

**GEOTRACES INTERNATIONAL SSC MEETING
PALO ALTO, CALIFORNIA, USA
27 SEPTEMBER – 29 SEPTEMBER 2023**

List of attendees

SSC Members (in person):

Karen Casciotti (co-chair)
Maeve Lohan (co-chair)
Eric Actherberg (for Walter Geibert)
Susanne Fietz
Jessica Fitzsimmons
Yoshiko Kondo
Rob Middag
Taryn Noble
Abby Ren
Dalin Shi
Alessandro Tagliabue
Rodrigo Torres

Other participants (in person):

Bob Anderson (Past SSC co-chair)
Andrew Bowie (Past SSC co-chair)
Phoebe Lam (Past SSC co-chair)
Reiner Schlitzer (Past SSC co-chair)
Ana Aguilar-Islas (Standards and
Intercalibration Committee, S&I, co-chair)
Hélène Planquette (S&I co-chair)
Bill Landing (Data Management Committee,
DMC, co-chair)
Maite Maldonado (DMC co-chair)
Angela Milne (DMC member)
Tom Weber (DMC member)

SSC members (online):

Jay Cullen
Vineet Goswami
Marina Kravchishina
Yeala Shaked
Kazuyo Tachikawa

Jun Nishioka (DMC member)
Zanna Chase (DMC member)
Elena Masferrer (IPO executive officer)
Donna Cockwell (GEOTRACES data
manager)
Emily Twigg (SCOR executive director)
Hedy Edmonds (Program Director at US
National Science Foundation)

Other participants (online):

Catherine Jeandel (IPO science director)

WEDNESDAY 27 SEPTEMBER 2023

Introduction

Karen Casciotti and Maeve Lohan welcomed the Scientific Steering Committee (SSC) members. Arun Majumdar, Dean of Stanford Doerr School of Sustainability, delivered a welcoming address to participants.

Minutes and action items from 2022 meeting

Maeve and Karen reviewed the list of action items from last year. The following pending actions items were discussed and it was decided to keep them for next year:

10. Action: Vineet Goswami to inform the IPO as soon as the plans for next year cruise along GI08 are completed.

Vineet: He informed that the cruise has not happened. He will keep updated the IPO about the plans for this cruise.

21. Action: SSC members to remind national colleagues that:

- Data and intercalibration report submission is open
- Metadata needs to be as explicit as possible
- They can communicate with committee at any time
- Please don't wait until the last minute

Maeve really urged SSC members to remind national colleagues to start the registration and intercalibration process as soon as possible.

National reports

Australia – Taryn Noble

Taryn Noble started her presentation by introducing main results of a study about dissolved manganese export of the George V Land East (AGVL) Antarctic shelf. She then reported about cruise activities: they have completed a cruise in January 2023 on board *RV Investigator* voyage to Cape Darnley East Antarctic to investigate past Antarctic Bottom Water formation and a new cruise of the SOTS Time Series GIpr08 process study (IN2023_V03). However, they could not take samples from the process study GIpr11 since the cruise had to be interrupted after only 5 days of work. The MISO GS05 section cruise is planned for January 2024. Also, they are planning a new process study for January 2025 on *RVS Nuyina* to Denman/Shackleton ice shelf.

Canada – Jay Cullen (online)

Jay Cullen reported that Canadian PI's continue to work closely with US and European colleagues on Arctic GEOTRACES synthesis projects resulting in a number of jointly authored manuscripts. They also support the Canadian Line P Iron Programme (GPpr07) study making observations of bioactive trace elements and trace element- microbe interactions on time-series cruises completed along Line P in the northeast Pacific. They have also organised the 2nd Canada National Workshop for BioGeoSCAPES, May 1-2, Halifax (Erin Bertrand and Maite Maldonado). Erin Bertrand is collaborating with Rob Middag in the MetalGate process study as well as there was some trace element and isotope (TEI) sampling in the Canadian Arctic as part as the ArticNet programme. Also, a new project that overlaps with Line P (stations P16, P20 and P26) and expands monitoring of copper ligands in the subarctic NE Pacific to a zone encompassing 38 stations has been approved for funding by the North Pacific Anadromous Fish Commission (NPAFC) and BC Salmon Restoration Initiative Fund (BC SRIF). Finally, funding from the new Fisheries and Oceans Canada (DFO) Competitive Science Research Fund (CSRF) to support sampling and analysis of trace metals and ligands along Line P (GEOTRACES Process Study GPpr07) has also been approved for the next 3 years.

Chile – Rodrigo Torres

Rodrigo Torres presented results published in his paper “Iron and silicic acide addition effects on early spring macronutrient drawdown and biogenic silica production of Patagonia estuarine waters” in *Progress in Oceanography*.

China – Dalin Shi

Dalin Shi introduced a study on the processes and mechanisms of the biological pump in the Kuroshio Extension. The cruise took place from 9 June to 25 July 2022 on board *R/V Tan Kae Kee*. They would like to complete current GP08 section as well as a section from Xiamen to Hawaii but at the moment they have not been successful in obtaining funding for them.

Alessandro and Maeve suggested Dalin to consider submitting trace metal data from the completed cruise as compliant data.

France – Kazuyo Tachikawa (online)

Kazuyo Tachikawa presented 3 science highlights from French GEOTRACES work including “More dFe(II) in the ocean: loss during sampling due to oxidation (GA13 along Mid Atlantic Ridge); “Natural iron fertilization by shallow hydrothermal sources fuels diazotroph blooms in the ocean (GPpr14)” and “Solid-solution distribution of the cosmogenic beryllium-7 in the water column: GEOVIDE/GA01”. During the reporting period, 12 publications and 9 presentations have been done and 1 PhD thesis has been completed. The second SWINGS post-cruise meeting took place in May in Auxerre (France).

Germany – Eric Achterberg

Eric Achterberg reported on behalf of Walter Geibert who was unable to attend the meeting. He first reported about the new scientific results. In terms of cruises, three cruises have been completed during the reporting period, this includes two GEOTRACES cruises: GP11 section cruise and GApr17 process study. Upcoming cruises include Arcwatch-2 cruise in August-September 2024 and GI07 section on *FS Sonne* in November-December 2024.

India – Vineet Goswami (online)

Vineet Goswami reported that no new sampling was done during the reporting period. They are focused in analysing the samples already collected in past cruises with major stress in the sources of key trace elements in the Indian Ocean to assess the role of various processes operating in the region. Some of the results have already been published (5 papers published in 2022-2023). Vineet finalised by summarising the main scientific results obtained so far from the Indian cruises.

Israel – Yeala Shaked (online)

Yeala Shaked started her presentation by introducing the Israeli GEOTRACES researchers as new scientists have joined them recently. She introduced the RedMAST process study (time serie) led by Adi Torfstein. Yeala has led a chapter on “Trace Metal Biogeochemistry in the Ocean: From Chemical Principles to Biological Complexity” in Treatise in Geochemistry 2024 Series.

Japan – Yoshiko Kondo

Yoshiko Kondo reported that several GEOTRACES oral presentations and posters were presented at the meeting of the Geochemical Society of Japan. In addition, a GEOTRACES symposium took place with 20 oral presentations (6 from students). A special issue including 13 review articles has been published in the Japanese Journal “Chikyukagaku” by the Geochemical Society in Japan (all the articles are in Japanese). In terms of cruises, GEOTRACES Japan has completed the GP22 section (leg 3 completed in June 2023). They are planning to undertake the GPpr16 process study in the Bearing Sea in 2025.

The Netherlands – Rob Middag

Rob Middag explained that progress is being made with the interpretation and publication of the results from the MetalGate, ANA08B and PS117 cruises. They have recently participated in the 64PE517 expedition aboard *RV Pelagia* to the Norwegian Trench, including trace metal measurements from May 26th till June 14th 2023 from Texel (Netherlands) to Texel (Netherlands); part of NWO XL proposal to study the role of the North Sea in the Atlantic Ocean biogeochemical system: North Sea-Atlantic Exchange. He reported that 8 publications and 7 presentations have been made during the reporting period. Rob made the university course inaugural lecture and was

invited to a radio interview. The Netherlands BioGeoSCAPES scoping workshop was held on 22 February 2023.

Russia – Marina Kravchishina (online)

Marina Kravchishina reported that main interest from the Russian GEOTRACES community are: (1) biogeochemical processes in the major Arctic rivers, Arctic seas and subpolar North Atlantic with special emphasis on particulate matter and bottom sediments and (2) particle fluxes in water column and from atmosphere to the Arctic Seas. Most studies are conducted along potential Russian GEOTRACES transects on the Eurasian Arctic shelf. She then highlighted main science results obtained during the reporting year and listed the publications (3), PhD defense (1), presentations (2) and new projects (1).

South Africa - Susanne Fietz

Susanne Fietz presented major results from the study “multidecadal trend of increasing iron stress in Southern Ocean phytoplankton”. Tommy Ryan-Keogh made several outreach actions including a TED talk (<https://youtu.be/EK0qGAToWts?t=11>). In terms of cruises, a SCALE cruise was completed from on July 11-31, a SEAmester class afloat was completed in June 2023 and a SANAP cruise was also held in September. They are waiting for the outcome on the Southern Ocean and Antarctic project proposals for 2024-2026 where they have submitted an expression of interest for a cruise on board SA Agulhas II (led by Sarah Fawcett, UCT). Susanne reported that preferred sampling region by the South African community is the Indian Ocean sector, 18°E to 35°E (meridional transect from Cape Town to MIZ that traverses all major Southern Ocean zones).

Taiwan – Abby Ren

Abby Ren started her presentation by summarising two main scientific results published during the reporting period. Taiwan GEOTRACES has published 5 main papers. They have also completed a cruise in the Western Pacific (July-August 2023) and two more are scheduled to be completed in 2024. These two cruises will include trace element sampling. First cruise is scheduled for March 2024 and second cruise for August 2024.

UK – Alessandro Tagliabue

Alessandro Tagliabue presented some science highlights emerging from GApr13 as well as results from Arianna Olivelli’s work on lead concentrations and isotopes from GA02. In terms of cruises, they have completed 3 cruises, including the N-ARC process study (GApr19) in the Barents Sea. A process study to the Weddell Sea has been submitted for endorsement (it will be discussed later on the agenda). UK interests in the future remains in the GA12 section in the South Atlantic. They plan to submit an outline proposal for a NERC “large grant” in March 2024 to undertake this cruise. They also plan to send a full proposal for a cruise in the Southern Ocean focused on trace metal cycling and biological responses.

USA – Bob Anderson and Jessica Fitzsimmons

Bob Anderson reported that the US GEOTRACES Project Office has updated the US GEOTRACES website and now it has all the information about US GEOTRACES cruises (including the cruise reports), a searchable publication database and have added modules for education and outreach that they aim to continue updating it. They have also started doing an eNewsletter quarterly. Bob explained that the US GEOTRACES Office mainly does logistics. They have 23 separately funded research projects and they have organised several coordination meetings (GP17-ANT cruise logistics meetings in March, US GEOTRACES SSC in June and the Arctic halocline synthesis in July in Boston).

In terms of cruises, US GEOTRACES is planning for smaller and more process-oriented cruises for 2026. This includes two process studies following GA05 and GP05 sections respectively. US is currently focused in GP17 section which will be completed in 2 cruises. GP17-OCE was completed in January 2023 (with 22,000 bottles sampled) and the GP17-ANT will be sailing in November.

International Project Office/Outreach – Elena Masferrer

Elena Masferrer reported about the main highlights of International Project Office (IPO) activity in the past year. She first presented the major improvements done at the DOoR (a detailed report was presented at the DMC meeting) and thanked François André for all the hard work on it. She then highlighted the work done by the IPO to facilitate the IDP2021 version 2 release and the promotional materials available.

An important product this year has been the release of the series of GEOTRACES educational videos aimed at explaining the GEOTRACES research to the general public, as well as providing a resource for teaching and attractive method for students to learn about marine sciences. From January to July, the IPO has been releasing one video per month. The videos are available in YouTube (having captions in up to 10 languages), and thanks to the help of Yanran Liu from Xiamen University, they are also available on Youku. Elena thanked Adrian Artis, the graphical designer who has been working on the videos.

Elena has submitted a 2-page article highlighting these videos on GEOTRACES Special Issue of Oceanography and presented them at the Goldschmidt 2023 Conference. Concerning the Goldschmidt conference, Catherine Jeandel was the chair of the scientific and organising committee. Elena was theme chair for Theme 14, Science and Society. Two GEOTRACES sessions took place under this theme, one session about the use of GEOTRACES data, with Angela Milne and Bill Landing as co-conveners and a second session about communicating geochemistry to non-scientific audiences with Chrissy Wiederwhol and Elena as co-conveners (where the GEOTRACES videos were presented). In addition, the DOoR portal was also presented under the Theme 14 by Catherine Jeandel.

Concerning the Ocean Decade, Elena explained that on August 2023 there was a meeting with the Decade Coordination Office (DCO) for Ocean Data Sharing. The officers expressed that the resources developed by GEOTRACES were an example of best practices in data management and

offered creating visibility for GEOTRACES work.

Finally, Elena asked for help from SSC members to remind colleagues to respect the GEOTRACES publication best practices.

Action: SSC members to make sure and remind colleagues to follow the GEOTRACES publication best practices:

- Please include “GEOTRACES” in either the title, abstract or keywords of your GEOTRACES publications
- Intermediate Data Product (IDP) data contributors: Please use the DOoR portal to add any new publication of your data included in the IDP.
- Please help us to acknowledge support from SCOR in your publications as follows:
“The International GEOTRACES Programme is possible in part thanks to the support from the U.S. National Science Foundation (Grant OCE-2140395) to the Scientific Committee on Oceanic Research (SCOR).”

Elena ended by congratulating Bob who received, on 26 of June, the title of Doctor Honoris Causa 2023 by the University of Toulouse III-Paul Sabatier, France. The title of Doctor Honoris Causa is the most prestigious academic title that can be conferred by a French university to honour “personalities of foreign nationality for exceptional services rendered to science, literature or the arts, to France or to the university”.

Videos from 3rd GEOTRACES Summer School – Elena Masferrer on behalf of Walter Geibert

Elena presented on behalf of Walter Geibert a series of videos on marine sample analysis produced, as part of the GEOTRACES summer school 2022, organised by Walter Geibert and Claudia Hanfland, at the Alfred Wegener Institute (AWI), supported by the Volkswagen Stiftung. The videos available are:

Video #1: ICP_MS and ICP-OES for analysing marine samples explaining the principles of ICP-OES and ICP-MS analysis.

Video #2: Calibrating and validating analysis of marine samples explaining how instrumental readings are converted to quality-checked analytical results for marine samples.

Video #3: Trace metal clean preparation of marine samples explaining the principles of working in a clean room with marine samples.

The videos will soon be available on the GEOTRACES site.

GP17 cruise virtual reality project - Jessica Fitzsimmons

Jessica Fitzsimmons presented a cruise virtual reality project “Sailing with GEOTRACES” developed during the GEOTRACES GP17-OCE cruise. This project is aimed at the general audience and it is led by Chrissy Wiederwohl from Texas A&M University. It consists on a virtual tour on board *RV Roger Revelle* so that people can experience the reality of sailing with GEOTRACES. It also includes games to play. Once available, the product will be linked to the GEOTRACES web site.

Ocean implementation plans - Rob Middag, Karen Casciotti and Maeve Lohan

Discuss requests for approval as process study - Rob Middag

There are two proposals for endorsement as process study:

Piccolo, UK proposal (submitted by Simon Ussher)

Rob presented the cruise and reviewed the compliance with the GEOTRACES process study criteria. The cruise leaders propose to crossover with 2 different GEOTRACES cruises (GApr12 and GIPY05). Rob mentioned that it would be best for them to focus on GApr12 rather than GIPY05 since the full suite of trace metals were not measured for this cruise.

Decision: The PICCOLO cruise is approved as GEOTRACES process study (with code GApr20) with the following recommendation: *"Since not all trace metals of interest were measured during GIPY05, GEOTRACES SSC recommends to focus the intercalibration process on cruise GApr12 (PS117) and sampling at least 1 full-depth crossover with this cruise"*

EASI 2, Dutch proposal (submitted by Rob Middag)

Rob presented the cruise and reviewed the compliance with the GEOTRACES process study criteria. The plan is for this cruise to crossover with the French SWING cruise.

Decision: The EASI2 cruise is approved as GEOTRACES process study (with code GIpr12).

Volunteer to review process study proposals (replacement from Rob Middag)

Maeve explained that since Rob Middag will rotate off as SSC member this year, so there is a need for a volunteer to replace him on the role of reviewing process studies. Taryn Noble agreed to take the role.

Decision: Taryn Noble to take the role of process study reviewer.

Review national implementation plans; current status of completed and planned cruises as well as identification of gaps and opportunities

Maeve introduced the discussion. The aim is to review for each ocean basin the sections that are not completed, decide if they need to be kept or removed from the maps, as well as identify any gaps that need to be covered and decide how can be covered.

Section cruises:

Pacific Ocean

The following sections have no cruise planned GP04 and GP14.

GP05 is going to be completed partly as a process study by USA (this will be an iron motivated cruise but other parameters will be included).

Alessandro: Concerning the process study along part of the GP05 section, he asked whether international collaboration would be possible. Phoebe replied that it would be possible but it is too early in the process at the moment.

Phoebe: She advocated keeping the section lines which are not yet completed in the map to facilitate for other nations to try to complete them. For example, for GP14 having the line make help Canadian researchers to obtain funding to complete it.

Decision: SSC decided to keep GP04 and GP14 sections in the map.

Indian Ocean

The following sections have no cruise planned: GS04, GS03, GI08

GS04: South Africa could probably complete it.

Susanne: She asked for this line to be kept so that they can make the case that the GEOTRACES community needs it.

GS03: Australia may try to complete it.

GI08: India would be the most adequate country to complete this cruise.

Decision: SSC decided to keep GS04, GS03, GI08 sections in the map.

Atlantic Ocean

The sections having no cruise planned are GA09 and GA07. GA05 will be partly completed as process study by USA and there is interest in UK to complete GA12 (the plan is to submit an outline proposal for a NERC “large grant” in March 2024).

GA09: Maeve reviewed the reasons that led for this cruise to be included in the map (from the Atlantic Basin report). One reason was that it crosses a very high productivity zone (fishery zone). The challenge was to separate the sources and identify controlling processes and it was recommended to repeat the section to cover the seasonality of the productivity.

Bob: He added that there was a workshop in Montevideo in 2008 where there was a discussion about completing this line by Brazil, Argentina and US.

Karen: She said that rational behind the field programme is more achieving the scientific goals of GEOTRACES rather than finishing or not the lines or whether they are done as process study or section cruise.

Bill: He said that in his opinion no one will do GA09.

Alessandro: He said that it would be good to add some of the scientific rationality under the different lines so that people are encouraged to make them as process studies.

Action: DMC to create a document explaining the scientific rational behind each section line.

Alessandro: He pointed out that the Atlantic Ocean still has an important gap in the South Atlantic Ocean.

Arctic Ocean

There is the cruise from Walter Geibert, ArcWatch2, on *RV Polarstern* scheduled for August-September 2024. No other cruises are planned so far.

Process Studies:

Maeve reported that this year 5 process studies have been completed and that 3 are already planned for 2024 and 2025: GPpr16 from Japan, and the two just approved process studies: PICCOLO from UK and EAIS2 from Netherlands.

Alessandro: He believes the process studies map needs to be more accurate on the real stations completed.

Action: Donna to explore whether it is possible to change the lines of the process studies for another representation that makes the lines more accurate to the real stations completed, for example, to represent the actual stations by dots.

Karen: She mentioned that if GEOTRACES plans to provide state estimates, there is a need to start thinking on how this can be achieved and what is missing. For example, are there key areas that represent processes or conditions that have not been reached? Can GEOTRACES accurately present a global distribution of all key parameters or are there gaps? She proposed that SSC members could each review this for his/her particular parameters and if there are gaps for them to think on whether there are process studies in the particular area covering this or not. This could be a way of objectively analysing what is needed.

Alessandro: He agreed that a good way to do so is thinking on the main key parameters groups and see what are the main gaps.

Eric: He suggested that this can be done during the synthesis workshops.

Rob: He said that it would be very useful to have in the map of process studies the different parameters that are measured in each process study. If this information were available then it could be easier to find volunteers to fill these gaps.

Donna: She said she is happy to work on this as it is easier to put the parameter information on the maps rather than the GDAC website.

Action: Donna to explore how to add in the map the parameters collected by each process study.

Jessica: She put the example of the margins. GEOTRACES has done a lot in respect to margins. The research can be pursued until infinite but may be SSC could think if GEOTRACES has completed what was aimed about margins and also think whether there are processes for which we have not done enough. She added that there is a need as a group to decide whether we have done enough on each cruise. She proposed chasing down some lists of processes that the group originally aimed to study and review whether there have been enough on each of them, that is, if all parameters have been done and if not, report about it as this information could be useful for people who might take the product and grow from it. She concluded by saying that the reporting function is as important than the cruise completion.

The discussion was adjourned to be continued later on the agenda under the topic “Define the completion strategy for GEOTRACES”.

BioGEOTRACES – Maite Maldonado

Maite Maldonado introduced the labs that are behind the samples: Julie LaRoche (Delhousie University), Mak Saito (WHOI), Ben Twining (Bigalow), Penny Chisholm group led by Paul Beroube (MIT, USA) and Jed Furtman and Jesse McNichol (U. Southern California). She then thanked all the volunteers and cruises which have been collecting samples for BioGEOTRACES. She then reported about the work done for each of these groups.

She reminded the SSC that Paul Berube’s data is linked (and not included) with IDP. The reason was that these datasets are changing so they could not be included in a static product. This was a work accomplished with the help of Reiner. For next IDP they expect data from GP15.

Ben Twining’s data was in IDP2021. For the next IDP, datasets for the GP17-OCE are expected.

Mak Saito data from GA03 were included in IDP. Mak has also improved his Ocean Protein Portal (www.oceanproteinportal.org). She reminded the SSC that Mak has a vehicle called Clio that has been taking samples for intercalibration. Importantly, Mak led the submission of the proposal to NSF for BioGEOSCAPES which has been funded. For the next IDP, he expects to provide proteins from GP15.

Julie LaRoche’s group’s data from GA03 and GN01 cruises were submitted to the IDP but did not make it as no intercalibration report was submitted. They plan to submit datasets from GA01 and GI07 to the next IDP.

Finally, she mentioned other data that are expected for the next IDP, including:

GPc03	qPCR, ammonia monooxygenase subunit A (amoA)	Alyson Santoro, U. California Santa Barbara
KK1903	HPLC pigments	Bangqin Huang, Xiamen University
KH15-03	Chla fluorometer	Jing Zhang, University of Toyama

Linking BioGEOTRACES data portals with IDP – Reiner Schlitzer

Reiner Schlitzer explained that he worked with Paul Berube in linking their data to IDP. The aim was to offer a service to get the BioGEOTRACES in IDP but also to offer the service for the biologists to get easy access to trace metal data. He then did a live demonstration on how to use explore.webdv.awi.de and obtain the BioGEOTRACES data.

Upcoming BioGeoSCAPES programme – Maite Maldonado

Maite explained that BioGeoSCAPES is the concept for a potential future interdisciplinary global-scale microbial biogeochemistry program. At the moment, there is traffic on the website from 60 countries. The programme is possible thanks to the large scientific revolution in omics (e.g., in 2009 here was a need to filter 29 liters to make omics nowadays only 2 liters is enough thus it is also very cheap) and thanks to the significant advances in micronutrient research that led to significant insights into biogeochemical controls in biology. Maite thanked SCOR, NSF and Moore Foundation which funded a scoping workshop to create a BioGEOSCAPES and define the mission and the vision of the programme that she presented.

Maite mentioned that there are 3 intercalibration efforts going on: (1) ocean metaproteomic intercomparison effort underway since 2018 (2) ocean nucleic acids “omics intercalibration and standardization” which started in 2022 supported by NSF and (3) an upcoming on ocean metabolomics intercalibration.

They plan to host the first international meeting in November 2023. She pointed out that there is a growing interest in BioGeoSCAPES internationally with workshops being held in 13 countries and with cruises putting BioGEOSCAPES as mission. They have 25 volunteers to be ambassadors and they have national activities in 28 countries.

She reported that there have been 3 efforts to try to fund the programme: US, Europe and Canada. Only the US proposal has been successful so far. The project AccelNET is funding the implementation of the project. It is supposed to be a network of networks. The first BioGeoSCAPES science plan meeting will take place in November 2023 at WHOI. There will be 90 persons and some participants online. They plan to launch the programme in 2025-2026 and maybe have the first release of integrated products in 2035.

Bill: He asked whether they plan to have dedicated cruises. Maite said that they do plan to have them.

Phoebe: She asked about the infrastructure; would it be similar to GEOTRACES? Maite replied that she thinks they will have to have structure similar as an IPO but they would like to have several of them in different places.

International Partnerships opportunities

New SCOR proposals for Working Groups – Emily Twigg

Emily Twigg reported that SCOR has currently 18 working groups on-going, 5 large scale projects and 5 infrastructure projects. She reminded the SSC that SCOR has also funding for capacity development.

In terms of SCOR working groups, SCOR provides 45k\$ to the selected projects.

GEOTRACES-related current SCOR working groups includes: FeMIP (Iron Model Intercomparison Project) which started in 2016 so it will probably finish this year; RUSTED (Reducing Uncertainty in soluble aerosol trace Element Deposition) which is a new working group that was selected in 2022 and the Active Chlorophyll fluorescence for autonomous measurements of global marine primary productivity which will finish this year too.

This year 12 new proposals have been submitted. The most relevant to GEOTRACES are: MASIS (Towards best practices for Measuring and Archiving Stable Isotopes in Seawater) and TRACESAMORS (TRACE element SAMplers and sensORS).

Phoebe: She asked about the difference between an infrastructure and a research project. Emily mentioned that an infrastructure has to provide capacity. She then asked, whether GEOTRACES should expect another review of GEOTRACES. Emily answered that she did not know at the moment as this was a request from ICSU and not from SCOR.

Conversation with Hedy Edmonds

Hedy Edmonds started her talk by acknowledging that GEOTRACES remains very successful in terms of the international representation and thanking all national representatives for their tremendous contributions and putting so many cruises. She then reminded the SSC that NSF is funding the IPO and GDAC as well as US GEOTRACES.

Hedy said that what it is important for NSF is that the GEOTRACES data is used now and in the future. The potential of the data needs to be realised. The DMC should make as a goal that the data continues to be available. Data Management is really expensive so there is a need to see that the science is using the data. The group should facilitate and encourage people to write proposals working with the data that exists.

Reiner: He commented that data being taken are growing, knowing that the planet is changing it, he thinks the data collection should not be stopped. Hedy clarified that she did not mean to stop but she meant that the data that have been collected continue to be available, so that it's there to be compared to the new data.

Phoebe: She asked whether there was a mechanism by which GEOTRACES could ensure the accessibility of GEOTRACES data. She wondered whether GEOTRACES could be converted into a SCOR infrastructure project to continue being funded. Emily clarified that this type of

infrastructure projects are mainly funded by international contributions.

Bill: He mentioned that GEOTRACES has developed a scheme to generate the IDP. Although, the data will be available forever at BODC, the main concern is how GEOTRACES can continue to keep the structure that makes possible the IDP.

Bob: Bob asked whether Hedy could provide examples of successful uses of data that she would like to see. She put ARGO and the work that have been done in using SOCCAT database answering questions about carbon as good examples. She added that NSF has put 2 million dollars per year in BCO-DMO so they want the data to be used. They do not want it to be just a repository.

Maeve: She asked whether BCO-DMO would be permanent? Hedy said that BCO-DMO was created as a data management office.

Reiner: He claimed that the way GEOTRACES is handling the data and making the product follows what NSF want to see. GEOTRACES is accumulating data and the aim of IDP is to make data access as easy as possible. Also, over a decade, the technology has evolved making it even more easy to access the data (e.g., it is not anymore necessary to install a software or download the data, GEOTRACES is offering a website where data users can work and interact with data online). So, in his point of view GEOTRACES is already following NSF recommendation.

Hedy: She clarified that the vision is that the way GEOTRACES has been doing making data available continues in the future.

Bob: He added that Reiner has made possible for the GEOTRACES data to be available in different formats: (1) for those people who are comfortable downloading the data and work on their own software they can easily do this, (2) for those willing to use ODV they can easily extract the data desired to work with ODV, but (3) importantly, Reiner has made possible that everyone can easily explore the GEOTRACES data online with no need to download anything. He emphasized that the work Reiner has done for GEOTRACES is precious. Hedy agreed.

Karen: She asked whether she ever has received feedback about communities that GEOTRACES is failing to reach. Hedy answered that she has never got this feedback. Then, Karen asked whether Hedy knew of questions that international committee should be thinking about. Hedy encouraged the committee to continue using, publishing, synthesising and getting the data out of the data centre.

Action: SSC members to facilitate, encourage and continue using, publishing, synthesizing and writing proposals to work with data, in order to get the data out of the data centre.

THURSDAY 28 SEPTEMBER 2023

Standards & Intercalibration (S&I)

Report on the S&I Committee – Hélène Planquette and Ana Aguilar Islas

Ana Aguilar-Islas started the presentation by reviewing the members of the committee. Currently the committee has 8 members. Pete Sedwick has stepped down this year and Ana is taking over his parameters. Yoshiko Kondo is also rotating off this year, so they are now seeking to replace her.

The S&I Committee met in person last week in San José. 6 members were present and 2 members were online with 1 member not being able to attend. In addition to reviewing the reports they discussed the strategy for next IDP and edited sections of the cookbook.

She then presented the list of datasets that have been recently approved. This included several nutrient data from cruises having data already in IDP.

S&I also reviewed and approved the following compliant datasets and are seeking SSC approval of them:

IN2019_V01	Cd_D_CONC_BOTTLE::o6jx5v
IN2019_V01	Cu_D_CONC_BOTTLE::zwacsx
IN2019_V01	Fe_D_CONC_BOTTLE::s2p7im
IN2019_V01	Mn_D_CONC_BOTTLE::xz7ib5

Decision: SSC approved the compliant data from cruise IN2019_V01 in the list above.

Ana then reported S&I Committee work in updating the cookbook. New sections will be included as the GOSHIP links for nutrients, oxygen, PH, etc.; sea ice environmental sampling and processing; working with DOoR; data management best practices; appendix for naming parameters convention and appendix for biological parameter protocols. They plan to release it by early 2024.

She then explained that future activities include: to continue to review reports, updating naming parameters for organic ligands and to have next meeting January 8th 2024 (zoom).

She urged SSC members to help them in encouraging the community to submit their reports as soon as datasets are finalised and to submit metadata as explicit as possible. Ana encouraged communication with the committee (any time) and asked to please don't wait until the last minute. S&I will be communicating the dates for next meetings to Elena to be put on the eNewsletter.

Action (similar to action item 21 from 2022 SSC): SSC members to remind to national colleagues that:

- Data and intercalibration report submission is open – please submit them as soon as the datasets are finalised.

- Metadata needs to be as explicit as possible
- Please indicate the flags on the reports
- They can communicate with committee at any time
- Please don't wait until the last minute

In terms of budget, they plan to held one in person meeting in March 2025 (5-day meeting in Fairbanks, Alaska. They request 30k (15k for flights, 10k for accommodation, 3k food and 2k other). This is less cost compared to the 2-day annual meetings on 2024 and 2025.

Bob: He wanted to know what happens when the report submitted is by a member of the S&I Committee? Maeve explained that they review the reports but the member concerned is not voting for the report.

Ana: She took the opportunity to remind all members that it is very important to indicate the flags when submitting the reports.

Maeve: She supported the idea of a 5-day meeting. She asked whether the BioGEOTRACES protocols will be added in the cookbook. Ana replied that they are planning to do so. They will be added in as appendix. Maite added that she will send the protocols to the S&I Committee.

Ana: She reminded people that the sensor data is the only data that do not require a S&I report.

Maite: She reminded SSC members that some of the parameters they plan to submit may not have yet a name so a new parameter name will have to be created, thus asked members to please do not wait until the last minute to register their parameters.

Berger leach intercomparison values

Ana reported that they have some results but they are not ready to be released yet.

Data Management – Bill Landing and Maite Maldonado

Report on Data Management Committee activities – Bill Landing and Maite Maldonado

Bill Landing started by presenting the Data Management Committee (DMC). There are two new members this year: Zanna Chase and Angela Milne. Also, Donna has entered the DMC replacing Mohamed Adjou.

Bill explained that one important action item from last year was to update the fair use agreement to specify the requirements for third parties to use GEOTRACES data. This has been done by providing a new example in the list of examples available in the document. He then showed the example of CMAP (Collaborative Marine Atlas Project) which has already applied the recommendations.

He then reported the main decisions from the last DMC meeting. DMC decided to reinforce the showcase of GEOTRACES data. So, they have compiled a list of websites that provide ocean data and the plan is to contact them and ask to add a link to GEOTRACES data. This includes, World Ocean Atlas, GLODAP: Global Ocean Data Analysis Project, SOCAT: Surface Ocean CO₂ Atlas, SOOS: The Southern Ocean Observing System, PAGES (Past Global Changes) project, GO-SHIP/CCHDO (CLIVAR and Carbon Hydrographic Data Office), NOAA/National Centers for Environmental Information, NOAA/National Oceanographic Data Center (NODC) and IODE/UN Decade Coordination Office for Ocean Data Sharing.

Ocean Decade has created a Data Sharing Coordination Office. Bill, Catherine and Elena met them last August. Ocean Decade Officers were impressed by GEOTRACES and considered GEOTRACES data management as a good example to help other projects. They have been invited to participate to the Ocean Decade Conference to be held in April in Barcelona.

Bill reminded everyone that it is very important that all SSC members take the opportunity to promote GEOTRACES in all the meetings they participate. In addition, he showed a slide that DMC plans to showcase at the beginning of each special session. This slide will also include a QR code. It will include the information that data sent to GDAC will be kept forever so this is a nice way to have their data preserved. In addition, GEOTRACES plans to participate at the SCOR Booth at Ocean Sciences.

Action: SSC members having ideas of information that should be added to the slide to be showcased at Ocean Sciences and other international conference, to please send it to Bill, Maite and Elena.

He then introduced the SCOR/TOS Special Issue of “Oceanography” A vision for Capacity Sharing in the Ocean Sciences and asked for volunteers from the SSC that could be interested in submitting an article to this call.

Action: SSC members volunteering to submit an article to the SCOR/TOS Special Issue of “Oceanography” to contact Bill Landing.

Bill also reported that the IDP flowchart has been modified so that it includes now the proof-check step.

Jess: She said that it would be good for scientists to register the data in DOoR as soon as possible so that Donna has this information as soon as possible.

Reiner: He disagreed that the parameters should be registered so in advance in DOoR. In DOoR we only want what will be submitted. Any data registered in DOoR that later is not submitted generates extra work for S&I and DOoR team.

Jess: She pointed out that the problem is the cruise form GDAC is asking to provide a long list of parameters thus, it would be easier to put this information on DOoR only. Phoebe corrected that what it is needed in this form it is each category of trace element that will be sampled and the main investigator for it.

Action: Donna to review the flowchart to update what needs to be provided and when (before or after the cruise). Donna to share this information with Elena, Bill and Maite.

Action: Donna to review the GDAC cruise form to try to simplify it and ask only the information that GDAC really needs.

Bill reported that DOoR has been substantially improved. The DMC has an action item about making a new video and ppt instructions on how to submit the data through it as well as they have an action item about providing more explicit instructions for CTD file and hydrographic data submission (file formats) and in make more visible the units for sensor data.

He reminded the SSC that TEI interpretation requires basic hydrographic data (T, S, nutrients and oxygen). A big effort has been put by DMC co-chairs and Elena in helping GDAC in chasing sensor, nutrient and oxygen data. But there is a need for help for SSC members to help chase more data. Also, he reminded scientists to communicate with GDAC when submitting hydrographical data to make sure they meet the requirements. There is an action item from DMC to make this information available in DOoR.

Action: SSC members to remind cruise leaders and PIs to:

- Adopt a consistent Event Log scheme (STA # missing! ask DMC for help).
- Submit CTD files and hydrographic data ASAP in proper formats.
- Use the DOoR flowchart very early.
 1. DOoR allows potential datasets to be registered
 2. DOoR generates data spreadsheet templates (with barcodes)
 3. DOoR generates S&I report templates
 4. DOoR provides Proof check visualizations

Bill added that there will be several parameters names that should be created, this includes: new sensor names for upcast sensor data when bottles are tripped; Size-fractionated particles from GO-FLO bottles (Hélène Planquette and Rob Sherrell); Trace metal binding ligands from electrochemical methods; change some old names and develop new names with the S&I committee; Trace element binding ligands from high-resolution mass spectrometry (e.g., Dan Repeta) and BioGeoTraces names, e.g., amoAqOCR.

Bill reported that a DMC subcommittee met after the DMC to work on the state estimates (to be reported later on the agenda) and that the DMC brainstormed for other synthesis model workshops.

He then presented the timeline for IDP2025 already agreed last year:

15-MAY 2024: Deadline for guaranteed inclusion (dataset registered in DOoR and S&I reports submitted, S&I review started; data submitted to data centres).

15-DEC-2024: Final deadline (dataset registered in DOoR and S&I reports submitted; data submitted to data centres).

15-NOV-2025: IDP2025 release; virtual release event; highlighted at AGU 2025 and Ocean Science 2026 sessions; Poster displayed at SCOR booth

Action: SSC members to help sharing the timelines for IDP2025 with colleagues.

Bill reported that there was also a discussion about future IDPs. Thanks to DOR the increase of IDP release frequency is possible. Next IDP will be 2025, then 2028 and later 2031 assuming funding continues. Should 2031 be the latest one? This assumes that last GEOTRACES cruises will be in 2026 and 2027 is this feasible? Also, DMC discussed about how can GEOTRACES manage data to be submitted after 2031. He mentioned that DMC is planning to look at other programmes to see how they continue data submission and processing specially, what the funding sources are.

Donna: She mentioned that at BODC there is a lot of work to make sure that any information stored at GDAC is accessible permanently.

Intermediate Data Product 2021 version 2 (IDP2021v2) – Reiner Schlitzer

Reiner reminded the SSC that the IDP2021v2 was released on July 7, 2023. It consists of new versions for seawater and aerosols datasets only. For sensor, cryosphere and precipitation datasets v1 versions were kept.

He showed the maps of the stations for aerosols and seawater version 2 data. For the aerosols there are no new parameters added but there are new samples: 379 compared to 319. For seawater there are 2 new parameters for Cr (586 parameters in total) and the samples have been increased to 105,417 (instead of 96,184). Also, there is a significant (10 – 20 %) data count increases for CTDOXY, CTDSAL, CTDTMP and Fe_D, but this is smaller (<5%) for PHOSPHATE, SILICATE and NITRATE

In conclusion, the transition from v1 to v2 added significant numbers for the ancillary parameters but the macronutrients were less completed (only 5% increase) because they need to be intercalibrated so they could not be added.

Reiner reported that often the cast identifiers are listed but the stations are not listed in the GDAC event table. This causes errors. DMC has discussed about it and the strategy is to: (1) for Donna to work on the files and try to resolve as much as possible; (2) Ensure station numbers/names are entered in future ship event logs, in addition to cast numbers/names; (3) Inform chief scientists of future GEOTRACES cruises about this request and (4) ask national representatives on SSC to help by contacting PIs in their country.

Action: SSC members to contact PI and ask them to ensure the station numbers/names are entered in future ship event logs, in addition to cast numbers/names.

Report on GDAC activities – Donna Cockwell

Donna Cockwell explained that version 2 of the IDP included hydrography, some data that had not rolled over from IDP2014 and IDP2017 and data that had been processed but S&I committee

could not approve it in time for v1. In total 261 new parameters were included. However, there is still outstanding data: (1) submitted to BODC but not registered on DOoR and/or no S&I reports and (2) hydrography and nutrient data still not received for some cruises.

She reported that from IDP2021v2 the use of Jupyter notebooks has been established allowing a more consistent processing, the checks have been enhanced and all data processed had the dynamic html visualization uploaded to DOoR (they can be created at the submission stage, no need to wait until all is processed and this catches errors earlier).

Donna has also generated new scripts to make it easy to update the maps as well as new scripts to check rollover data. At GDAC they are currently working on processing CTD profiles to identify missing data.

Donna ended her presentation by asking SSC encourage colleagues to please submit the data as soon as possible. Also invited SSC members to send feedback about the interactive maps.

Action: SSC members to send feedback about the interactive maps to Donna.

GEOTRACES State Estimate Working Group Report – Tom Weber

Tom Weber started his presentation by defining a state estimate. In oceanography, it is a globally continuous gridded tracer distribution or rate estimate, often temporally resolved (e.g., monthly-mean climatology).

The 3 potential sources for the state estimates are: fully prognostic ocean biogeochemical models, element specific data-assimilation models, machine-learning models that predict TEIs as a function of physical chemical, and biological properties. He presented a table summarising what is available at the moment for each of these sources and key parameter. The parameters that have the 3 types available are: Zn, Fe, N and C.

He reported that during the meeting of this subcommittee, there was also a discussion about what type of product GEOTRACES could offer. 3 options are available. From less time and cost the list would be: (1) to provide a curated list of links on the GEOTRACES site to existing products; (2) to compile existing state estimates into a user-friendly format with shared variable names, grid and documentation. (3) to lead a community effort to generate a suite of new state estimates following consistent methods and pre-defined “best practices”, with quality control and assessment.

For this, the questions that it would be necessary to address are: which TEIs should be included? How many state estimates should we include per TEI? What is the submission model? What is the role of the DMC subgroup in picking and choosing? Should we even do this?

They also tried to list out who should be using these models. Within trace element geochemistry community, they have identified (1) those scientists planning for future research cruises and (2) those scientists extrapolating processes globally to assess importance. Outside this community: (1) numerous chemical and biological oceanography applications, providing environmental context

by allowing estimation of unmeasured properties (e.g. compare genomic stress indicators with micronutrient distribution, compare biological rate measurements to environmental drivers), (2) initialization of fields in Earth System Models and Ecosystem Models, (3) Isoscapes – how does TEI composition of animals relate to environment? and (4) policy makers – how have contaminants spread through the ocean?

The group concluded that with all these users, there is enough value to warrant the effort to put together the state estimate. So they focused on answering the questions mentioned above: Which TEIs should be included? They believe they should prioritise the micronutrients first and then pollutants. How many state estimates? One state estimate per TEI: simplest product for the target audience. Perhaps a “pro version” with multiple estimates for those who care about variance. The submission model that they prefer will ask for submissions from the modeling community at large, offer authorship on the product to all contributors, and involve them in the assessment process. The group will determine the best category of SE to use for each TEI assessment to select the most skillful SE within the chosen category. Other SEs will be used to assess uncertainty. Should we even do this? There is enough value to warrant the effort.

Finally, he presented the product the group propose:

- All estimates on a universal grid (World Ocean Atlas 1x1 degree), annual mean of monthly climatology.
- For each included TEI, the product will contain:
 - o The state estimate itself
 - o Uncertainly estimate (quantitative where possible)
 - o The IDP/FDP data binned onto the same model grid
 - o Acknowledge of contributors (for both data and state estimates)
- Release separately from IDP to ensure it does not detract, and is recognised as a completely separate entity.

In terms of timeline, they propose to release it shortly after the final product, about 2031 with a testing/intermediate release in 2027.

Phoebe: She encouraged the group to make it ambitious and added that she would really like to see the list of links to each of the existing state estimates for the different parameters

Action: Tom to provide the list of links to the already existing state estimates to Elena to compile a web page on the GEOTRACES site.

Bob: He asked whether rate estimates would be a useful tool for assessing the different state estimates against each other, assessing how realistic they are. Tom answered that it could help for some of the categories of state estimates coming from process-based models but not for the machine learning models that do not contain any process information in the first place.

Jess: She suggested that it would be useful to see the uncertainly in each state estimate so that she can decide whether or not they believe them as otherwise the risk if that users use the state estimates and not the data and what GEOTRACES wants is for the people to use the data.

Jess: She also added that she believes it would be very useful for the group to prepare a document

that could be used to inform the observational community to help understand how the data can be used by the state estimates. Tom answered that they are already putting together an article for the special issue coordinated by Tim Conway.

Karen: She asked how they expect for the estimates to use the newest data available. Tom mentioned that they are limited by what has been done already if they need to incorporate new data the groups will require funding to do so. This is one of the reasons to decouple from the IDPs so that people do not assume it uses the most recent IDP data. Karen also asked the group to think on what kind of resources they need and where would these resources could be found.

Bill: He said that from the DMC perspective he encourages the group to continue as small subgroup as seems the most adequate way to proceed.

Alessandro: He thanked Tom and Zanna for all the work done so far.

GEOTRACES Events and Synthesis Initiatives

Matrix of synthesis topics - Bob Anderson

Bob proposed to organise the GEOTRACES publications on a matrix of processes versus TEIs. The idea is that this matrix could help in the synthesis efforts. He wanted to know whether SSC members believe it would be helpful or not.

Phoebe: She proposed trying whether ChatGPT could help on this. She then added that she would like to have this done but she is not sure it's worth the effort.

Reiner: The publications included in IDP already have the information on the parameter so this is a 2-dimension problem with one of the dimensions already known. Elena agreed and added that keywords could help in identifying the second dimension (processes).

Jess: She proposed that GEOTRACES should think on who would be the audience for this. Are the students, the experts? Bob answered that it could be those scientists for example, that are writing the synthesis papers.

Jay: He noted that some chemical properties, periodicity, might broadly relate to the processes so using the periodic table to organise the publications may be useful for this.

Phoebe: She explained that she has a student that will work at the IPO next March. She will use a network analysis software, which studies clusters. May be this software can also help on this task.

Reiner: He noted that using keywords is free text. He proposed that when people provide publications in DOoR, they should also provide the information on the processes that they are addressing.

Action: Elena to work with François André in adding in the step 6 of DOoR the possibility for users to provide the information on the processes that the publication address.

Action: Elena to work in trying to compile the matrix of GEOTRACES publication per key element and processes.

Other synthesis activities – Bob Anderson

Bob: He mentioned that if someone has ideas on synthesis products and believes that making a meeting would help, US GEOTRACES has funding for it. Synthesis products like papers add great value to GEOTRACES so he encouraged people to do so.

Update on the synthesis workshop on “Changing marine elemental cycles”

Elena reported on behalf of Walter Geibert. Walter was unable to submit a proposal for a workshop to be held next year as he will be involved in several cruises.

Venue for next GEOTRACES Summer School – H  l  ne Planquette and Susanne Fietz

H  l  ne Planquette reported that she has funding available to support a summer school at the Stellenbosch University to be held in 2025 or 2026. They have potential for 20 or 30 students to attend the workshop. Two limitations are that there are no large laboratories and it would not be possible to have a ship available to go to field. But they have clean containers that can be used. The funding is available until 2027.

Maeve: She thanked H  l  ne and Susanne for this initiative.

Reiner: He asked whether they plan to focus on a specific topic. Hel  ne replied that at the moment the planning is not done yet. If the SSC approves this initiative, they will elaborate a plan and present it to the SSC next year.

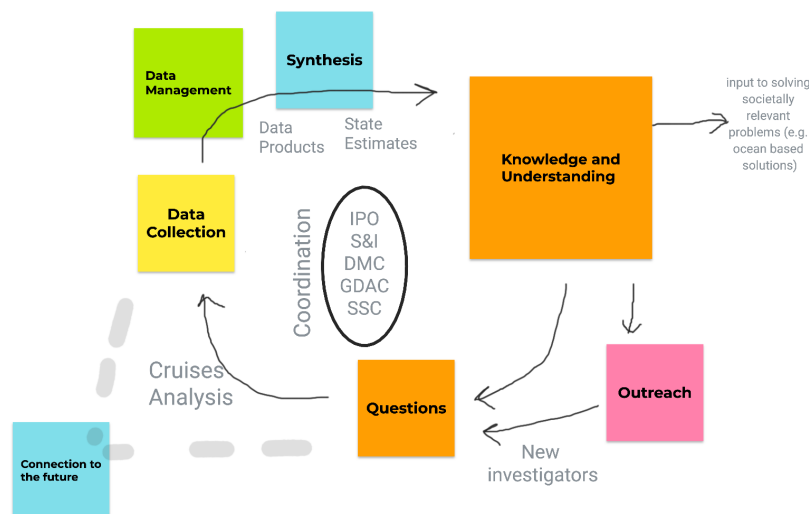
H  l  ne: She invited the SSC members willing to be involved in the Summer School Scientific Committee and/or volunteering to make lectures to approach H  l  ne and Susanne.

Karen: She suggested adding some modeling/state estimate module in the summer school. Tom agreed.

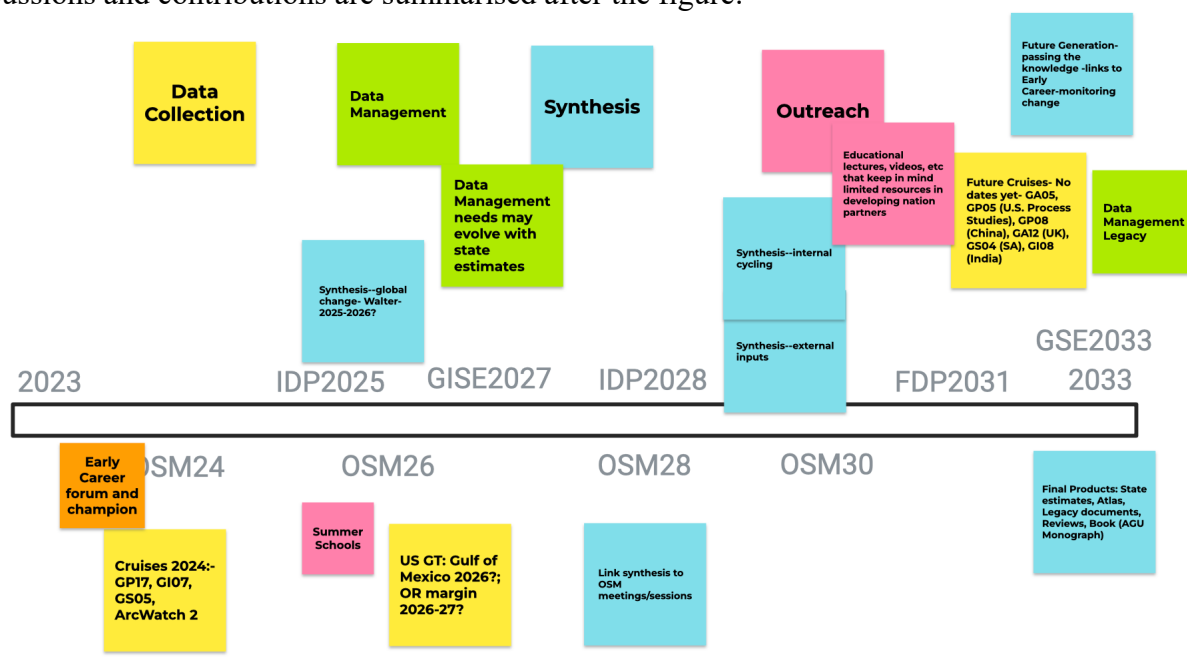
H  l  ne: She explained that there was a modeling module in the Brest Summer School already. This module was focused on explaining for example which are the limitations of modeling, the different types of models, etc. The feedback they got was very positive.

Alessandro: He agreed the past summer school had some modeling modules already. May be some extrapolating and new technologies could be added too.

The first discussion page is available on the figure below. It includes the key components of GEOTRACES, the main priorities. This includes data collection, data management, synthesis (data products and estate estimates), knowledge and understanding (to solve societally relevant problems), outreach. All these coordinated by the GEOTRACES Committees and the IPO.



The second page included a timeline from 2023 to 2033. She invited SSC members to provide inputs on what needs to be achieved for each of the GEOTRACES components by the end of the programme. The resulting document after discussion is presented in the figure below and the main discussions and contributions are summarised after the figure:



Phoebe: She noted that the timeline is mostly focused on the what needs to happen until 2033, but not what comes after, and she said it is also important to think on how GEOTRACES research can continue after the official end of the programme.

Karen: She replied that for this discussion is better to focus on how to complete the project. She added that to discuss this it could be useful to think on the milestones to be achieved between 2023 and 2033.

Phoebe: She suggested adding the main GEOTRACES forthcoming cruises on the timeline.

Alessandro: He suggested adding the main goals of GEOTRACES and what GEOTRACES will be doing to achieve them. He also suggested adding the state estimate product into it.

Karen: She asked about the opportunities for synthesis that people can think about and whether there was an opportunity for coordination that could help GEOTRACES to stimulate synthesis.

Phoebe: She asked whether Walter still plans to organise a synthesis workshop or not. Maeve replied that Walter needs to find the year that he could organise it.

Alessandro: He proposed discussing whether or not there is a need for another synthesis workshop, maybe it could be useful to review all the workshops that have been done and see if they can benefit from additional synthesis effort.

Jess: She mentioned that it would be great to organise reviews on all that has been learned for certain topics (e.g., internal cycling, external sources or both combined?) and for this having a workshop may help identifying heroes. GEOTRACES should try to organise more synthesis workshops.

Phoebe: She suggested using the state estimate targets to organise the workshops. Alessandro advised to be cautious about using the estate estimates until they have been released.

Jess: She proposed organising a series of workshops where the GEOTRACES goals are taken and a group of persons works on synthesising the science done under each topic.

Maeve: She said it might be best to organise more mini workshops focused on small aspects of the topics.

Phoebe: She suggested organising for example a session at Ocean Sciences (e.g., in scavenging) and then having a little mini synthesis workshop after this.

Alessandro: He said that in this case 2026 would be the next opportunity to place this type of workshop followed by 2028.

Phoebe: She suggested the first workshop to focus on fluxes. Then other subjects could be scavenging, regeneration and bioavailability.

Bob: He noted that small workshops could be done pretty quickly while organising a big workshop may need more time (e.g., 4 years). It could be possible to organise it and then for a group of people to stay a few extra days to write the synthesis paper.

Maeve summarised: It seems that SSC members agreed that organising small focused workshop is more feasible than a big workshop. If so, we should start thinking on how to do this.

Phoebe: She mentioned that there is a need to identify heroes for 2026 at next SSC meeting.

Bob: He strongly advised to organise them in conjunction to an international conference.

Taryn: She said a major conference as AGU would attract more diverse community. Phoebe said that it makes sense to diversify and target conferences other than Ocean Sciences like AGU. But for certain topics like biology, it makes more sense Ocean Science and Goldschmidt is more adequate for geochemical topics.

Decision: SSC decided to organise small synthesis workshops in conjunction to international conferences. The first one could be focused on fluxes at Ocean Sciences 2026.

Action: Elena to put on the agenda to discuss about organising a small synthesis workshop on fluxes at Ocean Sciences 2026.

Alessandro: He said it would be useful to know how we can attract colleagues from other countries, for example from Japan, Chile, etc.

Dalin: He noted that Xiamen hosts the XMAS symposium every year it could be possible to organise a workshop during the symposium.

Alessandro: He suggested GEOTRACES could also run webinars.

Yoshiko: She said that to attract the Japanese community the Ocean Science conference is more pertinent.

Action: SSC members to think on organising small thematic synthesis workshops.

Maite: She suggested that GEOTRACES could publish a book in addition of just publishing synthesis papers. Taryn agreed. Rob noted the book should be digital.

Jess: She said that AGU monograph could be a good place to publish synthesis papers.

Maeve: She proposed discussing on what needs to be completed for topics such as outreach and data management.

Bill: He noted that a big effort has been done in these two topics and that it would be a pity to lose all what has been done.

Taryn: She suggested it would be nice to have at the end of the programme, an element-by-element lecture of what the GEOTRACES has achieved.

Phoebe: She explained that IODP has a lecture series that funds around 12 scientists to travel

around the world to give talks about the IODP science.

Jess: She suggested having some kind of summer school videos so people can be educated without being present.

Maeve: She pointed out we have to be ambitious to engage with stakeholders and other communities that we are not reaching.

Alessandro: He proposed SSC members to think if they can identify other communities or stakeholders and if so, to think whether they could make contact with them first.

Taryn: She said GEOTRACES should also think on how can we made the output more accessible to policy makers and how we can have a broader impact.

Maeve: She pointed out that GEOTRACES should try to identify which groups of stakeholders should be contacted. Maite suggested the agro/agriculture community.

Alessandro: He changed subject to data management to note that depending on how the state estimate evolves this could change the data management needs and also that thanks to DOoR or other tools data management could be easier to manage in the future.

Phoebe: She suggested opening a discussion about how GEOTRACES could look like after 2031. How could GEOTRACES integrate new GEOTRACES relevant data after the final product and what infrastructure would be needed. This is important specially for young people and for the nations that are entering in the GEOTRACES science, it would be necessary to come up with a plan for them.

Jun: He mentioned that SOLAS have an early career committee representative at the SSC. If GEOTRACES could have this type of system too then this could be a way to pass the knowledge.

Taryn: She agreed but she said GEOTRACES would need money for this.

Phoebe: She summarised the discussion held at the DMC about how GEOTRACES could continue after the official end of the programme. All started with Bob saying that for JGOFS the data is still available for the US but all the data from the other nations the links to the data are broken so it is not possible to access the data anymore. In the case of GEOTRACES, the final data product will be available at GDAC forever but still it is important for GEOTRACES to come up with a plan for young people who are just being trained and for the nations that are just entering in the GEOTRACES science to be able to continue.

Taryn: She added that what has to be discussed is the vision of how current or other countries could continue to provide data and also intercalibrate the data. How GETRACES could have an organization that permits for the data flow to continue.

Bob: He explained that GEOTRACES started from GEOSECS and for some years GEOTRACES was called GEOSECS 2. However, they learned that having a programme named GEOSECS 2

was killing the new programme, there was a need for a new programme. GEOTRACES cannot continue forever, but new programmes need to appear.

Reiner: He noted that in 2032 some key geochemical questions will still be there. GEOTRACES could be the baseline for where future observations can be compared.

Taryn: She said that it is the legacy that allows for the next generation to establish changes. May be in this future timeline scenarios, there should be a workshop that takes together the future generation to look for a future programme. She wondered whether this is the responsibility of the SSC or whether this is something that will organically happen.

Reiner: He suggested that a programme focused on process studies could be the way to proceed as we are discovering processes all the time. In his opinion, the continuation will not come organically. There is a 10-year timeframe, the young generation should start thinking about how the programme could evolve. They should start creating a group to discuss on how to continue the GEOTRACES effort. He also added that in 10 years' time technology could make things much easier, but there may still be a need for an integrated data center.

Phoebe: She reported that DMC proposed to review models from other projects. A model that has been proposed is GLODAP. She asked SSC member whether they know about other programmes that made possible for data management to continue for longtime without the funding from national agencies.

Action: SSC members knowing about other programmes that made it possible for data management to continue without the funding from national agencies to report to Bill Landing and Maite Maldonado.

Phoebe: She noted that to continue the programme there is also a need for persons willing to provide their leadership and energy to the programme like have done Catherine for the IPO, Bob for the synthesis and Reiner for the IDP. There is a need for more heroes.

Bill: He said it is important that data continue to arrive and could continue to be integrated.

Reiner: He said it could be possible to have documentation to teach the new generation, but the energy needs to come from the next generation.

Alessandro: He said that the community will probably continue organically but it is also the responsibility of the SSC to continue it, for example, with the early career committee.

Bob: He said that whoever continues the effort should take into account the lessons learned from GEOTRACES; for example, if the IPO had to rotate GEOTRACES would have lost a lot.

Phoebe: She asked whether we want a way to continue infrastructure or to start a new programme. Bob answered that the two options are not mutually exclusive.

Maite: She noted that DMC has an action item to look for how other programmes have continued. DMC should work on how to make possible for the GEOTRACES dataflow to continue after the

official end of the programme.

Bill: He agreed. All what has been achieved as a team should be maintained.

Maeve: She insisted that if SSC members have ideas of other programmes which have been successful in continuing the effort of keeping the data, should please let Maite and Bill know.

Bill: He said that he has the goal to find a foundation that could continue the effort. The amount of money that it is put on IPO/GDAC it is not that much. If this can be kept forever this is really warrant.

Jay: He suggested that a way GEOTRACES can capture the next generation is being carefully on how the GEOTRACES legacy can be used. The younger generation are very focused on solving problems and on applied knowledge.

Alessandro: He noted GLODAP is the closer model to GEOTRACES. He also added that it is important for the SSC to help in developing the rationale behind a new programme.

Abby: She suggested that it would be good to consider during the rotations discussion the possibility to have more early career scientists appointed as SSC members.

GEOTRACES Publications

Maeve reviewed the forthcoming GEOTRACES special issues. This includes: (1) a Special Issue in Oceanography led by Tim Conway; (1) a call open on the Special Issue to celebrate 20 years of Ocean Science (<https://www.ocean-science.net/>); (3) several GEOTRACES scientists are working on the Treatise on Geochemistry and (4) the Oceanography Special Issue on Capacity Sharing that Bill had presented already.

Action: SSC members to inform the IPO of any special issue related to GEOTRACES.

Bob: He asked whether anyone had a list of GEOTRACES chapters in the Treatise? Phoebe provided it:

00069. Elemental classifications and their distributions in seawater Lohan, Maeve

00071. Organic matter in the contemporary ocean Boiteau, Rene; McParland, Erin;
Niggermann, Jutta

00072. Metal stable isotopes in the marine realm Little, Susan Halsall; de Souza, Gregory;
Xie, Ruifang

00074. Nutrient cycling in the oceans (macro and micro nutrients, limitation, cellular
stoichiometry) Conway, Tim

00075. The Role of Trace Metals in marine biogeochemistry and Major Nutrients cycles
Shaked, Yaela

00076. The geochemistry of marine particles Lam, Phoebe J.; Xiang, Yang

00077. Chemical tracers of scavenging, particle deposition, and sedimentation processes (Used

to be called Chemical tracers of particle transport) Marcantonio, Franco; Anderson, Robert; Pinedo-Garcia, Paulina

00079. Hydrothermal processes in the ocean German, Christopher

00081. Chemical Tracers of Waters Masses and Ocean Circulation – Present and Past
Marchitto, Thomas;

00083. Tools to Trace Past Productivity and Ocean Nutrients Farmer, Jesse ;
Fehrenbacher, Jennifer; Horner, Tristan; Kast, Emma

00084. Present and Past Ocean redox chemistry Hardisty, Dalton S.; Lau, Kimberly V.

00088. Geochemistry of marine sediments Hayes, Christopher

00089. Geochronology of marine sediments Hemmings, Sidney

00090. Sediment diagenesis, deposition environments, benthic fluxes Aller, Bob

FRIDAY 29 SEPTEMBER 2023

Budget – Emily Twigg

Emily reported that the main GEOTRACES SCOR funding comes from NSF. From September 2023 to August 2024, the total amount available was 855,204 but there was a carryover from a previous grant so the final amount available was 989,455\$. In addition to the funding from NSF, there is some unrestricted funds. Japan provides 5k per year.

The expenses per year increased to 372k for 2023. The expenses budgeted for 2024 are 234k. This includes 20k for S&I but only 10k for the SSC and covers 2/3 of the annual cost of the IPO and GDAC.

In terms of budgeting process for 2024-2027, Emily explained that the budget will be prepared by SCOR based on an extensive consultation with the GEOTRACES Executive Committee. Then they will start consultations with NSF in March 2024. The idea is to use a combination of the 2018 and 2021 grant as a starting point.

Emily explained that there is no flexibility to move money from the IPO/GDAC costs to other categories, but there is flexibility among other categories (travel/publications/unrestricted funds).

Engaging with Early Career Scientists – Karen Casciotti and Maeve Lohan

Karen explained that last year the SSC discussed about ways to engage with Early Career Scientists (ECS) and that an action item was established to establish a definition for GEOTRACES ECS and a proposal for an open call for a committee or network. She presented some examples of early career engagement by other programmes including: Ocean Decade, SCOR, SOLAS and IMBER. Ocean Decade has established an Early Career Ocean Professionals (ECOP) Network, SCOR has one single representative in their committee, SOLAS has an ECS Committee and IMBER has an online network. GEOTRACES needs to decide its own model to engage with ECS.

Jess: She noted that GEOTRACES Summer Schools are a very successful early career effort helping students to develop a network. She believes GEOTRACES should develop a network for ECS but that this needs a hero willing to drive it.

Eric: He pointed out that in terms of activities there could be online seminars organised.

Bob: He shared his experience participating as mentor at the DISCO Conferences. The main concern that ECS expressed was finding a job. He also added that networking with senior persons has been used in GEOTRACES to help ECS to get a job. There are lot of possibilities for networking, at cruises, at workshops, at conferences, inviting ECS to the SSC, etc. He put the example of the Joint PAGES-GEOTRACES workshop where 5 synthesis papers were led by ECS. GEOTRACES should try to provide as many possibilities for networking as possible.

Alessandro: He noted that if GEOTRACES establishes a committee then it will be necessary to think on how can this forum be supported, e.g., can GEOTRACES provide funding or should the committee be only meeting online?

Jun: He shared the knowledge he has from the SOLAS ECS Committee. They mostly meet online.

Maite: She explained that BioGeoSCAPES launched a Fellow Programme (<https://www.us-ocb.org/biogeoscapes-fellows/>) that aims at building a community of early career BioGeoSCAPES scientists. They did that through a call. They got 100 applications from 20 nations and selected 12 from 9 nations. ECS selection process was done through a two-step process. They suggested to organise webinars every 2 months, they will also work with senior scientists. Each fellow received 5000 USD for travel.

Ana: She pointed out that she had heard from some ECS the criticism that an ECS network just becomes more work for them and that sometimes the better ECS opportunities are those where the senior scientists are engaged.

Jess: She agreed. In her opinion, it is important for the SSC to be engaged, listen and provide what they need. She said the seminars are also a good idea.

Alessandro: He asked whether there is a hero to do so.

Bill: He mentioned that there are several early career groups in Facebook and this cost nothing. GEOTRACES could also create one.

Maeve: She said that it seems like there is a need to identify a hero from the SSC to lead this either of the two ideas proposed, the seminars or the committee. Also, that if GEOTRACES wants to listen the early career there is a need to think about how can GEOTRACES reach them. The seminars seem easier to be organised.

Jess: She volunteered to be involved in the mentorship of early career scientists.

Eric: He proposed starting by organising brief talks (10-15 minutes) not necessarily need to be on

science (e.g., how to run a cruise, etc.) followed by discussion, instead of being top level science talks as this makes easier for students to participate.

Alessandro: He said some ways of reaching the ECS could be using the national representatives, the mailing list and the summer school participant list. He added that it seems that the easier way is to organise the seminars or an online forum. He suggested putting an action item for a subgroup to discuss about it. But he reminded that still there is a need to establish a process to select the Ocean Decade Early Career Ocean Professional (ECOP).

Maeve: For the ECOP there is a need for an open process to have a mechanism to select a GEOTRACES representative. There is a need to have some agreement on how GEOTRACES could select the ECOP and in general the early careers. She added that it is important that this process needs to be publicised to reach ECS from all over the World.

Jess: She explained that in her department there is a Graduate Council that are elected through an open application. GEOTRACES could do the same. She added that to encourage applications GEOTRACES could provide some money and if so, it would be good to provide it for networking rather than for personal travel. Once the persons are selected, they can organise themselves and then can even make a new call.

Jess: She also added that she believes the seminar are a very good idea and that GEOTRACES should organise them anyway.

Alessandro: He agreed that seminars could be organised on a shorter term but then if there is an effort to establish an open call there is a need to have a clear selection criteria. He suggested the co-chairs to establish a draft of criteria and circulate to the SSC.

Maeve: She said it is important for the criteria established to be as much inclusive as possible so it would be good for the SSC members to provide input on how they think their students could be involved. It would be best to have a sub-committee of the SSC to work on this rather than only the co-chairs, especially those on the committee that are ECS.

Maite: She recommended a small international group of about 5 persons to draft the application form/criteria and once done for them to share it to the rest of the SSC.

Jess: She recommended that application should be to select the committee members and for them to decide on the roles of each of them.

Karen: She summarised: a subgroup establishes a call that is distributed widely to select a committee, this group selects a leader who will become the Ocean Decade ECOP.

Bob: He pointed out that there is a need to establish a definition of what a ECS is. He proposed to use the AGU definition that is within 10 years of obtaining the PhD.

Ana: She mentioned that one criticism Laura Whitemore has of ECOP network is that all what is built by the working groups is to the benefit of the UN Ocean Decade.

Maeve: She reviewed the different definitions of early career from Ocean Decade, SCOR, SOLAS and IMBER that Elena had put together.

Bill: He pointed out that if the goal is to appoint the Ocean Decade ECOP then it would be best to endorse their definition.

Alessandro: He would go for a 10-year definition. He also mentioned that next step would be to define what GEOTRACES can actually do and what could be useful for this community.

Jess: She agreed that using the most common definition of 10 years would be the easier for the first year. But that GEOTRACES should consider that, for example, she would fall into the 10 years definition but her needs are very different from PhD students. So, she suggested after one year review what the committee propose and make sure that the goals proposed match all the community.

Karen: She presented a document of what a call for applications for the GEOTRACES Early Career Scientists Committee could be. The document is available at: https://docs.google.com/document/d/1gJTiqPB_7aVNSAgX6hk9IX4ExKLEyTXf/edit?usp=sharing&oid=114350749751296148576&rtpof=true&sd=true

Jun: He noticed that it is necessary to decide the amount of time the term should last.

Bob: He pointed out that AGU has two categories of early careers (e.g., there are separate representatives for students and for ECS), similarly there could be several subcommittees in GEOTRACES so that all the groups are well represented.

Jay: He pointed out that it is important for the programme to have students on the committee that could listen and learn about the programme so that they can learn how it works and how the international community interact with each other. Also, he proposed that GEOTRACES should focus on capacity building through this process.

Action: Karen to organise a follow-up meeting in a month to move forward the call for applications for the ECS Committee. Those SSC members willing to participate to contact Karen. Note: Jess, Maite, Taryn agreed to participate.

SSC Rotations – Karen Casciotti and Maeve Lohan

SSC co-chair rotations

Karen explained that Maeve is rotating off this year as SSC co-chair. Two candidates have been proposed: Alessandro Tagliabue and Jun Nishioka. Karen and Maeve would like to propose for the two of them to integrate as co-chairs in replacement of Maeve. That is, to have three co-chairs instead of two. This will require changing the GEOTRACES Committee Terms of Reference (ToR).

There was full support to this proposal.

Decision: SSC decided to propose Alessandro Tagliabue and Jun Nishioka to be both co-chairs of the SSC in replacement to Maeve Lohan.

Action: Elena to update the GEOTRACES Committee Terms of Reference and send it to SCOR for approval.

SSC members whose first 3-year term is ending

Yoshiko Kondo and Dalin Shi first 3-year term is ending at the end of the year. The proposal is for them to be reappointed for another term. Everyone agreed.

Decision: SSC decided to propose Yoshiko Kondo and Dalin Shi to be appointed for a second 3-year term.

SSC regular members whose second 3-year term is ending

Jay Cullen, Marina Kravichishina, Rob Middag, Yeala Shaked, Antonio Tovar, Susanne Fietz, Abby Ren and Kazuyo Tachikawa have arrived to the end of their second 3-year term. Each of them nominated 3 national colleagues that could rotate in the committee.

Decision: The SSC decided to propose: Erin Bertrand to replace Jay Cullen for Canada, Hélène Planquette to replace Kazuyo Tachikawa for France, Adi Torfstein to replace Yeala Shaked for Israel, Caroline Slomp to replace Rob Middag for The Netherlands, Dina Starodymova to replace Marina Kravichishina for Russia, Tommy Ryan-Keogh to replace Susanne Fietz for South Africa, Juan Santos to replace Antonio Tovar for Spain, and Yu-Te Alan Hsieh to replace Abby Ren for Taiwan.

Action: Elena to prepare the 2024 SSC nomination package to be submitted to SCOR for approval.

Karen thanked all rotating off members for their service. Special thanks to Maeve Lohan for her important contributions to the programme as S&I and SSC co-chair.

Venue for next SSC meeting – Karen Casciotti

Karen explained that 4 potential venues were available: Cape Town (South Africa), Texel (The Netherlands), Toulouse (France), Xiamen (China),

Decision: SSC decided for 2024 SSC meeting to be held in Texel (the Netherlands) hosted by Rob Middag.

Any other business

Jess: She is planning to submit a proposal to collect new samples for consensus materials.

Maeve: She thanked Jess for this effort as this is an important activity for the community.

Thanks to Karen Casciotti for hosting the meeting.

Meeting adjourned.

Zoom recordings:

Wednesday, 27 September 2023

<https://univ-tlse3-fr.zoom.us/rec/share/J4C8ltmQ4LIirgbSXgdbTpL0oWCf-9GPfrWAEuhdjRO5UrLrWuD8B4HP2jIba6G9.rZGa5bFRWUEZXb98>

Password: 0ePjue?a

Thursday, 28 September 2023

https://univ-tlse3-fr.zoom.us/rec/share/BpBbxEwAzjQOH0iJcBiqfa1BHq284Vq22HBNIBtK6WrtRt5Tpxprlm_F2s73IX4o.rWFrNI7pXfVncNIT

Password: zT#b3%ZP

Friday, 29 September 2023: [https://univ-tlse3-](https://univ-tlse3-fr.zoom.us/rec/share/VB2yO5aO3_yKg9JklgrPAgUXw3RYRQFPSxFQJCQUXKeWKsJ7TCE3I_FrTMDSJkYC.EAPxy5EkzF1F7bZ8)

[fr.zoom.us/rec/share/VB2yO5aO3_yKg9JklgrPAgUXw3RYRQFPSxFQJCQUXKeWKsJ7TCE3I_FrTMDSJkYC.EAPxy5EkzF1F7bZ8](https://univ-tlse3-fr.zoom.us/rec/share/VB2yO5aO3_yKg9JklgrPAgUXw3RYRQFPSxFQJCQUXKeWKsJ7TCE3I_FrTMDSJkYC.EAPxy5EkzF1F7bZ8)

Password: p15du!#r