particular regarding sea level pressure and sea surface temperature, but also for a data acquisition system.
 - iii. WMO n°8: WMO is working on a new Volume on Ocean measurements to the Guide to Instruments and Methods of Observation (WMO No. 8). The TT-ISSC was strongly involved in writing chapter 2 describing ship's observations.
- 2. How has the network advanced across the OCG Network Attribute areas¹
 - a. VOS Panel (Joel Cabrie):
 - i. VOS through the TT-RPT have made advancements towards Best Practices and Capacity Development. See TT-RPT below for details.
 - b. SOOPI (Tamaryn Morris, Justine Parks)
 - i. SOOP XBT and pCO₂ are mature components of the network meeting all feasible OCG Network Attribute Areas (pCO₂ data inherently is a challenge for real-time posting), so advancement is focused on increasing participation and improved communication within the group.
 - ii. No real advancements for the developing sub networks of SOOP, (CPR, TSG, ADCP, etc).
 - c. ASAPP (Rudolf Krockauer)
 - i. No advancements but reduction of E-ASAP fleet from 18 to 16 ships as of 2024 due to budget constraints.
 - d. Task Team on VOS Delayed Mode Data (TT-VOS DM) (Axel Andersson)
 - i. Global in Scale / Sustained Observation: Due to more automated systems (AWS) the number of submitted observations in delayed mode is at a high level. In contrast to that, the number of active members remains low.
 - ii. Delivers data that are free: Delayed mode data is routinely provided and discoverable through WMO/GISC. Efforts are ongoing for data discoverable through WIS 2.0.
 - e. Task Team on Instrument Standards and Satellite Communications Systems (TT-ISSC) (Jean-Baptiste Cohuet, Martin Kramp)

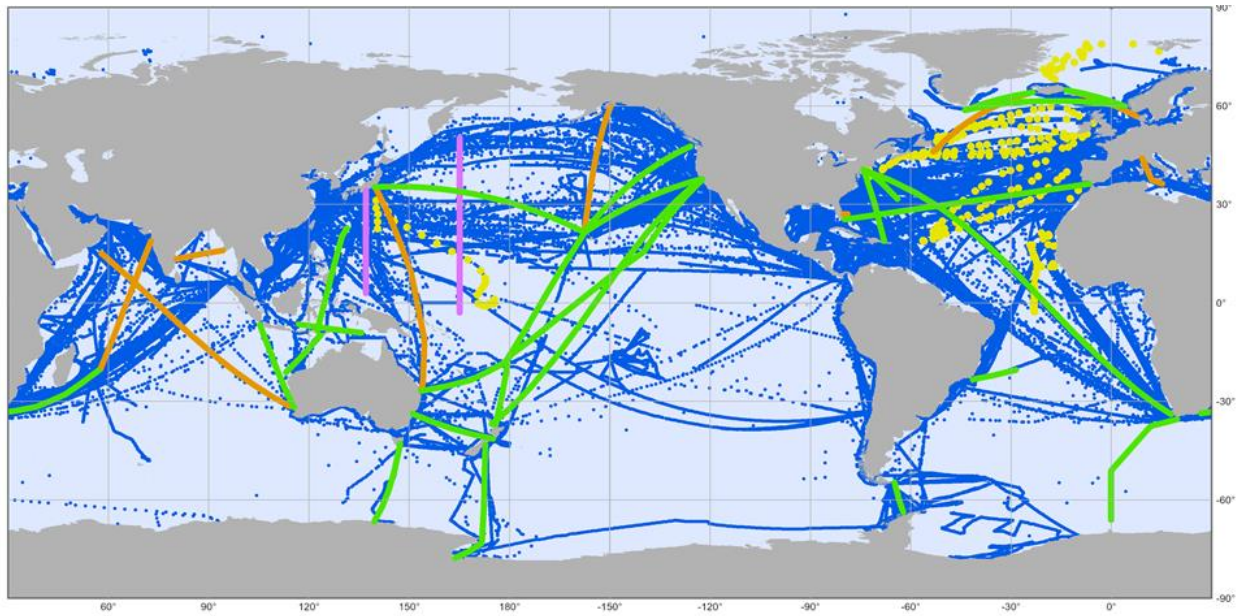
¹ <https://oceanexpert.org/downloadFile/45372>

- i. Chair and TC support GBON (marine) spec working group and review of WMO 8.
- f. Task Team on Recruitment, Promotion and Training (TT-RPT) (Joel Cabrie)
 - i. Undertaking capacity development and technology transfer: The VOS Donation Program, PMO Buddy Program, regular webinars and PMO Training Workshops have been helping the VOS Network to advance across this OCG Network Attribute.
 - ii. Global in Scale: Working with Vanuatu and the Solomon Islands to implement new national VOS programs. Working with Chile and Argentina to further develop their VOS programs.
- 3. Future Plans² and Opportunities - at network and/or cross-network OCG level
 - a. VOSP (Joel Cabrie, Chair)
 - Provide technical expertise and support to the development of the Next Generation Turbowin software for use on VOS ships.
 - b. SOOPIP (Tamaryn Morris, Justine Parks, Martin Kramp)
 - i. Assist in the transmission of data to the GTS by Indian and Italian colleagues.
 - ii. Push for XBT data unification in the areas of standard data formats, a single data repository, real-time auto-QC, and gridded products.
 - iii. pCO2 working towards emergence of the SOCONET network and fostering metadata availability for underway stations.
 - iv. Promote the use of SOT-IDs for all SOOP platforms.
 - c. ASAPP (Rudolf Krockauer)
 - i. Implement descent profiles (additional to standard ascent profiles) on board all ships of the European E-ASAP fleet.
 - d. Task Team on Recruitment, Promotion and Training (TT-RPT) (Joel Cabrie)
 - i. Conduct capacity development webinars (Metadata, Ship recruitment best practices, Data Quality).
 - ii. VOS Donation Program – Further call for EOI for South Pacific Island countries to receive barometers and transfer standards to assist with commencement of new VOS programs.
 - iii. Use the PMO-Buddies to support VOS Donation Program recipients to develop their national VOS programs.
 - iv. Re-write IMO MSC 1293, with ref to 2024 IMO-WMO symposium at IMO HQ and new developments with forming working relationships with large shipping companies.
 - v. Request from SPC to host a national-level PMO/SOT training workshop in the Solomon Islands.
 - e. Task Team on Expansion of Independent Class Observations (TT-EICO) (Darin Figurskey)
 - i. Working with BIMCO to add surface marine meteorological variables to the IMO Compendium.
- 4. Challenges and Concerns - at network and/or cross-network OCG level
 - a. VOSP (Joel Cabrie)
 - i. Development of Next Generation Turbowin software for the VOS network.
 - ii. Unexpected change of leadership of the SOT.
 - b. SOOPIP (Tamaryn Morris, Justine Parks)

² Future plans on implementation, instrumentation, data management, test, new sensors, plan for new EO/ECV observations, capacity development, etc.

- i. Proposed minimum 35% budget cuts coupled with a major loss of personnel and political environment antagonistic to international collaboration for the US programs.
 - ii. Uncertainty of how to engage and coordinate a diverse group of ocean variable data gatherers with differing needs.
 - iii. Lack of avenues to engage the shipping community to increase awareness of the programs and promote participation.
- c. ASAPP (Rudolf Krockauer - Chair; Martin Kramp – OceanOPS TC)
 - i. Budget cuts and declining performance, no progress: ASAP is aside the E-ASAP program in N-Atlantic far from good/global coverage and national support, and E-ASAP is also reducing efforts in terms of funding for program management, recruited ships and number of launches. Unclear how next GBON steps (requiring Members to perform ASAP launches) can be implemented in such circumstances.
- d. Task Team on VOS Delayed Mode Data (TT-VOS DM) (Axel Andersson, Martin Kramp):

Not all data from VOS which goes to GTS is submitted afterwards to one of the two VOS GDACs;
- 5. Asks from OCG (Exec, networks, OceanOPS, and/or GOOS), perhaps related to the responses to parts 3 and 4 and how OCG can support your network
 - a. SOT (John/Huai-Min Zhang, Martin Kramp):
 - i. Discussions with shipping companies should be lifted to very high/exec level with the aim to achieve strong partnerships across the full OCG portfolio and potentially including contributions that go beyond deployment opportunities (e.g. also funding instrumentation, or in-kind support for software developments).
 - b. VOSP (Joel Cabrie)
 - i. Support outreach to industry partners to identify additional funding sources to help develop and maintain the next generation of the Turbowin software.
 - c. SOOPIP (Tamaryn Morris, Justine Parks)
 - i. Letter from IOC/GOOS in support of ships riders to undertake SOOP observations on vessels of opportunity.
 - ii. Increase fundraising activities for OceanOps from network member states.
 - iii. Engage industry partners at their forums. Commercial shipping concerns should be aware of these robust science activities and why they should participate.
- 6. Recent publications, articles, etc. (if you want to share)
 - a. SOOPIP (Tamaryn Morris, Justine Parks)
 - i. Vessel Recruiting Best Practices was endorsed by GOOS published on oceanbestpractices.org <https://doi.org/10.25607/OBP-2029.2>
 - b. Synthesized datasets (Huai-Min Zhang & Elizabeth Kent, SOT Chair & Vice Chair):
 - i. A Daily version for the International Comprehensive Ocean Atmosphere Data Set (ICOADS) has been operational produced, including SOT observations distributed via the GTS (e.g. figure below). The dataset combines ocean surface meteorological and oceanographic observations from ships, surface drifters, moored buoys, ice buoys, lightships, C-MAN and Costal stations, Rig platforms and Tide gauges. <https://www.ncei.noaa.gov/data/international-comprehensive-ocean-atmosphere/v3/archive/nrt/>



Ship Observations Team

Network Status

February 2025

Voluntary Observing Ships, Automated Shipboard Aerological Programme
and Ship-of-Opportunity Programme



- VOS monthly observations (351028)
- ASAP monthly launches (362)

- Active SOOP-XBT line
- Active SOOP-CTD line
- SOOP line not funded or no ships



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