



SOOS
SOUTHERN OCEAN
OBSERVING SYSTEM

The
Southern Ocean Observing System
2019 Annual Report

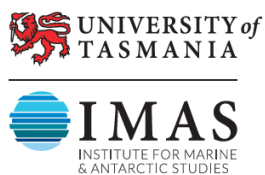


Summary

The Southern Ocean Observing System (SOOS) is a joint initiative of the Scientific Committee on Antarctic Research (SCAR) and the Scientific Committee on Oceanic Research (SCOR); and is endorsed by the Partnership for Observations of the Global Ocean (POGO), and the “Climate Variability and Predictability (CLIVAR)” and “Climate and Cryosphere (CliC)” projects of the World Climate Research Programme (WCRP).

SOOS was launched in 2011 with the mission to facilitate the collection and delivery of essential observations on dynamics and change of Southern Ocean systems to all international stakeholders, through design, advocacy, and implementation of cost-effective observing and data delivery systems.

The SOOS International Project Office Core Sponsorship 2019



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2019 in review

This report marks 8 years since the first Scientific Steering Committee meeting in 2012. Under the auspices of SCAR and SCOR, SOOS has become an important part of the Southern Ocean community, and many developments contribute more broadly to global ocean observing. 2019 has been an important year for consolidating key SOOS initiatives. Our five regional working groups (RWGs) are now established. The first meetings of the Amundsen and Weddell-Dronning Maud Land groups were held, resulting in consolidated work programs into the future. All RWGs are also expanding their membership to enable greater collaboration amongst nations in the different regions.

SOOS increased its profile in the Antarctic Treaty System, through representation at the Antarctic Treaty Consultative Meeting, the Commission for the Conservation of Antarctic Marine Living Resources, collaboration with the Council of Managers for National Antarctic Programs, and a MoU with the International Association of Antarctic Tourism Operators. These relationships deliver increased contributions to DueSouth for enhanced use of ships of opportunity for science.

Our 2019 annual Scientific Steering Committee meeting was held in Incheon, South Korea. We extend heartfelt thanks to our colleagues at KOPRI for their incredible hosting of our meetings and side meetings, such as a “Datahack” workshop that helped streamline data processing and availability. Data availability has further improved through the work of the Data Management Subcommittee (DMSC). SOOSmap had fantastic end-user uptake, with over 53,000 visits to the site and 17,000 data downloads. Thank you to EMODnet for delivering this data sharing facility.

SOOS now has demonstrable globally significant contributions. In 2019, we contributed to the Bulletin of the American Meteorological Society’s “State of the Climate” for the fifth year in a row. SOOS led an OceanObs19 community paper on the development and priorities for Southern Ocean observations, and the air-sea flux capability WG and DMSC also contributed focused papers showing SOOS’ leading role in developing regional observing systems. Further, SOOS was invited to COP25 Earth Observation Day, and is now coordinating the planning of a Southern Ocean contribution to the UN Decade of Ocean Science.

This year has also seen a consolidation of our International Project Office. We thank Louise Newman, Pip Bricher and Alyce Hancock for their dedication to excellence and support. We thank Richard Coleman for his service to SOOS and the establishment of the IPO at the University of Tasmania. We thank him and the Australian Research Council's Antarctic Gateway Partnership for the last 5 years of funding. Further, we thank our other 2019 sponsors, Antarctica New Zealand, the State Oceanic Administration (China) and the University of Gothenburg for their continued support of SOOS. Looking forward, we are pleased by support from a wider-Hobart consortium of the University of Tasmania IMAS, CSIRO and the Tasmanian State Government for hosting of the IPO in Hobart for 2020 – 2022, and are excited by a new collaboration with the Swedish Polar Research Secretariat for support of the Swedish SOOS community.

Lastly, we thank our community for the continuing support of SOOS and for assisting with its development into an integral part of the Southern Ocean marine science community.

Signed:



Dr. Andrew Constable; Biological Sciences Co-Chair
Australian Antarctic Division, Australia

Signed:



Dr. Sebastiaan Swart; Physical Sciences Co-Chair
University of Gothenburg, Sweden

Performance Report

SOOS published its 5-Year Implementation Plan in 2016, which articulated the key challenges driving SOOS, and resulted in the identification of 4 Objectives and specific Key Result Areas (KRAs) that will address the causes of these challenges. The annual report for SOOS is the mechanism through which we review progress against the KRAs, to ensure the Objectives are being met.

The 5-Year Implementation Plan is available at <http://soos.aq/activities/implementation>

Progress report against Objectives and Key Result Areas

Objective One: Facilitate the design of a comprehensive and multi-disciplinary observing system for the Southern Ocean

Objective 1 will support delivery of a coordinated, integrated and efficient program that provides sustained observations of Southern Ocean systems, following the Framework for Ocean Observing (FOO, 2010) and the identification of Essential Ocean Variables (EOVs). Activity towards achieving Objective 1 will be carried out by the Regional Working Groups (RWGs) and Capability Working Groups (CWGs).

As reported in 2018, the focus and mechanisms to achieve this Objective have changed since 2015, and several of the KRAs are no longer practical priorities. Instead, SOOS will be working through CWGs, RWGs, and specific Task Teams, to identify, prioritise and document EOVS coverage and requirements (KRA 1.3), which will result in a more “organic” delivery of Objective 1 rather than a top-down directed effort.

Objective One includes 4 KRAs, and although only KRA 1.3 and 1.4 were identified for action in 2019, some efforts that deliver into KRAs 1.1 and 1.2 were also supported and are reported herein.

Key Result Area 1.1: Establish Criteria for adopting EOVs and communicate them

2019 Intended Actions	Progress Made (Y/X)	Comment
No intended actions for 2019, however: MEASO/eEOV Task Team	Y	SOOS approved development of an eEOV Task Team to support EOV identification through the Marine Ecosystem Assessment of the Southern Ocean (MEASO) effort. Efforts of this group contribute to this KRA and will be published as part of the MEASO Special Issue. Full achievements of this group on pg 40

Key Result Area 1.2: Southern Ocean EOVs are identified and the manner in which they satisfy the criteria are communicated

2018 Intended Actions	Progress Made (Y/X)	Comment
No intended actions for 2019, however: MEASO/eEOV Task Team	Y	The MEASO TT will be articulating ecosystem EOVs and assessment requirements in a publication

Key Result Area 1.3: Spatio-temporal, system-level EOVS sampling requirements are identified, documented and agreed, and strategies for implementation developed if needed

2019 Intended Actions	Progress Made (Y/X)	Comment
Review of current status of EOVS coverage, key gaps and requirements	Y	Regional Working Groups are developing sub-regions to enable quantification of observational coverage and requirements. All 5 RWGs worked towards defining sub-regions and requirements
International strategic plan for observing the ocean beneath Antarctic sea ice and ice shelves (OASIIS Working Group)	Y	A POGO Fact Sheet was drafted. The report is planned and will be delivered in 2020. Issues – Products from this group continue to be delayed and have been modified in scope to account for changing requirements. The report is planned for delivery by end-2020
Observing system design for Southern Ocean Flux moorings	Y	A joint effort between the SOFLUX and Observing System Design working groups. Work was carried out by a Postdoc funded by the State Oceanic Administration, China. Resulting publication: Wei et al., 2020: Optimizing mooring placement to constrain Southern Ocean air-sea fluxes, <i>Journal of Atmos. Ocean. Tech.</i> DOI: 10.1175/JTECH-D-19-0203.1
International standards, methodology and strategy for sustained and reliable remote sensing-based monitoring of pack-ice seal populations	Y	SOOS CWG Censusing Animal Populations from Space (CAPS) continued to deliver methods, standards and outcomes towards this KRA. See pg 36 for more details
Development of international initiative to Benchmark Southern Ocean ecosystems	X	This effort did not gain traction with the community. Key components of this effort were incorporated into the deliverables of the MEASO effort and are now delivered by the eEOV TT

Key Result Area 1.4: A strategy for the uptake of EOVs within the RWGs is developed

2019 Intended Actions	Progress Made (Y/X)	Comment
Regional Implementation Strategies developed	Y	Regional Working Groups are developing sub-regions to enable quantification of observational coverage and requirements. All 5 RWGs worked towards defining sub-regions and requirements

Objective Two: Unify and enhance current observation efforts and leverage further resources across disciplines, and between nations and programs

Delivering Objective 2 will ensure regional implementation of long-term, sustained observations to achieve circumpolar coverage of Southern Ocean systems, built by integrating across internationally coordinated observation programs and existing efforts by national programs.

There are 3 KRAs that will focus work towards achieving this objective, and all were identified for action in 2019. Progress is shown in the tables below.

2019 focused on maintenance and continuity in delivery of key products and networks. Capability and Regional Working Groups continued to coordinate activities in their communities, and the Data Management Sub-Committee and IPO continued to support and maintain the Key Products. Importantly, the lack of capacity in the IPO to provide communication and networking support for all working groups was partly resolved, as the new multi-year sponsoring partnership for 2020 (see pg 26) enabled stable forecasting of the operational budget, and thus the hire of a Communications and Project Officer.

Key Result Area 2.1: Working Groups and Task Teams that coordinate efforts across disciplines and programs, and between nations are developed to fill priority gaps

2019 Intended Actions	Progress Made (Y/X)	Comment
Continuation of active Working Groups and Task Teams (TTs) against group-specific TORs	Y	<p>SOOS has 10 Working Groups and 4 TT and all were active in 2019. For detailed reports, see pages 31-43</p> <p>Issue: The Benchmarking2020 WG was not able to build the required community interest to achieve its objectives, and was therefore sunsetted in 2019; capacity on eEOVs was redirected to eEOV TT (see below)</p>
Development of new WGs and Task Teams (as required)	Y	<p>The Flux Moorings Task Team (a joint effort between SOFLUX and OSD working groups), identified where and how many flux moorings are required to constrain large-scale fluxes of heat in the Southern Ocean. The Task Team lead was a PostDoc sponsored by the State Oceanic Administration, China.</p> <p>The ecosystem Essential Ocean Variables Task Team (eEOV TT) is a contribution to the Marine Ecosystem Assessment of the Southern Ocean (MEASO) and will work with MEASO to identify and describe eEOVs</p> <p>The AUV Task Team is tasked with matching polar AUV science objectives and engineering capabilities with deployment capabilities and sensor development from across National Antarctic Programs. An initial planning workshop was held in Norway</p>

Key Result Area 2.2: Key products for the Southern Ocean that aid in information transfer and facilitate collaborative efforts are identified and produced

2019 Intended Actions	Progress Made (Y/X)	Comment
Database of Upcoming Expeditions to the Southern Ocean	Y	<p>Considerable progress in populating DueSouth with expedition information. COMNAP provided its Regional Information Exchanges and JCOMMOPS provided automated updates from their shipping database. CCAMLR's commission approved the republication of fisheries notifications, in line with the 2018 approval by CCAMLR's Science Committee. Negotiations continued with IAATO for tourist vessel movements resulting in an MoU for integrating IAATO vessel movements into DueSouth. More details available on page 22.</p> <p>Issues – The AADC can no longer provide hosting and maintenance support for DueSouth, and a new host/coder is being sought; Specific observational projects remain unpopulated; Inability to obtain user statistics; limited input of plans by community; Low level of control over timing and delivery of enhancements and modifications due to in-kind delivery of product.</p>
SOOSmap	Y	<p>Product is delivered and is being used by the community; improvements to core functionality; new data layers added; future data layers identified; modifications to user interface initiated. SOOSmap was moved to its own stand-alone domain, http://soosmap.aq/ to facilitate additional functionality.</p> <p>SOOSmap received ~8000 pageviews per month, with ~2500 near-real time files and ~11 long-term archive files downloaded each month. More details available on page 24.</p> <p>Issues – Low level of control over timing and delivery of enhancements and modifications to functionality due to in-kind delivery of product</p>
Community annual calendar	Y	Product was maintained and updated as required

SOOS Publications	Y	<p>Newman et al., 2019: Delivering sustained, coordinated and integrated observations of the Southern Ocean for global impact: https://doi.org/10.3389/fmars.2019.00433</p> <p>Swart et al., 2019: Constraining Southern Ocean air-sea-ice fluxes through enhanced observations: https://doi.org/10.3389/fmars.2019.00433</p> <p>Tanhua et al., 2019: Ocean FAIR Data services: https://doi.org/10.3389/fmars.2019.00440</p> <p>Meijers et al., 2019: Southern Ocean [in "State of the Climate in 2018"] doi:10.1175/2019BAMSSStateoftheClimate.1.</p>
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Key Result Area 2.3: Collaborative, multidisciplinary and multinational workshops and meetings are undertaken, resulting in the SOOS mission being achieved

2019 Intended Actions	Progress Made (Y/X)	Comment
Task Team, Capability and Regional Working Group workshops	Y	Amundsen Sea RWG, Weddell and Dronning Maud Land RWG, AUV Task Team, Data Management Sub-Committee meeting
Capacity- or Community-building workshops	Y	Polar Data Policy Alignment Workshop; Polar Federated Search Workshop; SOOS Datathon; Polar oceanographic data management workshop
International conference sessions, town-halls, side meetings, information sessions	Y	Polar Data Forum III; OceanObs19 Arctic Observing System

Objective Three: Facilitate linking of sustained long-term observations to provide a system of enhanced data discovery and delivery, utilising existing data centres and programmatic efforts combined with, as needed, purpose-built data management and storage systems

Achieving Objective 3 will enhance access to multidisciplinary, quality-controlled observational data from the Southern Ocean. Currently, such data is difficult and time consuming to access as there are many fragmented, mono-disciplinary, mono-platform, or mono-national data centres; a shortage of focused effort towards data sharing and platform interoperability; large variations in national/institutional data policies and data-sharing cultures; and a lack of general knowledge on the data that are being collected.

There are 4 KRAs that focus work towards achieving this objective, and all were identified for action in 2019. Progress is shown in the tables below.

In 2019, SOOS consolidated progress and continued the strategic community engagement and consultation of recent years. These connections are vital to maintain in the coming years. As the SOOS data vision has developed, the focus of activity shifted away from several KRAs and this is reflected by a lower intensity of effort on these fronts. In particular, KRA 3.4 “Community-developed data synthesis tools and products for the Southern Ocean are accessible through the SOOS website”, was identified as being beyond the capability of the IPO to make appropriately comprehensive and useful at this point in time.

Key Result Area 3.1: A multidisciplinary metadata portal is developed and populated and continuously updated with records. Efforts include archiving of orphan datasets and advocating for direct links to data in metadata records

2018 Intended Actions	Progress Made (Y/X)	Comment
Maintenance of the SOOS NASA GCMD metadata portal	Y	<p>NASA GCMD rebuilt the portal for the second time in two years. The new SOOS portal has 16% fewer records (3676) due to filter changes and a redundancy clean-up. Between Jan 2018 - May 2019, there were 2589 unique visits to the two (old and new) portals, with 18,116 page views.</p> <p>Issue: It is difficult to track usage and content between years. There is a lack of interest from oceanographic institutions to engage with the GCMD, and the decrease in relevance of this product for our community increases the importance of POLDER and development of the federated metadata search.</p>
SOOS mooring network	Y	<p>Corrections to minor errors in some records in the mooring network and an updated version published through SOOSmap. Historic moorings from US Antarctic Programs were identified for inclusion</p>
Chinese CTD data sharing	Y	<p>DMSC members, Chinese researchers and data managers, and CCHDO staff continued to calibrate historic Chinese CTD observations and negotiate incorporation of these datasets in international aggregations of CTD data. This resulted in direct collaboration between Ocean University of China and CCHDO.</p>
Southern Ocean glider network	Y	<p>A report was drafted to identify the core needs of Southern Ocean glider users, in terms of data standards and management. Delivered in 2020.</p> <p>Swart et al., 2020: Report on the data management needs of Southern Ocean glider users DOI: 10.5281/zenodo.3826080</p>

Key Result Area 3.2: Up-to-date information on key Southern Ocean data programmes, centres and repositories is provided

2019 Intended Actions	Progress Made (Y/X)	Comment
New content management system developed for website descriptions of key programs	Y	As part of the development of SOOS IPO's content and contact management system, information on key Southern Ocean data programs was collated into an Airtable database, for publication through the new SOOS website in 2020.

Key Result Area 3.3: Web-based tools will be explored and, as needed, developed to aid data discovery and delivery; the wider community is encouraged to adopt and enhance tools that already exist

2019 Intended Actions	Progress Made (Y/X)	Comment
Federated metadata search tool	Y	<p>Due to SOOS advocacy action, several polar data centres adopted schema.org, the technology expected to underpin federated search. A workshop in Finland (Nov 2019) educated many on the process for making metadata machine-searchable enabled investigation of existing search tools that could underpin a polar federated search.</p> <p>See page 42 for information on this effort</p>
Brokering data discovery and interoperability	Y	<p>All CTD datasets held by PANGAEA were added to SOOSmap and the main EMODnet Physics portal resulting in a 12-fold increase in the number of CTD casts (166 998 casts compared with 12,929).</p> <p>The SOOS Datathon in Incheon, Korea, brought together DMSC and SSC members to deliver small projects to enhance data discovery: identifying additional sources of mooring data; tidying up data flow into SOOSmap; standardising BEPSII sea-ice chlorophyll data for SOOSmap; identifying</p>

Southern Ocean glider community data needs; and defining a project to rescue historic oceanographic data from the Argentinian Antarctic research program.

General data management advocacy and advice

Y

Advice was given to Australian Autonomous Underwater Vehicle scientists on data management practices for an academic program with commercial applications. Ad hoc advice also provided to other Australian Antarctic Gateway scientists on publishing data alongside research papers.

Key Result Area 3.4: Data synthesis tools and products are made accessible

2019 Intended Actions	Progress Made (Y/X)	Comment
Online catalogue of data products	X	This KRA requires considerable resources to develop and maintain. Following several efforts to scope a useful, sustainable product, SOOS have put this KRA aside pending resources or increased priority

Objective Four: Provide services to communicate, coordinate, advocate and facilitate SOOS objectives and activities

Objective 4 provides the foundation for the work program of the International Project Office (IPO). It outlines the activities required to support the sustained implementation of SOOS, delivery of SOOS tools and products, and facilitate activities of the SOOS network.

There are 6 KRAs that focus work towards achieving this objective, and all were scheduled for action in 2019. Progress is shown in the tables below.

The latter half of 2019 saw a step-change in the ability of the SOOS IPO to support the actions required to deliver the Implementation Plan. With enhanced security in funding, the IPO was able to grow in capacity through the employment of a Communications and Project Officer.

Key Result Area 4.1: The need for sustained Southern Ocean observations is strongly articulated

2019 Intended Actions	Progress Made (Y/X)	Comment
Endorsement of observational research projects	Y	Review and endorsement of 6 international observational research projects
High-level advocacy actions	Y	Attendance and representation at: Antarctic Treaty Consultative Meeting CCAMLR OceanObs19 COP25 Earth Observation Day

Key Result Area 4.2: Engagement with international stakeholders, across all disciplines and nations, is maintained

2019 Intended Actions	Progress Made (Y/X)	Comment
Reporting	Y	<p>In 2019, annual reports were prepared for SCAR, SCOR, CCAMLR, ATCM-CEP, Australian Research Council's Antarctic Gateway Partnership, POGO, SCADM, and the SOOS SSC</p> <p>Issue: Reporting requirements are a significant overhead, particularly given the lack of standardisation in the required information.</p>
Development of SOOS Engagement Strategy	Y	<p>A database of key contacts, institutions, nations, programs, projects, events, and products was developed. It underpins all tables on the new SOOS website, simplifying the process of updating the website; provides contact management support for SOOS groups; and simplifies reporting on SOOS' activities and network. This database will form the basis of a strategic engagement strategy to be developed in 2021</p>
Community Engagement and conference presentations	Y	<p>Direct engagement included: IICWG, COMNAP, CCAMLR, SORP, IAATO, GOOS, APECS, POGO, OOPC, SCAR Programs, SCADM, ICED, IASC,, IMBeR, IMOS, IAPSO, SCOR, OceanObs19, EGU, ADC, AOGS</p> <p>All engagement/presentations were carried out directly by IPO staff or by a community member facilitated by IPO</p>
Engagement with core IPO sponsors and stakeholders	Y	<p>Regular engagement was maintained through in-person meetings and email correspondence:</p> <p>Engagement included: IMAS, UTAS, AAD, ACE CRC, CSIRO, AGP, IMOS, TPN, Tas. State Government, Antarctic NZ, University of Gothenburg, SOA-China, Swedish Polar Research Secretariat, National Centre for Polar and Ocean Research India</p>

Key Result Area 4.3: A SOOS community bibliography is developed

2019 Intended Actions	Progress Made (Y/X)	Comment
Scoping of requirements and delivery of product	Y	The need for this product has changed and a bibliography will no longer be developed. The IPO will continue to track all published references to SOOS using AirTable, which was initiated in 2018.

Key Result Area 4.4: The SOOS Communication Strategy is implemented

2019 Intended Actions	Progress Made (Y/X)	Comment
Maintaining the SOOS Website	Y	<p>Development of a new website was initiated in 2019 to enhance functionality. A standardised Joomla template was selected and the transfer and update of information from the old website to the new one was progressed.</p> <p>Issue: This is a high priority but has taken a considerable proportion of the IPO's capacity to implement. Was achieved only after hiring of new Communications Officer</p>
Online database of presentations, posters, publications and other products	Y	As described under KRA 4.2, all products (including posters, maps, and slide presentations) were updated and maintained in the SOOS database, newly developed in Airtable (see 4.2 above).

Delivery of the SOOS Newsletter	Y	Two issues were produced in October and December 2019 following the hiring of the SOOS Communications Officer
SOOS Publications (not including WG-specific publications)	Y	As above in KRA 2.2
Other communication activities	Y	Preparation for SOOS tutorials as part of the SCOR Booth at Ocean Sciences 2020
Social Media	Y	<p>Basic-level updates to SOOS Facebook and Twitter accounts was maintained and automated where possible</p> <p>Issue: Social media is ad-hoc and not strategic. Facebook posts are automatically delivered to Twitter irrespective of the different type of engagement that Twitter facilitates</p>

Key Result Area 4.5: Support for SOOS International Project Office is maintained and enhanced

2019 Intended Actions	Progress Made (Y/X)	Comment
Engagement and brokering of new hosting agreement for the IPO	Y	Significant engagement with Australian organisations for brokering of a new hosting agreement for the IPO; resulting in the formation of a Partnership Agreement between UTAS-IMAS, the Tasmanian Government Department of State Growth, and CSIRO for a 3-year hosting of the IPO in Hobart, Australia

Maintenance of existing IPO and SOOS sponsorship	Y	<p>Regular engagement with existing sponsors; Oversight of finance and budget; Development of annual sponsorship agreements and project schedules; Management of in-kind services and agreements</p> <p>Issue: Most in-kind services are agreed verbally without the ability to develop a Service Level Agreement on delivery of product/service</p>
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Actions on new sponsorship opportunities	Y	Engagement with potential new sponsors of SOOS; significant progress in new sponsorship by the Swedish Polar Research Secretariat for 2020-2022.
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Key Result Area 4.6: SOOS Administration, facilitation of Strategic Plan activities and delivery of support services is maintained

2019 Intended Actions	Progress Made (Y/X)	Comment
Maintenance and support of SOOS Governance	Y	<p>Engagement with governing bodies SCAR and SCOR</p> <p>Management of Executive Committee (meetings, membership, activities, TORs)</p> <p>Management of Scientific Steering Committee (meetings, membership, activities, TORs)</p> <p>Management of Data Management Sub-Committee (meetings, membership, activities, TORs)</p>

Management of Implementation Plan monitoring and progress review	Y	Weekly IPO review and recording of activities against all KRAs
Administrative finance	Y	Development of 2019 budget Management of income and expenditure Sponsorship of SOOS events
Office administration and staff development/support	Y	Management and support of SOOS IPO staff

SOOS Key Products

Database of Upcoming Expeditions to the Southern Ocean



DueSouth is a community-populated database for the sharing of information on upcoming field campaigns and expeditions. It enhances opportunities for collaboration and sharing of field resources.

Key Sponsors / People:

DueSouth coding and hosting is provided to SOOS by James Cusick of the Australian Antarctic Data Centre. Antarctic Sea Ice Processes and Climate (ASPeCt) has provided funding to complete the coding. Expedition plans are systematically provided by JCOMMOPS, CCAMLR, and COMNAP. DueSouth is available at <https://data.aad.gov.au/duesouth/>

2019 Milestones:

The upgraded DueSouth portal was completed and launched to the public in 2019. The portal supports:

- Many-to-many mappings of projects and expeditions so that multi-year projects can easily be mapped to all relevant expeditions and Antarctic research stations
- A polar-projected map for better visualisation of expedition plans
- Automated data transfers from JCOMMOPS, with the capacity to add other organisations in the future,
- Bulk uploads from tables of planned expeditions
- Allows users to edit their contribution
- Greater ability for SOOS Data Officer to edit submitted expeditions and projects

2019 Achievements:

- Refactoring of the code to support enhanced functionality.
- Approval sought and gained from CCAMLR for publication of future notifications from their krill and new and exploratory fishery notification systems
- Work with the CCAMLR secretariat for bulk upload of fisheries notifications into DueSouth
- Memorandum of understanding signed with IAATO to allow the development of a workflow for ingesting planned IAATO vessel movements into DueSouth, with appropriate redactions of data to protect commercially sensitive data. (NB - publication of this data will be dependent on approval from the IAATO membership.)
- Engage the SOOS community to populate DueSouth with expedition plans for 2019/20 and beyond
- Implement site analytics to enable user statistics to be collected

2020 Plans:

- Work with AADC to finalise the documentation of the code and final improvements
- Negotiate a hosting agreement with a new host/code maintainer for DueSouth and implement the transfer
- Work with the IAATO secretariat to develop a workflow for publishing planned IAATO vessel movements in DueSouth
- Present the IAATO propose workflow to IAATO membership for approval and implement it if approved
- Work with the COMNAP secretariat to improve the compatibility of information shared through the COMNAP Regional Information Exchange with DueSouth's data requirements
- Encourage the SOOS Regional Working Groups to populate the expedition and project records for 2020/21 and beyond.

SOOSmap



SOOSmap is an interactive web map that allows users to explore circumpolar datasets before downloading the data they need. SOOSmap was developed for SOOS by the European Marine Observations and Data Network (EMODnet) Physics group.

Key Sponsors/People

All development and hosting are provided by Antonio Novellino and Marco Alba at EMODnet Physics as part of their mandate to support regional ocean observing systems and under the banner of EMODnet For Global. The relationship between SOOS and EMODnet was negotiated by Patrick Gorringer from the EuroGOOS secretariat.

2019 Milestones

During 2019, the focus for SOOSmap was on consolidating the functionality developed in 2018. Major improvements to the functionality include:

- Restructuring portal architecture to speed up drawing times to cope with the growth in the number of observations included in EMODnet Physics' servers.
- Completing the development of pop-up boxes with cleanly structured metadata for SOOS-specific layers
- Allowing users to select the transect for any individual mobile platform (e.g. Argo floats, drifting buoys, or MEOP seals) in addition to the default display of most recent recorded location for each data point
- Transfer of SOOSmap to a standalone domain soosmap.aq, which allows users to share specific views of the map - i.e. zoom, time filter, and layers - for reporting purposes.
- For the seven months in 2019 for which analytics data are available, SOOSmap received 57,311 page views, with 19,782 requests to the servers for further information. A total of 17,268 near-real-time monthly files were downloaded, along with 79 long-term

repository files. Visitors were primarily from Spain (45,844), France (9715), United States (394), Netherlands (199), India (160), and China (134).

In terms of adding new data to SOOSmap, in 2019 there were two significant additions:

- The actual data for CTD casts hosted by PANGAEA, were included in SOOSmap for the first time increasing the CTD data holdings of SOOSmap by 12 times as many as were in SOOSmap before this collaboration. This required technical collaboration between EMODnet Physics and PANGAEA, as well as policy agreement involving SOOS, PANGAEA, and EMODnet. This is the first time that PANGAEA-curated data are being republished outside PANGAEA itself, and is thus a significant achievement.
- The addition of data from the first Antarctic circumnavigation by Saildrone is a significant milestone for SOOSmap because it is the first time that SOOSmap has published data collected by a private company
- Following the SOOS Datathon in Incheon, South Korea, in May 2019, an updated version of the SOOS Mooring Network was added to SOOSmap.

2020 Plans:

In 2020, we plan to:

- Re-engineer the backend architecture for hosting data through EMODnet Physics to speed up loading times when drawing new datasets, which remains slow, despite improvements in 2019
- Provide input into EMODnet Physics' new user interface to make it more intuitive for Southern Ocean researchers
- Publish datasets from GLODAP and SOCAT
- Work with Australian curators of CTD data to design a workflow that makes it simple for Australian CTD data to be served through SOOSmap
- Take direct feeds from the British Oceanographic Data Centre into EMODnet servers, since SeaDataNet (the current intermediate step) contains a limited portion of BODC's total holdings.

SOOS Sponsorship

SOOS IPO Sponsorship in 2019

SOOS remains an initiative of SCAR and SCOR, and in 2019 this support, governance and sponsorship continued, highlighted by the support provided for the Annual SOOS Scientific Steering Committee Meeting (see page 30).

Further, in 2019, SOOS maintained its broad sponsorship base. Core sponsors remained the Australian Research Council's Antarctic Gateway Partnership (AGP), the University of Tasmania, Australia, the State Oceanic Administration of China, the University of Gothenburg, Sweden, and Antarctica New Zealand.

In-kind Service Providers are important and enable SOOS to achieve outputs and outcomes that would not be possible if they had to be funded directly by SOOS. The figure below shows the Service Providers for SOOS in 2019.

SOOS is grateful to all sponsors for the contribution they make to ensuring the efficient and sustained delivery of SOOS for the community.

Sustained support for the IPO

Sustaining funding and support of the IPO remains a significant activity of the IPO. Building on the significant effort in 2018 to secure sustained hosting for the SOOS office, SOOS delivered enhanced engagement with the partners of the newly developed SOOS funding partnership that is to run from 2020-2022: the University of Tasmania, Commonwealth Scientific and Industrial Research Organisation and the Tasmanian State Government Department of State Growth. Additionally, SOOS engaged with the Swedish Polar Research Secretariat to draft a new collaboration to enhance Swedish community efforts in the Southern Ocean, to be started in 2020. Further discussions took place with a number of other national communities on potential sponsorship opportunities.

SOOS Governing Bodies



Core Sponsors



Service Providers



Sponsorship of SOOS Activities

Sponsors of SOOS events provide a vital service in enabling the delivery of SOOS activities. In 2019, the following institutes sponsored SOOS events, and we thank them for their important support.

Event	Sponsoring Institute/Organisation
Workshop on the development of the SOOS RWG Weddell Sea-Dronning Maud Land (Tromso, Norway, Jan 2019)	Norwegian Polar Institute, Alfred Wegener Institute, SOOS Report: http://soos.aq/activities/rwg/wsdml

<p>1st Workshop of the Amundsen Bellingshausen Seas RWG (Incheon, Republic of Korea, May 2019)</p>	<p>SCAR, SCOR, SOOS, Korean Polar Research Institute (KOPRI), AGP Report: http://soos.aq/activities/rwg/abs</p>
<p>SOOS Scientific Steering Committee Meeting (Incheon, Republic of Korea, May 2019)</p>	<p>SCAR, SCOR, SOOS, Korean Polar Research Institute (KOPRI), AGP Minutes: http://soos.aq/about-us/ssc/meeting-minutes</p>
<p>SOOS Data Management Sub-Committee Meeting (Incheon, Republic of Korea, May 2019)</p>	<p>SCAR, SCOR, SOOS, Korean Polar Research Institute (KOPRI), AGP Minutes: http://soos.aq/data/dmsc/dmsc-minutes</p>
<p>Southern Ocean Data Hackathon (Incheon, Republic of Korea, May 2019)</p>	<p>SCAR, SCOR, SOOS, Korean Polar Research Institute (KOPRI), AGP</p>
<p>SOOS Executive Committee Meeting (Incheon, Republic of Korea, May 2019)</p>	<p>SCAR, SCOR, SOOS, Korean Polar Research Institute (KOPRI)</p>
<p>Polar Data Forum (Davos, Switzerland; June 2018)</p>	<p>SCAR Data Management Committee, Arctic Data Committee, Finnish Met. Institute, World Data Service, Royal Netherlands Institute for Sea Research</p>

Governance

Executive Committee

In 2019, the SOOS Executive Committee (EXCOM) held one in-person meeting, and several virtual meetings. Andrew Constable (AUS) and Sebastiaan Swart (Sweden) continued as Co-Chairs, and Mike Williams (NZ) and Eileen Hofmann (USA) continued as Vice Chairs.

Scientific Steering Committee

One SSC member rotated off the SSC in 201: Sang Hoon Lee (S. Korea). We thank Hoon for his contribution to SOOS! No new members were brought on to the committee in 2019, however an open call for nominations was held in late-2019 – early 2020 for new members starting in mid-2020.

The composition of the SSC in 2019, including the RWG Co-Chair ex-officios, is shown below:

Name	Country	Region	Gender	Expertise	2015	2016*	2017- Mid 2018	Mid 2018- 2019	Mid 2019- 2020	Mid 2020- 2021
Sebastiaan Swart	Sweden	EU	M	Physical	2^	2^	2^	3^	3^	
Andrew Constable	Australia	Aus/Pac	M	Biology	1^	1^	2^	2^	2^	
Matthew Mazloff	USA	N. Am	M	Physical	1	1	1	2	2	2
JB Sallee	France	EU	M	Physical	1	1	1	2	2	2
Mike Williams	NZ	Aus/Pac	M	Physical	1	1	1^	2^	2^	2^
Dake Chen	China	Asia	M	Physical			1	1	1	
Burcu Ozsoy	Turkey	EU/Asia	F	Sea ice			1	1	1	
Anya Waite	Canada	N. Am	F	Biology			1	1	1	
Eileen Hofmann	USA	N. Am	F	Biology				1^	1^	1^
Irene Schloss	Argentina	S. Am	F	Biology				1	1	1
Andrew Meijers	UK	EU	M	Physical				1	1	1
Sarah Fawcett	S. Africa	Africa	F	Biogeochem				1	1	1
DMSC Co-Chairs										
Sian Henley	UK	EU	F	WAPSA						
Kate Hendry	UK	EU	F	WAPSA						
Oscar Schofield^^	USA	N. Am	M	WAPSA						
Philippe Koubbi	France	EU	M	SOIS						
Tsuneo Odate	Japan	Asia	M	SOIS						
Walker Smith	USA	N. Am	M	Ross						
Sebastian Moreau	Norway	EU	M	WSDML						
Laura de Steur	Norway	EU	F	WSDML						
Julian Gutt	Germany	EU	M	WSDML						
Markus Janout	Germany	EU	M	WSDML						
Bastien Queste	UK	EU	M	ABS						
Patricia Yager	USA	N. Am	F	ABS						

Annual Scientific Steering Committee Meeting



The annual meeting for the SSC and Executive Committee took place in Incheon, South Korea (May 2019), hosted by the Korean Polar Research Institute. These meetings took place alongside the SOOS Data Management Sub-Committee meeting, Amundsen Sea Regional Working Group Meeting, and the KOPRI Symposium.

In addition to reviewing progress, a focus of the 2019 SSC meeting was strategic planning for the future. This was in recognition of the fact that we are nearing the end of the current Implementation Plan (2016-2020) and will need to start preparation for development of the next 5-year plan. This meeting also focused on the need to update the SOOS Science Plan, and discussions were held on how this can best be delivered.

The minutes from the SSC meeting are available on the SOOS website (soos.aq/about-us/scientific-steering-committee). SOOS thanks the sponsors and our host KOPRI for the significant organisation and financial support provided in hosting these meetings. SOOS also thanks SCOR and SCAR for their continued support of these annual meetings.



SOOS Executive Committee at KOPRI

SOOS Implementation Groups

Data Management Sub-Committee

The SOOS Data Management Sub-Committee (DMSC) has been engaged on a wide range of data activities, in addition to the development of DueSouth and SOOSmap (documented in other sections of this report).

Southern Ocean data rescue efforts

In 2019, the additional datasets discovered and documented in the SOOS Mooring Network were published through SOOSmap in 2019.

The DMSC continued to facilitate a collaboration between the Chinese National Arctic and Antarctic Data Centre, CLIVAR and Carbon Hydrographic Data Office, and the Ocean University China, to calibrate historic Chinese CTD data against other co-located observations. This collaboration also looked to publish these datasets alongside other international CTD observations, to improve access and use. Initial calibration trials were successful and negotiations on re-publication of the data through CCHDO or other CTD data aggregators is now underway.

Data Management Advocacy

In 2019, the DMSC drafted proposed new Terms of Reference for the DMSC and began discussions on a new consistent data policy for three key polar data committees - the SOOS DMSC, the Standing Committee on Antarctic Data Management, and the Arctic Data Committee. Core principles were suggested and discussed at the Polar Data Forum III in Helsinki, Finland in November 2019. A community discussion process is expected to agree on a core policy during 2020.

SOOS Datathon

Alongside the SSC and DMSC meetings in Incheon, Korea, the two committees worked together for a day of data management activities that resulted in several new projects that will improve SOOSmap and the broader SOOS data ecosystem. Among the main projects, a

collaboration was organised to standardise chlorophyll data from sea ice cores for publication in SOOSmap; a team identified key sources of duplication and potential new sources of oceanographic data for SOOSmap; the SOOS mooring network was checked for errors and new sources of data identified; the data needs of Southern Ocean glider scientists were identified; coding improvements were made to DueSouth; a team explored the potential and the challenges in trying to aggregate biogeochemical data beyond GEOTRACES and various carbon databases; and a project was defined to rescue and reuse historic Argentinian oceanographic data from the Antarctic Peninsula. The glider project has resulted in a report, and the chlorophyll data is expected to be published in SOOSmap in 2020, where the mooring network layer has been updated. The other projects have identified pathways to future improvements in Southern Ocean data management and created relationships among SOOS scientists and data managers that may underpin ongoing collaborations.

Federated Metadata Search

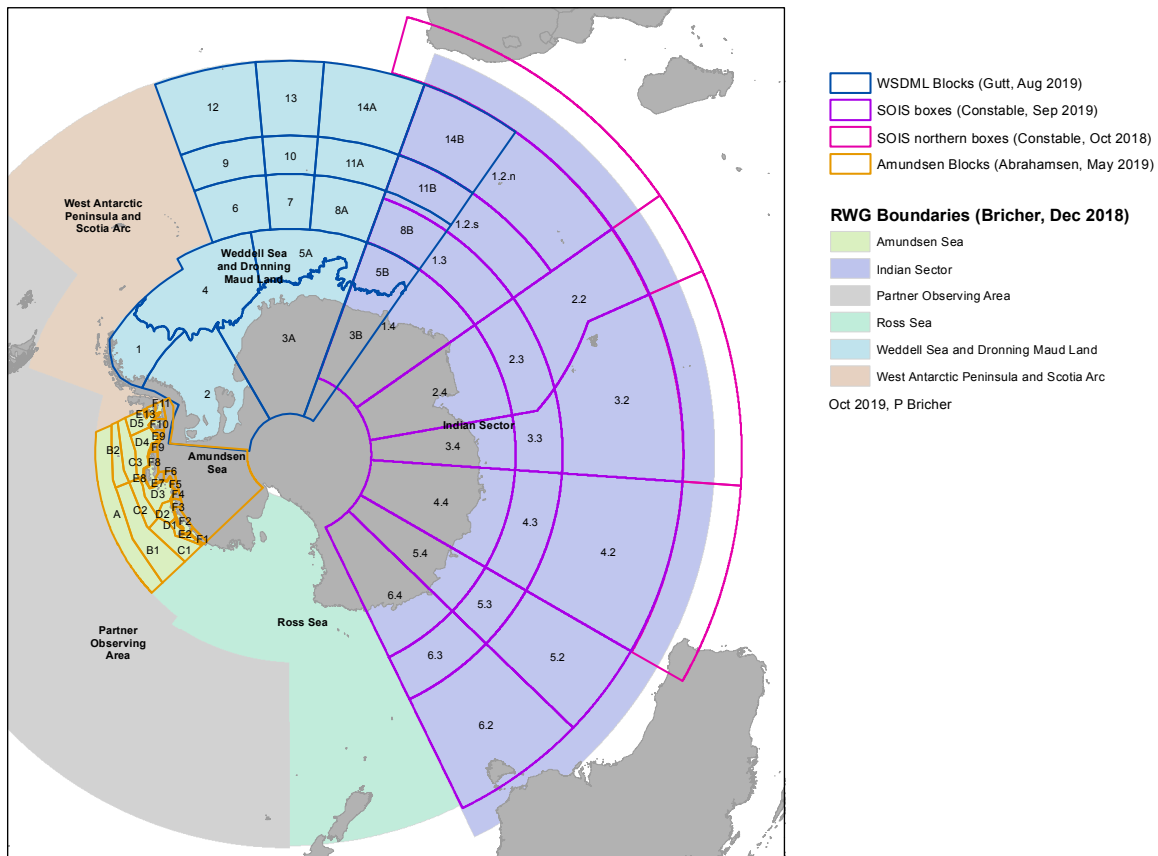
The Polar Data Discovery Enhancement Research (POLDER) continued its work in 2019. Details of this working group are highlighted in the Task Teams section below.

Regional Working Groups

SOOS Regional Working Groups will develop, coordinate and implement the observing system in their defined region. The regions align with the natural areas of focus of nations involved in Southern Ocean activities (although some activities will be coordinated at a circumpolar scale e.g., Argo). Given the long-term requirements for coordination and implementation, the SOOS Regional Working Groups are viewed as ongoing efforts, whilst still undergoing annual reviews by SOOS governance.

In 2018, SOOS SSC recommended that all RWGs develop sub-regions for quantification of observational requirements, coverage and gaps. In 2019, two RWGs defined their sub-regions (ABS and WSDML) and other groups initiated discussions on this. The sub-regions identified are shown in the map below, with justifications provided in individual RWG workshop reports.

SOOS RWG and Block Boundaries
(for discussion)



West Antarctic Peninsula and Scotia Arc (WAPSA) WG

Leadership:

K. Hendry (Co-Chair, UK); O. Schofield (Co-Chair, USA); S. Henley (Co-Chair, UK); I. Schloss (Argentina); M. Mata (Brazil); J. Arata (Chile); D. Abele (Germany); In-Young Ahn (Korea); A. Meijers (UK); E. Hofmann (USA); B. Ozsoy (Turkey); J. Hofer (APECS, Chile); P. Trathan (CCAMLR, UK)

2019 Milestones:

- WG Community Publication:
Henley et al., 2019: Variability and change in the West Antarctic Peninsula marine system: Research priorities and opportunities. *Progress in Oceanography*.
<https://doi.org/10.1016/j.pocean.2019.03.003>
- Submission of key West Antarctic Peninsula and Scotia Arc datasets in SOOSmap and cruises into DueSouth with support from the DMSC
- Student projects co-developed with the DMSC to improve discoverability, accessibility and usability of Southern Ocean datasets. For example, Masters project on Southern Ocean Argo data co-supervised by Kate Hendry (University of Bristol, WAPSA co-chair) and Matt Donnelly (BODC, DMSC). Published in Challenger Society:
<https://challengercaptainsblog.wordpress.com/2019/12/02/the-antarctic-circumpolar-current-what-can-argo-floats-tell-us/>
- Engagement with the Scotia Arc scientific community
- Establishment of WG newsletter using Airtable and Mailchimp with support from the IPO

Ross Sea WG

Leadership:

M. Williams (Co-Chair, NZ); W. Smith (Co-Chair, USA)

2019 Milestones:

2019 saw little activity by the Ross due to time limitations of the Co-Chairs. Following discussions with the group, Mike Williams stepped down from Ross co-chair positions and an open call for new Leadership Group members was made, closing in 2020.

SOOS continued engagement with CCAMLR with respect to the Ross Sea Marine Protected Area and planned monitoring activities to support the MPA.

Indian Sector WG

Leadership:

T. Odate (Co-Chair, Japan); A. Constable (Co-Chair; Aus); P. Koubbi (France)

2019 Milestones:

Presentations were made to the Leadership groups of ABS and WSDML in support of discussions on sub-region development and heat maps of observational coverage. Other than this, 2019 saw little additional activity by the SOIS due to time limitations of the Co-Chairs. Following discussions with the group, Andrew Constable and Philippe Koubbi both stepped down from SOIS co-chair positions and an open call for new Leadership Group members was made, closing in 2020.

Weddell Sea and Dronning Maud Land (WSDML) WG

Leadership:

J. Gutt (Co-Chair, Germany); L. de Steur (Co-Chair; Norway); S. Moreau (Co-Chair, Norway); M. Janout (Co-Chair, Germany); JB Sallee (France); A. Meijers (UK); L. Biddle (Sweden); S. Fawcett (S. Africa); M. Wege (APECS, S. Africa); U. Nixdorf (COMNAP, Germany); OA Bergstad (Norway)

2019 Milestones:

The first workshop for the working group was held in Tromsø, Norway, in January 2019. The workshop was jointly sponsored by the Norwegian Polar Institute and Alfred Wegener Institute.

The objectives of the workshop were;

1. Identify the community of researchers in the Weddell Sea - Dronning Maud Land
2. Gain consensus on the key drivers of biological and physical systems in the region
3. Develop a picture of the status of multidisciplinary observations in the region
4. Discuss key observational gaps, regional priorities, and challenges

The workshop was attended by 22 people (18 in person and 4 online) representing 16 countries. Report available [here](#) (de Steur, L., et al., 2019: DOI: 10.5281/zenodo.3941419).

Organisation and planning for a second workshop were also undertaken in 2019, to be held 28-30th April 2020 in Delmenhorst, Germany. This workshop was being sponsored by Hanse Wissenschaftskolleg, Alfred Wegener Institute, and Helmholtz Centre for Polar and Marine Research, as well as ECR support by SCOR. The workshop had 50 registrations but was unfortunately cancelled in early 2020 due to COVID-19.

Amundsen-Bellingshausen Sector (ABS) WG

Leadership:

B. Queste (Chair, UK); A. Wåhlin (Sweden); T-W Kim (Korea); T. Yager (USA); P. Abrahamson (UK); Y. Nakayama (APECS, Japan)

2019 Milestones:

The first workshop for the Amundsen and Bellingshausen Sector Regional Working Group was hosted by KOPRI, 8-10th May 2019.

The objectives of the workshop were;

1. Identify community of active researchers and operators in the ABS Sector
2. Gain consensus on the key drivers of the region
3. Develop a picture of the status of multidisciplinary observations in the ABS
4. Discuss key observational gaps, regional priorities, and challenges
5. Collate a list of upcoming work in the region to promote collaborative opportunities

The workshop was attended by 26 people representing 6 countries and 19 institutions.

A full report from the workshop is available [here](#) (Lowry, K., et al 2019: DOI: 105281/zenodo.3941417).

Capability Working Groups

SOOS Capability Working Groups enhance observational capabilities for SOOS, such as:

- Developing and implementing technologies
- Improving observational design, efficiency and coverage
- Developing associated methods for managing and disseminating information.

The enhanced knowledge, technology and observing capabilities from these groups are intended to feed directly into the implementation plans of the Regional Working Groups. Capability Working Groups are, generally speaking, limited to multi-year efforts, with annual review of progress provided by SOOS governance.

Censusing Animal Populations from Space (CAPS) WG

Leadership:

M. Hindell (Co-Chair, Aus); P. Fretwell (Co-Chair, UK); P. Trathan (UK); H. Lynch (USA); D. Costa (USA); K. Kovacs (Norway); A. Lowther (Norway); A. Constable (Aus); C. Southwell (Aus); B. de la Mare (Aus); M. LaRue (NZ); C. McMahon (Aus); H. Bornemann (Germany)

2019 Milestones:

CAPS has a 4-year work plan, starting in 2015, and is completing its final year.

- Spectral measurements of four seals species to assist with remote species discrimination were taken at Rothera in 2020.
- “Counting seals in Antarctica” through Tomrod crowdsourcing platform is now complete, and the WG is working on a final census and habitat suitability for Weddell seals.
- Distribution of Weddell seals along the Antarctic coastline via VHR and citizen science has been completed and is published in Remote Sensing for Ecology and Conservation (LaRue, M.A., et al., 2019).

- Tasked the first set of images for the circumpolar census of pack-ice seals and established a stratified sampling regime based on past sea-ice extents and concentrations (images provided by NASA CAPS members, funded by NSF).

Acoustic Trends in Antarctic Blue and Fin whales in the Southern Ocean (ATWG) WG

Leadership:

F. Samaran (Co-Chair, France); K. Stafford (Co-Chair, USA); S. Buchan (Chile); F. Castro (Chile); K. Findlay (S. Africa); D. Harris (UK); B. Miller (Aus); I. van Opzeeland (Germany); A. Sirovic (USA)

2019 Milestones:

- Deployment of 4 autonomous recording devices and retrieval of 2 previously deployed autonomous recording devices in the Southern Ocean during the 2019/2020 summer
- Deployment of a number of autonomous recorders in low and mid-latitude Indian Ocean, which will value-add and supplement the Southern Ocean Hydrophone Network
- Publication of a conference proceedings report on passive acoustic results from blue whale-krill voyage (ENRICH) during 2018. [Miller BS, et al 2019 A passive acoustic survey for marine mammals conducted during the 2019 Antarctic voyage on Euphausiids and Nutrient Recycling in Cetacean Hotspots (ENRICH). In: Proceedings of Acoustics 2019. Australian Acoustical Society, Cape Schanck, Victoria, Australia, p 1–10]
- Annotated library has been completed (early 2020) and manuscript detailing its contents and applications have been submitted to Scientific Reports.
[\[https://data.aad.gov.au/metadata/records/AcousticTrends_BlueFinLibrary\]](https://data.aad.gov.au/metadata/records/AcousticTrends_BlueFinLibrary)
- Drafted, Balcazar N, et. al. (Submitted). An open access dataset for developing automated detectors of Antarctic baleen whale sounds and performance evaluation of two commonly used detectors. Scientific Reports
- WG meeting held in December 2019, alongside the World Marine Mammal Conference, Barcelona, Spain.
- Hired a post-doctoral researcher, Dr Franciele Castro (University of Concepcion, Chile) under Dr Susannah Buchan, to undertake the analysis of the working group call library

Southern Ocean Fluxes (SOFLUX) WG

Leadership:

S. Gille (Co-Chair, USA); S. Swart (Co-Chair, Sweden); B. Delille (Belgium); M. Bourassa (USA); C-A. Clayson (USA); S. Josey (UK); A. Lenton (Aus); I. Smith (NZ) E. Schulz (Aus); B. Ward (UK); M. du Plessis (APECS, S. Africa)

2019 Milestones:

2019 was the 4th year of a 5-year work plan for SOFLUX (ending 2020).

- Growth in membership of the WG for 65 (2018) to 89
- The WG coordinated and published a review paper on Southern Ocean fluxes as a white paper to the OceanObs 2019 special issue
Swart, S., et al 2019 Constraining Southern Ocean air-sea-ice fluxes through enhanced observations. *Frontiers Mar. Sci.*, 6:421, doi: 10.3389/fmars.2019.00421.
- WG members also contributed Southern Ocean flux information and recommendations in other OceanObs papers;

Cronin M., et al., 2019. doi: 10.3389/fmars.2019.00430.
Smith G., et al., 2019 doi: 10.3389/fmars.2019.00429. 2019.
Smith, S., et al., 2019. doi: 10.3389/fmars.2019.00434.
- WG members contributed Southern Ocean air-sea heat fluxes products to the BAMS State of the Climate 2019.
Queste, B.Y., et al., 2020. Southern Ocean [in “State of the Climate in 2019”]. *Bull. Amer. Meteor. Soc.*, *accepted, 2020*
- Town Hall at the Ocean Sciences Meeting with sponsorship from Saildrone, with 64 attendees, representing 10 countries and 36 institutions.
- Regular communication to all members through newsletters (every 1-3 months) to update on key events, papers, field activities etc)

- In collaboration with the Observing System Design Capability Working Group, SOFLUX submitted a manuscript on the designing a mooring array for constraining air-sea heat exchanges (see Flux Mooring Project below)

Observing and Understanding the Ocean beneath Antarctic sea ice and ice shelves (OASIIS) WG

Leadership:

E. van Wijk (Co-Chair, Aus); R. Coleman (Co-Chair, Aus); A. Breierly (UK); L. Herraiz-Borreguero (Aus); P. Dutrieux (USA)

2019 Milestones:

- A number of meetings of the leadership group were held throughout 2019 to discuss the best way forward for the WG. It was acknowledged that a number of recent community publications and reports on under ice observation requirements had filled the niche that was to be covered by the OASIIS update to the Observing Under Ice Strategy document. In light of this, the WG has re-aligned their efforts to focus on the review of under ice observing technology and platforms, for delivery in 2020.
- A planning and scoping document of the review of under ice observing technology and platforms was achieved and is planned to be delivered in 2020.

Observing System Design (OSD) WG

Leadership:

M. Mazloff (USA)

2019 Milestones:

This working group was proposed in mid-2018, builds on the priorities identified in the Observing System Design Task Team (2017).

- Contributed to the AniBOS proposal to form a GOOS network of Animal Borne Ocean Sensors, by showing the value of animal-borne observations to GOOS.

- In collaboration with SOFLUX submitted a manuscript on the designing a mooring array for constraining air-sea heat exchanges (see Flux Mooring Project below).
- Worked with the IPO to build membership and define a clear way forward for 2020

Task Teams

SOOS Task Teams are developed to produce specific products, organise events, or solve a particular problem. Each Task Team is made up of a small group of experts and aims to complete its work within weeks or months. SOOS Capability Working Groups can be formed to address issues requiring a long-term effort (e.g., months to years).

Ecosystem Essential Ocean Variables (eEOVs) Task Team

Leadership:

A. Constable (Co-Chair, Aus); I. Schloss (Co-Chair, Argentina); O. Schofield (US); M. Muelbert (Brazil); J. Melbourne-Thomas (Aus)

2019 Milestones:

The Task Team was approved in mid-2019, and has worked to document, evaluate and scope routine reporting products for ecosystem Essential Ocean Variables (eEOVs) to support assessments of the status and trends of Southern Ocean ecosystems, and to prepare a publication on these efforts. The publication is being delivered as a component of the Marine Ecosystem Assessment for the Southern Ocean (MEASO) being undertaken by the program Integrating Climate and Ecosystem Dynamics, a joint program of IMBeR and SCAR.

All above publications are being prepared for submission in a MEASO special issue in *Frontiers of Ecology and Evolution*, due October 2020.

Autonomous Underwater Vehicles (AUVs) Task Team

Leadership:

G. Williams (Co-Chair, Aus); P. King (Co-Chair, Aus)

2019 Milestones:

The Task Team on Autonomous Underwater Vehicles (AUVs) was approved in mid-2019 and aims to match polar AUV science objectives and engineering abilities with deployment capabilities and sensor development across National Antarctic Programs. A workshop was held

in 2019, to develop collaborative efforts with the Swedish AUV program and other nations involved in deployment of large AUVs in Antarctica. Engagement through SOOS at the Amundsen Bellingshausen Sea RWG workshop at KOPRI, resulted in a new partnership and field campaign with the Australian AUV being successfully deployed in the Amundsen on the Korean research vessel in the 2019/2020 season.

Alignment with the Society for Underwater Technology's Polar AUV group and the international Expert Panel on Polar AUV (IEP-PAUV) has resulted more recently in a shift of focus for the SOOS Task Team, with a re-proposal of focus to be made in 2020.

Flux Mooring Project

Leadership:

Y. Wei (China); Sarah Gille (USA); M. Mazloff (USA); Veronica Tamsitt (AUS); Sebastiaan Swart (Sweden); D. Chen (China); Louise Newman (AUS)

2019 Milestones:

The task team was a joint initiative of SOFLUX and OSD working groups and supported by a Chinese-funded Post-Doc (Yanzhou Wei) and aimed to identify the optimal placement of moorings in the Southern Ocean to constrain large scale air-sea fluxes. This study was initiated in 2019 and resulted in a publication in 2020.

Wei et al., Optimizing mooring placement to constrain Southern Ocean air-sea fluxes, J. Atm. and Ocean. Tech. DOI: 10.1175/JTECH-D-19-0203.1. Accepted.

POLDER

Leadership:

P. Bricher (SOOS); A. Smirnov (Iceland); T. De Bruin (Netherlands)

2019 Milestones:

Polar Data Discovery Enhancement Research (POLDER) is a collaboration between the Arctic Data Committee (ADC), Standing Committee on Antarctic Data Management (SCADM) and

SOOS, to develop tools and resources to support metadata aggregation, and federated search tools to improve the discoverability of polar science data.

POLDER made considerable progress and also evolved its focus during 2019. POLDER has

- Helped organise and convene the Polar Data Forum III (PDFIII) in Helsinki, Finland, in November 2019.
- Led a community discussion for the three polar data committees (SOOS DMSC, SCADM, and ADC) about ways to prepare for and to speed up the adoption of the tools that underpin federated search.
- Coordinated a two-day workshop on implementing schema.org and identified ways for polar data centres to participate in global discussions on best-practice implementation of schema.org.
- Delivered a new webpage hosted by [SOOS website](#).
- POLDER members contributed to the OceanObs Community White Paper on FAIR data principles in oceanographic data management.

2020 Plans

- To finalise and publish the research paper associated with the survey of metadata repositories
- To publish the results of the survey of metadata repositories as a dataset for the broader community
- To continue to advocate for the adoption of the Science On Schema.org best practices by the polar data community

Acronyms

AAD - Australian Antarctic Division

AADC - Australian Antarctic Division Data Centre

ABS - Amundsen and Bellingshausen Sector

ACE CRC - Antarctic Climate and Ecosystem Cooperative Research Centre
ADC - Arctic Data Committee

AGP - Antarctic Gateway Partnership

AniBOS - Animal Borne Ocean Sensors

Antarctic NZ - Antarctica New Zealand

AOGS - Asia and Oceania Geosciences Society

APECS - Association of Polar Early Career Scientists

ASPeCt - Antarctic Sea Ice Processes and Climate

ATCM-CEP - Antarctic Treaty Consultative Meeting - Committee for Environmental Protection

ATWG - Acoustic Trends in Antarctic Blue and Fin Whales in the Southern Ocean Working Group

AUVs) - Autonomous Underwater Vehicle(s)

BODC - British Oceanographic Data Centre

CAPS - Censusing Animal Populations from Space

CCAMLR - Commission for the Conservation of Antarctic Marine Living Resources

CCHDO - CLIVAR and Carbon Hydrographic Office

CLIVAR - Climate Variability and Predictability

CLiC - Climate and Cryosphere

COMNAP - Council of Managers of National Antarctic Programs

COP25 - UN Climate Change Conference COP25 (Conference of Parties)

CTD - Conductivity, Temperature, Depth

CWG(s) - Capability Working Group(s)

DMSC - Data Management Subcommittee

EGU - European Geosciences Union

EMODnet - European Marine Observation and Data Network

ENRICH - Euphausiids and Nutrient Recycling In Cetacean Hotspots

EOVs - Essential Ocean Variables

eEOV - ecosystem Essential Ocean Variables

EuroGOOS - European Global Ocean Observing System

FAIR - Findable, Accessible, Interoperable, Reusable

FOO - Framework for Ocean Observing

GCMD - Global Change Master Directory

GOOS - Global Ocean Observing System

GO-SHIP - The Global Ocean Ship-Based Hydrographic Investigations Program

IAATO - International Association of Antarctic Tour Operators

JCOMMOPS - Joint Technical Commission for Oceanography and Marine Meteorology in situ
Observations Programme Support Centre

KOPRI - Korean Polar Research Institute

KRAs - Key Result Areas

IAPSO - International Association for the Physical Sciences of the Ocean

IASC - International Arctic Science Committee

ICED - Integrated Climate and Ecosystem Dynamics

IMBeR - Integrated Marine Biosphere Research

IMAS - Institute for Marine and Antarctic Studies

IMOS - Integrated Marine Observing System

IPO - International Project Office

IWC-SORP - International Whaling Commission Southern Ocean Research Partnership

MEASO - Marine Ecosystem Assessment of the Southern Ocean

MEOP - Marine Mammals Exploring the Oceans Pole to Pole

MPA - Marine Protected Area

NASA - National Aeronautics and Space Administration

NSF - National Science Foundation

OASIIS - Observing and Understanding the Ocean below Antarctic Sea Ice and Ice

ShelvesOOPC - Ocean Observations Physics and Climate Panel

OSD - Observing System Design

PDFIII - Polar Data Forum III

POGO - Partnership for Observations of the Global Ocean

POLDER - Polar Data Discovery Enhancement Research

RWG(s) - Regional Working Group(s)

SCADM - Standing Committee on Antarctic Data Management

SCAR - Scientific Committee on Antarctic Research

SCOR - Scientific Committee on Oceanic Research

SOA / SOA-China - State Oceanic Administration, China

SOFLUX - Southern Ocean Fluxes

SOIS - Southern Ocean Indian Sector

SOOS - Southern Ocean Observing System

SORP - Southern Ocean Regional Panel Expert Group

SSC - Scientific Steering Committee

TORs - Terms of Reference

TPN - Tasmanian Polar Network

TT - Task Team

UN - United Nations

UNFCCC - United Nations Framework Convention on Climate Change

UTAS - University of Tasmania

WAPSA - West Antarctic Peninsula and Scotia Arc

WCRP - World Climate Research Programme

WG - Working Group

WSDML - Weddell Sea and Dronning Maud Land