GO-SHIP Committee Meeting

27 May 2021 at 8pm UTC

Participants: Leticia Barbero, Elaine McDonagh, Maciej Telszewski, Mario Hoppema, Lynne Talley, Greg Johnson, Kumiko Azetsu-Scott, Martin Kramp, Isa Rosso, Are Olsen, Maribel Garcia Ibanez (IOCCP), Emil Jeansson, Steve Diggs (CCHDO), Pascale Lherminier, Katsuro Katsumata, Caroline Cusack, Jae Hak Lee, Yvonne Firing,

Agenda/Minutes

1. Rotation of members (Elaine)
2. National reports – cruise updates
3. OceanOPS / CCHDO updates (martin, Steve)
4. Report from GOOS-OCG 12th session (including data mapping; Martin, Elaine)
5. Ocean Decade Application (Elaine)
6. European GO-SHIP infrastructure application (Elaine)
7. Ocean Observing supplement (Lynne)
8. DOOS/AtlantOS meeting (Leticia)
9. Bio-GO-SHIP as part of GO-SHIP (Lynne)
10. Definition of associated sections: Limits of flexibility, scientific rationale, candidates/protocol
11. ICES – GDAC for homeless GO-SHIP data ? (Martin/Caroline)
12. Data Management Team, way forward (Elaine)
13. Suggested parameters: N2O, CH4 (Leticia)
14. AOB

1. Rotation of members

Welcome to our new co-chair Leticia Barbero, NOAA, AOML and committee members Yvonne Firing (UK representative), Maribel I. García-Ibáñez (IOCCP representative) and Pascale Lherminier (French representative). Thanks were extended to Rik Wanninkhof (outgoing co-chair) for excellent leadership since 2014, and thanks also for the contributions of Maciej Telszewski, Herlé Mercier and Penny Holliday as they stand down from the science committee.

2. National reports - cruise updates:

Spain-France: A25 (Vigo-Reykjavik): departure from Vigo May 28, 2021

UK: AR07E (+ part of AR28 depending on timing) pushed back to 2022 or 2023 (TBD). 2021/22 SR1b (Drake Passage) requested but not confirmed in ship schedule.

Japan: P01 (Jul.-Aug. 2021): Unless the COVID situation drastically improves in a month, it will be a "domestic" cruise such that all stations east of 160W will be cancelled. JAMSTEC tries to cover these stations in 2023 (but not funded).

Canada: AR07W cancelled due to a breakdown of the ship
Davis Strait (bi-annual, completed in 2020 and planned in 2022); supplement this line this year with USCGD Healy (chief scientist Robert Pickart)
Line P – winter (Jan-Feb) and spring (May) completed, summer (Aug-Sep, planned)
ARC02 – planned (August-September)

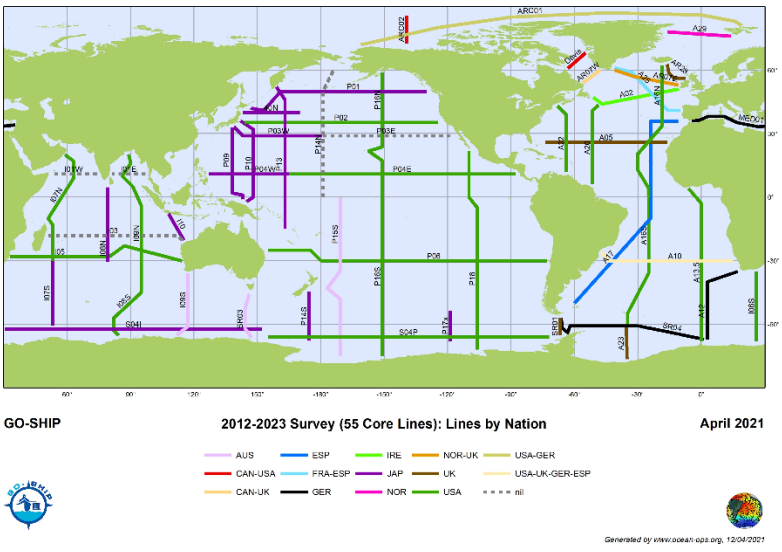
US: A20/A22 (completed in May 2021 on R/V TG Thompson; A20 Chief Scientist: Ryan Woosley; A22 CS: Viviane Menezes)
NOAA A13.5 (planned for ~Jan-March 2022; Cape Verde-South Africa; chief scientist: Denis Pierrot)
I05 (planning between March-June 2022, after or before DMB cruise on Revelle; however: if ports will be closed in Australia, could do either P04E after March or P02 in summer)

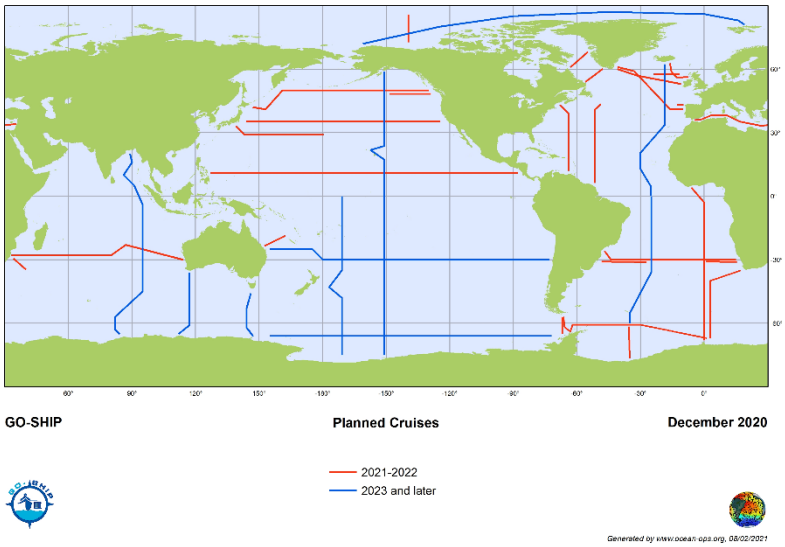
Spain: A10.5 planned to be not before February 2022

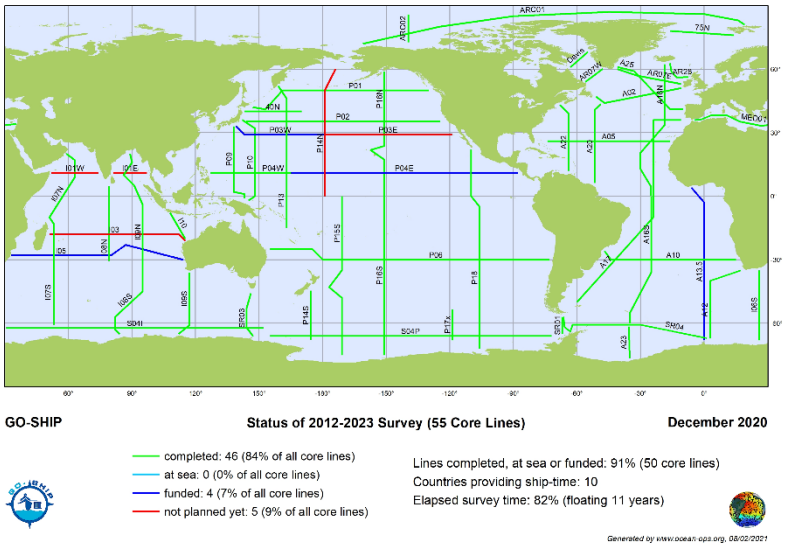
3. Data and Metadata update (OceanOPS/CCHDO)

Martin presented maps and statistics on the status of the decadal survey. Noting that the number of publications is of growing importance as indicator for data-uptake, committee members are encouraged to submit new available papers to the TC and promote the bibliography at national levels. More trainings took place with committee members regarding the submission of cruise updates to OceanOPS.

Maps:



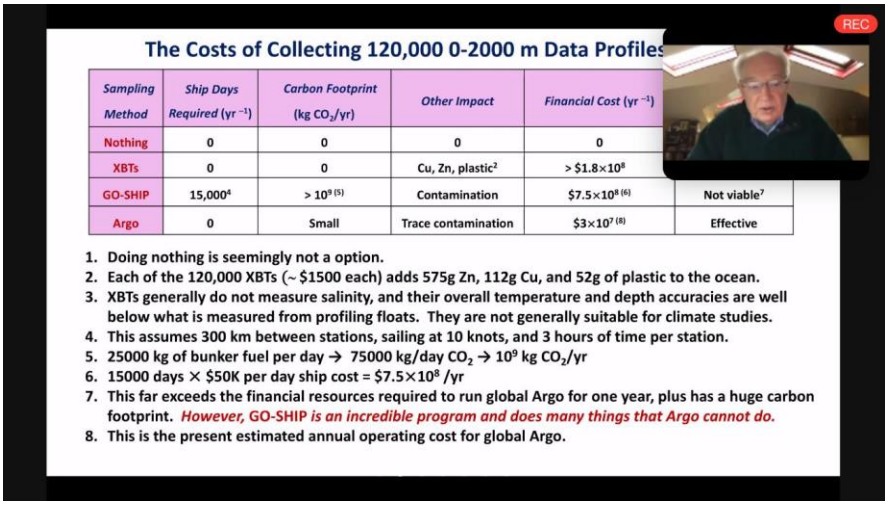




Steve reported that only 8 of initially more than 1000 expected profiles flew in 2020 into CCHDO, mostly because of Covid-19 impact. Steve stressed that there is no guarantee that the present NSF grant will be renewed in the sense of CCHDO acting as international GO-SHIP data archive.

4. Report from OCG12

Before OCG12, a series of virtual workshops took place, including on Environmental Stewardship. Based on a related Argo publication the slide below was presented. It was agreed that the GO-SHIP committee will follow this discussion, and evaluate the GO-SHIP cost and added value to other networks.



Other OCG12 related items:

- Ocean Decade and Integration. Increased focus around EOVs (Essential Ocean Variables).
- New focus of components of the observing system (boundary Currents and biological observations).
- Gaps identified in data system including ADCP data stream.
- Emerging networks including ship-based time series (ecological and coastal focus but includes HOTS and BATS)

5. Ocean Decade project updates there has been no formal feedback on the International GO-SHIP proposal for an Ocean Decade Program

6. Euro GO-SHIP infrastructure proposal we had a positive first meeting of a potential consortium and Elaine is following up with consortium members.

7. Ocean Observing supplement on *Oceanography* Magazine

LOI sent by Lynne Talley on May 20, 2021 on behalf of GO-SHIP (McDonagh, Barbero, Johnson, Talley). Huge response received by the GO-SHIP community. It was suggested to discuss at an OSM22 side meeting if a longer review article should be written. Deadlines:

- Expression of interest: May 20, 2021
- Confirmation of contribution: July 1, 2021
- First draft: September 15, 2021
- Expected publication date: December 2021

8. DOOS/AtlantOS meeting: The Deep Ocean Observing Strategy (DOOS) and the All-Atlantic Ocean Observing System (AtlantOS) are hosting a Deep Ocean observing project Scoping Workshop focusing on the Azores region on Tuesday June 24th, 2021 17-21 CEST (8-12 PDT). The half-day workshop will identify (i) the scope, (ii) potential approaches and (iii) contributors for developing a joint DOOS / AtlantOS project to demonstrate the feasibility of a comprehensive and multidisciplinary deep ocean observing system that aligns with scientific and societal needs in the Azores. Registration link here: https://us02web.zoom.us/meeting/register/tZMvf-CpqD4uG9zcAbqPhAuiRvTK2zyU-rXJ Deadline to register is June 18th COB

9. Bio-GO-SHIP

Adam Martiny reported that the NSF proposal was declined. A resubmission Is planned soon. NASA and NOAA: NOPP funding some Bio-GO-SHIP: $500k, 2 years project (https://biogoship.org/2021/04/29/bio-go-ship-officially-supported-by-noaa-and-nasa/). NASA: funding HPLC analysis; NOAA: supporting ship time.

Participation proposed on A13.5 (1 or 2 people, only surface samples), I05 (2 berths, need to request 2 days for UNOLS ship time), P04E (2 berths, 2 days already in the ship time request).

10. Associated sections

Based on OceanObs '19 paper the SC reworded the definition and rational as follows:

Definition:

Repeat hydrographic sections that do not necessarily meet the sampling density and are not coast-to-coast/ice, which (i) deliver high quality data, (ii) establish full depth stations below 2000 m at least every 240 nm, (iii) are repeated at least once per decade with sufficient Level 1 parameters to quantify decadal change in inorganic carbon (2 out of DIC, AT, pH, pCO2 (all discrete bottle), nutrients (nitrate, phosphate, silicate) and oxygen --> to enable MLR analyses, e.g.) and heat inventories, (iv) at a minimum resolution of 60 nm for 1000+ m depth (or full-depth) stations, and (v) comply with the data policy.

Rationale:

Following the science committee meeting Elaine summarised a new process to include new associated sections.

Associated GO-SHIP sections reach the GO-SHIP data requirements (quality and data policy). They contribute to the GO-SHIP aims of observing decadal variability of ocean carbon and heat, but with a regional focus. Their inclusion in GO-SHIP adds global oversight to these regional activities.

Action: science committee to check this process, report/decide at next SC meeting and then make it available on GO-SHIP website.

Process for introducing a new associated section into GO-SHIP (Draft):

The proposer is requested to provide a summary of the points below.

Description of the proposed section including:

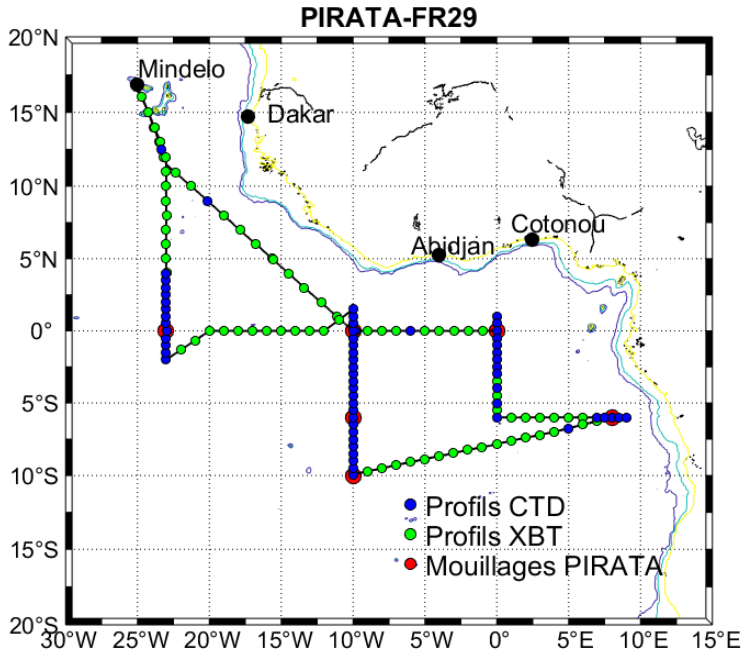
- map of location.
- Frequency of location.
- Parameters measured and used methods

Objectives. Map potential new section objectives onto GO-SHIP objectives.

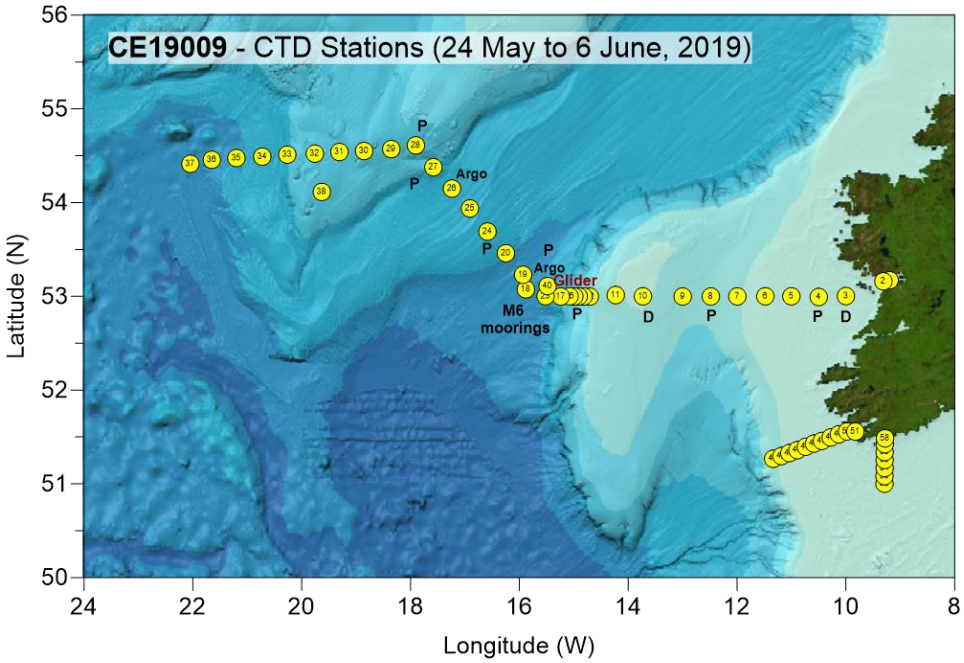
Data. Where is the data currently available and how will the GO-SHIP data requirements be achieved.

Best practices which GO-SHIP best practices are being followed and if they are not then describe the deviations from those best practices.

- France:

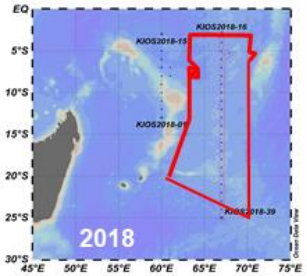


- Ireland:

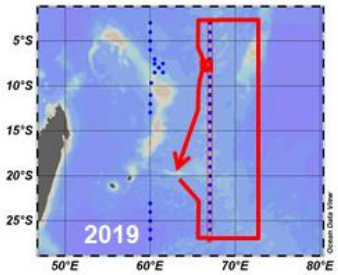


•Korea (Indian around 60°/67°E)

- 2 July ~ 25 July, 2017
- Colombo ~ Port Louis
- Along 67°E (5°N-16°S)



- 4 April ~ 29 April, 2018
- Port Louis ~ Port Louis
- 13°-3°S (60°E), 3°-25°S(67°E)



- 20 April ~ 17 May, 2019
- Port Louis ~ Port Louis
- 13°-3°S, 23°-27°S (60°E), 3°-27°S (67°E)

•India (Mauritius-Bharati)

•Review: Brazil, South Africa, Sweden, Australia, Canada, Spain (see map on https://www.go-ship.org/RefSecs/goship_ref_secs.html)

Investigate: Mooring/OceanSITES transit cruises

11. ICES Working Group

Martin attended the ICES Working Group on Oceanic Hydrography (GO-SHIP SC member Caroline Cusack is permanent member of the working group), virtual online meeting 13-15 April, 2021. He presented an overview of GO-SHIP activities with the aim to investigate how GO-SHIP and the ICES WGOH can cooperate and support each other. This activity relates to the ICES WG on Oceanic Hydrography Term of Reference C: Explore and continue to increase the international profile and exposure of this Expert Group across national and international events and engagement with the broader ocean observing system community (e. g. GOOS).

Some of the sections that are regularly sampled by WGOH PIs could comply with requirements of GO-SHIP associated sections. ICES also volunteered to host corresponding data for GO-SHIP, with GDAC-like tasks. The SC will review this item and decide how to foster such a cooperation. A clear request from the WGOH was that duplications (such as data/metadata submissions to multiple archives) must be avoided. WGOH members see a good advantaged to be associated with GO-SHIP, and therewith GOOS OCG-coordinated activities in general.

12. Data Management Team: way forward

A first meeting with Mario, Kats, Steve, at least one co-chair and the TC should take place before the northern hemisphere summer holidays in July/August. Martin will send a doodle.

13. New parameters: Suggested N2O, CH4:

Background information, email of Mark Warner (Including N2O as a GOSHIP variable):

"Hi Rik et al., Greetings from the RV Thomas G. Thompson where we recently completed the GO-SHIP A20 line and are beginning sampling at the southern end of the A22 line. I am measuring concentrations of the dissolved CFC-11, CFC-12, SF6, and N2O on all water samples collected. As Rik mentioned, N2O is considered a Level 2 measurement at present. Both tracer groups in Seattle (UW,

NOAA-PMEL) and the tracer lab at UT-Austin have measured N2O from the same water samples as collected for the tracer measurements during several of the GO-SHIP cruises beginning with the most recent (2010?) re-occupation of A10.There are some QC steps yet to be completed before all of these data will be made available. Yang et al. (2020) utilized many of the available, but still preliminary, data sets that may be found at cchdo.ucsd.edu. By the end of the current grant, all of the tracer groups in the US should be measuring N2O, and we envision it eventually becoming Level1 in US GO-SHIP. Jim Happell (U. Miami) is currently working on adapting his analytical system to measure N2O with funding from the 2021-2016 GO-SHIP NSF grant. I think moving N2O up a level will be easily accomplished in the US because it requires no extra manpower and no extra water from the rosette. It might be more complicated internationally if it requires two analysis teams on board the vessel and additional water from the Niskins."

https://usgoship.ucsd.edu/level-2-data/

On behalf of Fiz F. Perez, Spanish representative, two emails were shared with the SC, from Sam Wilson, leader of the SCOR#143 group "Dissolved N2O and CH4 measurements: Working towards a global network of ocean time series measurements of N2O and CH4" (https://scor-int.org/group/143/), and Parvadha Suntharalingam, expert on N2O in Global Biogeochemical Models and also coordinator of the oceanic N2O within de Global Carbon Project. Both express their interest in N2O being considered as a variable to be measured in the GO-SHIP campaigns. Please, let us know if you consider it necessary to send a formal letter of support from them.

"I am very supportive of all efforts to get more N2O measurements conducted as part of repeat hydrographic surveys. I hope that the Best Practice Guide will be useful for this. I am happy to write a letter of support if you wish me to do this. Please just let me know. Also is N2O identified as an Essential Ocean Variable https://www.ncdc.noaa.gov/gosic/gcos-essential-climate-variable-ecv-data-access-matrix/gcos-ocean-biogeochemical-ecv-nitrous-oxide. Does this help to get it part of GO-SHIP? Best wishes, Sam Wilson"

Following Elaine's suggested process (20 May 2021) for adding a new GO-SHIP parameter, Fiz and Mercedes submitted:

NITROUS OXIDE (N_2O) IN THE OCEAN. ADDING THE N_2O AS A GO-SHIP PARAMETER.

Mercedes de la Paz and Fiz. F. Pérez.

Justification (cost and value, 1 page) including answers to logistical questions and science questions.

- Is there a water requirement? If so how much and what is the sampling pattern (depths and number/spacing of stations)?

Recommended samples volumes for measuring the N_2O and CH_4 in oceanic waters goes from 120 to 250 mL. Samples are collected using a tubing connected to the spigot of the Niskin for filling borosilicate glass vials and then sealed with a rubber stopper and aluminium crimp-seal. During the sampling, the tubing and the vials need to be flushed with seawater sample volume

2-3 times the vial volume before closing it; then the total volume of seawater required for duplicated samples goes from 750 mL to 1500 mL.

- Is any addition ship time required? No. Samples should be collected from the Niskin bottle after Oxygen samples.
- How much lab and preparation space is required? After sampling, the samples can be fixed and stored until the analysis in the land laboratory. This would require 4-5 m of bench space in the laboratory for fixing, sealing samples and preparing the vials for the sampling. In case the samples are measured on board, the installation of the gas chromatograph on board will require more space in the laboratory, depending of the analytical system used.
- How many science berths are required? One or two berths for sampling and storing the samples would be required. Depending of the intensity of the sampling, one berth per turn would be desirable.
- What are the science questions that these observations address and how does these fit with the GO-SHIP aims?

N_2O is an important climate-relevant trace gas in the Earth's atmosphere, and the first stratospheric ozone depleting substance. Because of the on-going decline of chlorofluorocarbons and the continuous increase of N_2O in the atmosphere, the contributions of N_2O to both the greenhouse effect and ozone depletion will be even more pronounced in the 21st century. The ocean is a major source of N_2O and contributes about 30% to the atmospheric N_2O budget. The N_2O production and consumption in the ocean is biologically mediated, and both processes are highly dependent of the oxygen conditions in the environment, and also affected by nitrogen availability and other environmental factors that will be subject to changes in the future global changing ocean. Essential Ocean Variables (EOV) are defined on the basis of being relevant to the GOOS, being capable of being measured on a global scale using established methods, and having a high level of coordination. The GOOS states that N2O is an EOV (EOVs N2O). Furthermore, global models really lack sufficient ocean measurements to validate models and provide more information on the underlying cycling processes. Currently measurements have been targeted to upper water column and low oxygenated oceanic regions, and lack in the ocean interior and more ventilated regions. A proper N_2O observational system should include the N_2O measurements into the GOSHIP program to reduce uncertainties in oceanic N2O emission estimates and to characterize the spatial and temporal variability in N2O distributions in a changing ocean.

Requirement for best practices documentation before a parameter is adopted. This guide will be published in the next months. This effort was initiated with the formation of a Scientific Commission for Oceanic Research (SCOR) Working Group in 2014. The SCOR WG#143 has been working since then for the harmonization of the measurements from different laboratories with the aim to establish high accuracy measurements, and increased interoperability of the datasets. Efforts of the N_2O and CH_4 oceanographic community has been addressed to carry out several

international intercomparison experiments for measurements of N_2O and CH_4 (Wilson et al., 2018), an harmonized ocean observation network for N_2O has been proposed (Bange et al., 2019), and the elaboration of a best practices guide that currently is under review, and will be published in the coming months (https://web.whoi.edu/methane-workshop/sops/).

Requirement for a parameter relevant science committee member – may be an existing or a new member.

This point should be discussed by the N_2O scientific community involved in the oceanic measurements in previous GO-SHIP cruises. Currently few laboratories are involved in N_2O measurements in GO-SHIP repeat hydrography sections, but in terms of experience, it is deserving of attention the water column measurements of dissolved N_2O since 2010 made by the NOAA PMEL Ocean Tracer group as part of their anthropogenic tracer analyses which includes certain chloroflourocarbons and sulfur hexafluoride. The trace gas marine laboratory of the CSIC (Vigo, Spain), also measure N_2O in the North Atlantic at the OVIDE and FICARAM section since 2012 (de la Paz et al., 2017).

References:

-Bange et al. (2019) A harmonized nitrous oxide ocean observation network for the 21st century. Front. Mar. Sci. 6, 157. https://doi.org/10.3389/fmars.2019.00157

-de la Paz, M., et al. Ventilation versus biology: What is the controlling mechanism of nitrous oxide distribution in the North Atlantic?, Global Biogeochem. Cyc., 31, 745–760,

https://doi.org/10.1002/2016GB005507, 2017

-Wilson et al. (2020) Ideas and perspectives: A strategic assessment of methane and nitrous oxide measurements in the marine environment. Biogeosciences, 17, 5809–5828, 2020. https://bg.copernicus.org/articles/17/5809/2020/

-Wilson et al. (2018) An intercomparison of oceanic methane and nitrous oxide measurements. Biogeosciences 15, 5891–5907. https://doi.org/10.5194/bg-15-5891-2018

The committee thanked Fiz Perez for raising this item and proposing these important new variables – the committee agreed that there was a strong scientific case for including these new parameters that mapped well onto GO-SHIP's objectives. The committee agreed that N2O and CH4 be included as an International GO-SHIP level 2 parameter once

- The best practice documentation from the SCOR WG was published as part the Ocean Best Practices initiative.
- The timescale of data delivery and data centre was clarified and included as part of the GO-SHIP policy.
- A summary of those nations that are making these measurements and the methods that are being used.

There was some confusion over the different procedures/methodologies that are used for these measurements and what (if any) implications there were for data quality/delivery. Some clarity around this would be welcome.

Action: add process for new parameters to GO-SHIP to website once we have added requirement for identified data centre, plan for timely data delivery and assessment of international capability (which countries have the capability to measure the parameter via which method)