SOOS Weddell Sea and Dronning Maud Land Working Group (SOOS WS-DML WG)

Extended Terms of Reference,
approved by SOOS Scientific Steering Committee, Nov. 2018

SOOS Regional Working Group Title

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SOOS SSC Liaison

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SOOS WS-DML Working Group Key Objective

The Weddell Sea including the ocean off Dronning Maud Land (Figure 1) is regionally representative for the high latitude Southern Ocean, due to its pronounced seasonality and circum-polar currents and it is unique for its deep-water formation and multi-year sea-ice cover. In addition, the Weddell Gyre connects water masses at the northern margin of the Southern Ocean (SO) in the Antarctic Circumpolar Current (ACC) with those shaped by the large ice shelves and sea ice formation in the southern Weddell Sea. This hydrodynamic regime affects additional physical, geochemical and biological processes. A smaller proportion of the region in the western Weddell Sea is under climate-change stress, experiencing the disintegration of ice shelves and enhanced freshening due to ocean warming and changes in wind stress patterns . In the eastern part, however, the environment is relatively stable until recently but is still predicted to experience significant warming, sea-ice melting and loss of ice-shelf until the end of the century. The recent re-emergence of the Weddell Polynya in this region, for unknown reasons and with potentially significant impact to regional watermasses underscores the importance of observing and understanding this region.

The WS-DML working group **key objectives** are:

- to facilitate coordinated and standardized observational studies of major physical, chemical and biological variables including their drivers and interactions. This refers to a regional but also a circum-Antarctic approach.
- to contribute to an increase in quality of the science output, and strengthen the awareness of the relevance of research in the WS-DML sector of the Southern Ocean through international projects contributing to the Southern Ocean Observing System.

Terms of Reference

The SOOS WS-DML WG aims to fulfill the following terms of reference:

1. Develop and enable regional-scale observing using SOOS best practice for observing systems, including areas from which data sets already exist, to detect long-term changes.
2. Identify physical, geochemical and biological key processes and their coupling in areas of the WS-DML region under climate change as well as in presently stable areas expected to experience warming and melting of sea-ice in the future.
3. Identify and assemble key legacy data sets and sampling techniques.
4. Provide best practice sampling protocols to enable the standardization of measurements.
5. Based on the experience in the region, identify data gaps and bottlenecks in the observation systems that hinder a comprehensive understanding of the physical, geochemical and biological systems.
6. Facilitate coordinated and, where possible, multi-disciplinary observations.
7. Make plans of operations available on the SOOS website to increase collaboration amongst the international community.
8. Facilitate procedures to achieve data availability across the science community according to SOOS data policy, which includes the publication of data and meta-data.
9. Convene focussed sessions at international meetings, including SCAR, SCOR and their scientific initiatives, and facilitate synthesis products, to increase the awareness of the science community to the importance of the Weddell Sea – Dronning Maud Land region. Also joint events with the International Arctic Science Committee (IASC) on polar comparative observations and analysis as well as should be supported.
10. Provide support to the International Program Office (IPO) by providing short reports to be available at the SOOS SSC annual meeting, as well as providing content for the IPO website/newsletters on the activities and outcome.
11. Contribute to international initiatives assessing the state of the SO, especially with reference to climate change, pollution and the exploitation of natural resources.
12. Support stakeholders with scientific information, especially the initiative to develop an MPA; support the MPA management plan after its endorsement.

Participants

The SOOS WS-DML WG has no official membership. We are open for any experts who are interested in scientific issues related to SO scientific observations in our area of interest and adjacent regions. The executive committee includes experts in physical and chemical oceanography, marine biology and/or sea ice.

The executive committee (EXCOM) consists of:

Julian Gutt Julian.Gutt@awi.de	Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany	Co-chair SCAR liaison
Laura de Steur laura.de.steur@npolar.no	Norwegian Polar Institute, Tromsø, Norway	Co-chair
Sebastien Moreau Sebastien.Moreau@npolar.no	Norwegian Polar Institute, Tromsø, Norway	Co-chair
Torsten Kanzow torsten.kanzow@awi.de	Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany	Co-chair
Jean-Baptiste Sallée jbsallee@gmail.com	Laboratoire d'Océanographie et du Climat, Paris, France	member
Andrew Meijers andmei@bas.ac.uk	British Antarctic Survey, Cambridge, U.K.	SSC liaison
Louise Biddle louise.biddle@gu.se	University of Gothenburg, Sweden	member
Sarah Fawcett sarah.fawcett@uct.ac.za	University of Capetown, South Africa	member
Mia Wege mwege@zoology.up.ac.za	University of Pretoria, South Africa	APECS representative
Uwe Nixdorf Uwe.Nixdorf@awi.de	Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany	COMNAP representative
Odd Aksel Bergstad odd.aksel.bergstad@imr.no	Institute of Marine Research, Norway	Natural resources and conservation expert

Products and Outcomes

- Integration of data and other information from different sources (repositories) by the SOOS data management group in cooperation with data providers,
- Map of existing major sampling practices of ships and stations in the region posted on the SOOS Web site along with planned activities.
- Agreement for data sharing among the science community and provision of data streams to SOOS in cooperation with the main data repositories.

- Contribution to publications on latest results on dynamics and change in the region and concepts for future research priorities preferably in peer-reviewed journals.
- Encourage the development of innovative products, e.g. time series, maps and models that can be used by researchers to address scientific challenges.
- Facilitate that national operators reinforce following the best practice.

Mode of Operation

Communication and coordination within the WS-DML WG Executive Committee (EXCOM) and also with a wider community of experts will be done on a regular base by **electronic media** including virtual (video) conferences. For **meetings** of the core group and wider community **scientific conferences** such as the SCAR Open Science Conferences are used as platform but occasionally also independent meetings specific to WS-DML WG issues, are planned. For dissemination of any kind of information relevant to this SOOS WG we will use the **SOOS webpage**. In addition, the Southern Ocean Knowledge and Information (SOKI) wiki is available for registered users and SOOS WGs.

Region of Focus

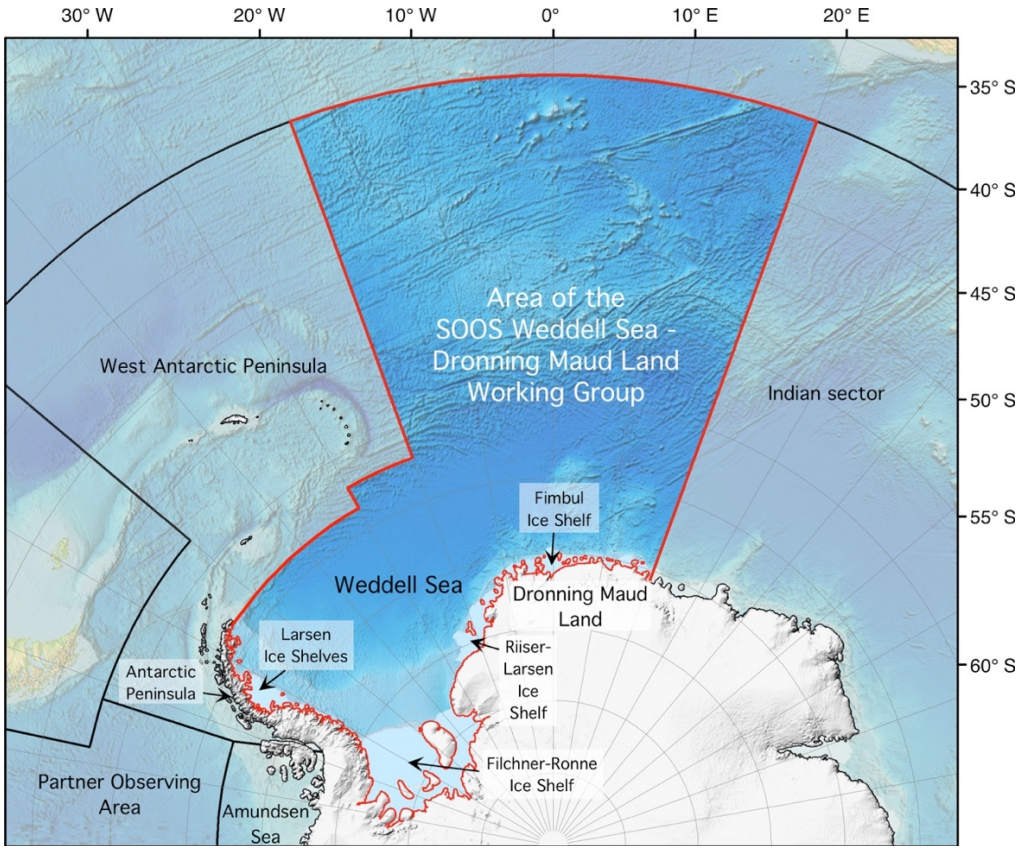

Figure 1: *Corner points: 40.00°S 020.00°E; 40.00°S 020.00°W; 62.00°S 020.00°W; 62.00°S 030.00°W; 63.50°S 030.00°W; 63.50°W 050.00°S; 63.50°W 055.34°S; 63.50°W 057.48°S; coastline/grounding line of the Antarctic continent; 70.85°S 020.00°E.*

A regionalization of our area of interest is to be discussed during the WS-DML WG workshop in January 2019 in Tromsø with the aim to identify sub-areas, which represent specific physical, geochemical and biological features, such as gyres, fronts and currents, upwelling, ice shelves, phytoplankton blooms, polynyas and benthic hotspots. Such definitions of environment-defined sub-areas demand the consideration of exchanges with neighboring working groups, such as those in the "Indian Sector" and "West of the Antarctic Peninsula" as well as land-ocean and ocean-ice shelf interactions.

Strategy & Milestones

The **short-term strategy** of the WS-DML WG on a monthly to yearly basis is to collect various kinds of information from the scientific community being generally relevant to SOOS and support the **dissemination of such information and the exchange of experience**. This is to be implemented using all kind of media, especially those mentioned in "Mode of Operation" (see above). Support from the SOOS webmaster(s) is needed.

As soon as possible all publicly available metadata of **SOOS relevant parameters** and of measurements incl. expeditions should be made available through the SOOS webpage acting as a kind of portal. They should be linked to the true data sets. Due to the amount and variety of data this challenge can only be addressed within an integrated approach between SOOS data managers and experts as well as decision makers maintaining data repositories. As a consequence, this milestone can only be achieved at an **intermediate temporal scale** of several years and demands considerable manpower (Figure 2).

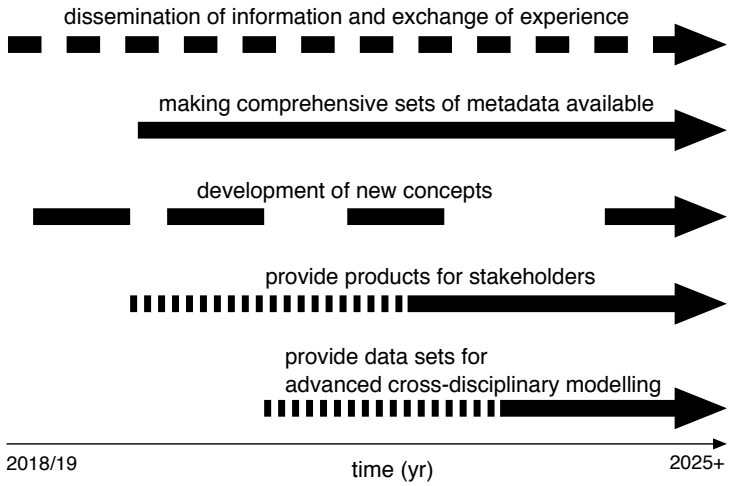

Figure 2: *Timeline of possible activities, milestones, strategies, and output of the SOOS WS-DML working group.*

At any time the WG supports the **development of new concepts** to collect new data and analyse new as well as existing data sets also during topical workshops. **The technology** includes advanced autonomous and remotely operating measuring platforms, moorings

and landers, traditional ship-based surveys and station-based measurements as well as remote sensing techniques (aircrafts, satellites, drones).

Another milestone for the **longer temporal scale** is a significantly improved and evidence-based understanding of the dynamics of physical, biological and geochemical processes in the WS-DML and to integrate this information into an approach covering the entire Southern Ocean. The resulting improved knowledge should be made available especially for **stakeholders and decision makers**, such as the Antarctic Treaty Meeting with its sub-organisations (e.g. CCAMLR and CEP), UNFCCC, IPCC and IPBES.

Also within a **long-term perspective** a comprehensive data set could be assembled, which provides the basis for better integrated model for (part of) the Southern Ocean. Such a contribution to a **cross-disciplinary approach** should allow to integrate a variety of selected key biological and physical parameters for a better understanding of climate, climate change and related phenomena, such as ocean acidification driving the SO ecosystem or ocean-atmosphere CO_2 and O_2 exchange.