SCOR Working Group 166: Developing resources for the study of Methylated Sulfur compound cycling PROcesses in the ocean (DMS-PRO)

1. Brief summary with the main highlights (200-300 words)

DMS-PRO initiated its activities in January 2023. During this initial period, the group has deployed a strategy to work effectively towards its objectives by (1) creating four thematic teams, (2) setting up internal communication and online collaboration platforms, and (3) trying to establish a regular meeting schedule within each team. The four teams are Standard Operating Procedures, Database, Communication & Outreach, and Funding & Endorsement. Each team has 2-3 coordinators, and coordination among teams is ensured by the co-chairs and by the participation of each member in more than one team.

According to the work plan, the group has placed efforts on the core terms of reference, T1-T3, which include the elaboration of a Standard Operating Procedures (SOP) document and the creation of a database for methylated sulfur cycling rate measurements. Discussions held during plenary and team meetings have been crucial to better define the content of the SOP and the database. On another front, the group has also networked with related working groups (Cice2CLouds, BEPSII) and organizations (SOLAS) and has delivered poster and oral presentations in 3 conferences or workshops. Furthermore, the establishment of DMS-PRO has been key to stimulate the organization of a new edition of the DMS(P) Symposium, planned for 2025. Although improvements in the internal functioning and member engagement are still needed, the activities carried out during these initial 7 months provide a solid foundation to achieve important objectives during the second year.

2. Activities since previous report to SCOR (e.g., virtual or in-person meetings, email discussions, special sessions). Limit 1000 words

The DMS-PRO working group initiated its activities on January 1st of the current year. During the initial two months, the group primarily concentrated on defining various organizational aspects that would enhance communication within the working group and contribute to the successful accomplishment of the proposed terms of reference.

In our first plenary virtual meeting, the working group successfully established thematic teams and engaged in productive discussions regarding platforms that would facilitate seamless collaboration among the members. As the months progressed, we dedicated our efforts to further shaping and structuring the different thematic groups, while also fostering a shared working foundation through efficient email exchanges and online questionnaires. Four thematic teams were established: Standard Operating Procedures, Database, Communication & Outreach, Funding & Endorsement. It was decided to use Open Science Foundation (OSF) as the main collaboration platform and document repository, because it is fully accessible from all members' countries. A Google Drive was also set up and integrated with OSF to allow for more flexible online edition of documents.

Once the organizational aspects were decided, we transitioned into working as separate thematic groups through online meetings. It is crucial to emphasize that despite operating as teams, all members of the working group are kept well-informed about the progress of other thematic groups

through the sharing of meeting minutes. Additionally, we ensure that there is a deliberate overlap of team members across different groups to promote fluid communication. By implementing these measures, we have created a system that allows us to maintain a comprehensive understanding of the advancements made by each thematic group while also facilitating effective collaboration and coordination among all team members.

In section 4 you will find a comprehensive overview of the advancements made by the thematic teams Standard Operating Procedures and Database, specifically pertaining to the respective term of reference they are associated with.

Outreach activities have played a significant role in raising awareness about the formation of the working group and its goals. Oral and poster presentations are summarized in section 3. Also, affiliation institutes, such as ICM-CSIC and INIDEP, actively promoted the working group's formation within their news platforms, and outreach efforts have extended to the public through local written press.

Furthermore, plans are underway to organize the 7th "International Symposium on biological and environmental chemistry of DMS(P) and related compounds" in 2025 in Mobile, USA (also in hybrid format), marking a significant milestone. The DMS(P) Symposia started in 1995 and had a periodicity of 4-5 years until the last one, held in 2014 in Barcelona, Spain. The working group will be actively involved in the organizational aspects of this upcoming meeting, ensuring integral coordination and participation.

<u>WG Plenary Meetings</u>
February 3 & 7

<u>Thematic Team Meetings</u>
SOP: May 8 & June 14
Database: May 5 & July 6
Communication & Outreach: May 2 & Jun 1
Funding & Endorsement: May 10

3. Documents published since previous report to SCOR (e.g., peer-reviewed journal articles, reports, Web pages) and should be limited to publications that resulted directly from WG activities and which acknowledge SCOR support

During the first year the group has not produced documents such as articles or reports. Work is underway to set up a web page where DMS-PRO's activities and products will be showcased, and which will also serve as a meeting point with the wider community. Below we list conferences and workshops where the group gave presentations:

Galí, M & del Valle, D.A. Introducing SCOR Working Group DMS-PRO: Developing resources for the study of Methylated Sulfur compound cycling PROcesses in the ocean. Sulfur cycling at high latitudes: New discoveries and challenges, SOLAS Seminar V, hosted by Biogeochemical Exchange Processes at the Sea-Ice Interfaces (BEPSII). Invited talk, online. March 2023.

Galí, M., D.A. del Valle, S.D. Archer, H.W. Bange, E. Bucciarelli, E.S.M. Deschaseaux, J.M. González, H.

Hayashida, F.E. Hopkins, S. Kameyama, E. McParland, K-T Park, D. Shenoy, J. Stefels, J.D. Todd, P.D. Tortell, L. Winkel, G-P Yang, M. Zárate, M. Zhang. Establishing an International, Multidisciplinary Community of Practice for the Study of Methylated Sulfur Compounds in the Ocean: SCOR Working Group DMS-PRO. Poster presented at ASLO Ocean Sciences, Mallorca, Spain. June 2023.

Hayashida, H., M. Galí, D.A. del Valle, S.D. Archer, H.W. Bange, E. Bucciarelli, E.S.M. Deschaseaux, J.M. González, F.E. Hopkins, S. Kameyama, E. McParland, K-T Park, D. Shenoy, J. Stefels, J.D. Todd, P.D. Tortell, L. Winkel, G-P Yang, M. Zárate, M. Zhang, S. Ishino, H. Angot, A. Haddon, S. Joge, H-G Lim, A. Mahajan, I. Peeken, N. Steiner, J. Thomas, M. Willis. Sulfur cycle research activities within SCOR working groups DMS-PRO and CIce2Clouds. Talk presented at The Asia Oceania Geosciences Society (AOGS), Singapore. July 2023.

4. Progress toward achieving group's terms of reference. List each term of reference separately and describe progress on each one. Limit 1000 words

T1. *To develop community consensus on the measurement of MSC cycling rates, evaluate the suitability of available methods, and recommend standard operating practices (SOP).*

We have formed a dedicated Standard Operating Procedure (SOP) Team coordinated by Frances Hopkins, Steve Archer, and Daniela del Valle, with the primary objective of developing the proposed SOP. The team has already convened twice to initiate this process. Their initial focus has been on creating a thorough inventory of measurements related to MSC rates. This comprehensive list will serve as the basis for determining the specific processes that will be included in the SOP. Furthermore, there is ongoing consideration to expand the scope of the SOP to include the measurement of different MSC pools. To accomplish this, a subgroup within the SOP Team will be responsible for organizing and overseeing the inclusion of these additional measurements.

T2. *To compile a comprehensive database of MSC cycling rates in the ocean and to freely disseminate the database and related documentation according to the FAIR principles.*

We have formed a dedicated Database Team coordinated by Martí Galí and José González, with the objective of designing, testing, and deploying the database, to ultimately open it for data submissions from the wider community. The team has convened twice and has worked in close coordination with the SOP Team to ensure that all measurement procedures included in the SOP can be accommodated in the database with unequivocal identifiers. Although the database will initially receive data from the pelagic environment, the discussions within the group have identified the need to design the database in such a way that allows for inclusion of data from other environments as well as mesocosm studies and laboratory cultures.

On the technical side, a test installation of ERDDAP (NOAA's data server that will be used to distribute DMS-PRO data), has been already made on ICM-CSIC computers by ICM staff. Template files for data submission are currently being prepared for testing on ERDDAP. It was agreed that the DMS-PRO database will be publicly distributed through Galí's institution domain with the URL https://dms-pro.icm.csic.es.

T3. *To develop a transparent framework for the quality assessment and control, standardization,*

and curation of MSC cycling datasets.

Discussions are underway, within both the SOP and the Database teams, as to the inclusion and quality control criteria for MSC cycling rate measurements. The prevailing view is that the SOP and Database products must include comprehensive information and metadata to allow end users to make informed decisions. The list of measurement types is rather extensive, and the development of quality assessment and quality control criteria for the SOP and Database will require the involvement of experts in the field outside DMS-PRO, which we have started to identify.

T4. *To analyze and summarize the patterns of MSC cycling rates in the global ocean in relation to their abiotic and biotic environment.*

Scheduled to be started on Year 2.

T5. *To provide expert guidance on the use of the MSC cycling database for model development and evaluation.*

Scheduled to be started on Year 3. Inclusion of modellers in the Database Team (Hakase Hayashida, Martí Galí) and exchange with the wider modelling community is a key aspect for achieving this term of reference.

T6. *To improve the coordination between measurements of MSC cycling rates and stocks, and foster interdisciplinary research by relating these to other biogeochemical variables and molecular and 'omics data (Overarching term of reference).*

To accomplish this objective, we have placed emphasis on the diverse composition of the teams. In particular, the Database Team is coordinated by José González, an expert in molecular microbiology and bioinformatics, and includes other members with molecular microbiology expertise (Jon Todd), and others with relevant expertise on biogeochemical stressors (Eva Bucciarelli, Damodar Shenoy, Hermann Bange, Steve Archer).

T7. *To establish an international community of practice focused on research, capacity development, and oceanographic multidisciplinary collaboration in the topic of oceanic S cycle.*
Overarching term of reference.

5. WG activities planned for the coming year. Limit 500 words

During the second year the DMS-PRO working group will focus on terms of reference T1 to T3, which together make the hard core of DMS-PRO on which other key activities (e.g. scientific reports, training and capacity building activities) rely upon. Completion of T1-T3 will therefore mark an important milestone in DMS-PRO's development strategy.

The first version of the SOP (T1) will be completed during the second year. The writing tasks will be coordinated by the SOP team but will require the engagement of researchers from outside the working group, who will be requested to write specific sections of the SOP according to their expertise. This first version of the document will be made public for review before the DMS(P) Meeting planned for late winter 2025, where discussions will be organized to collect relevant feedback.

Intensive work on T2 and T3 is also planned for the remaining part of year 1 and the entire year 2. During the remaining part of year 1 (until January 2024) the database will be fully deployed, and the data submission workflow will be tested internally by members of the Database team. During year 2, submissions will be made by members of the entire working group and additional reviews of the workflow will be made, with the objective of publicly opening the database for submissions before the end of year 2. At this point, it will also be possible to retrieve information from the database, although it will not be complete. The DMS(P) Meeting will provide a unique opportunity to present the database and to collect feedback.

Another important aspect that will be further developed during year 2 is the communication strategy and the engagement with other organizations that are part of the DMS-PRO research ecosystem. The Communication team and the whole group plan to make frequent use of the web page, once it is set up, and also the social networks (a Twitter account was recently set up). The Funding and Endorsement team will proceed with the requests for endorsement (SOLAS endorsement already requested) and with the identification of opportunities for obtaining additional funding for specific activities or leveraging funding obtained by DMS-PRO members at national or international level. A UN Ocean Decade Conference is being held in April 2024 in Barcelona, Spain, and DMS-PRO is planning to submit a proposal to organize a Satellite Event during this conference.

6. Is the group having difficulties expected in achieving terms of reference or meeting original time schedule? If so, why, and what is being done to address the difficulties Limit 200 words

After a progressive start up during the first months of 2023, the DMS-PRO working group has gained momentum with the setup of its four thematic teams and the regular scheduling of online meetings. Although some tasks are slightly behind schedule, the group co-chair and the team coordinators have placed priority on promoting thorough discussion and maximizing consensus within the group. This process was necessary to ensure that all members' efforts are aligned before some important activities begin. Therefore, we (the co-chairs) are overall satisfied with the development of the first year.

One difficulty the group is facing is the limited participation of some members. Although it was anticipated that the degree of participation would vary, a higher degree of participation from some members would benefit the dynamics of group and its scientific output. Therefore, we will keep seeking strategies that allow everyone to participate actively in DMS-PRO. In this regard, there has been a replacement of one associate member, Philippe Tortell, by his PhD student, Brandon McNabb. The former member resigned voluntarily because he could not allocate time to DMS-PRO and proposed his PhD student as replacement.

7. Any special comments or requests to SCOR. Limit 100 words.

There is no additional comments or requests.

Additional information can be submitted and may be posted at the SCOR Annual Meeting webpage at the discretion of the SCOR Executive Committee Reporter for the WG and the SCOR Secretariat.