

**GEOTRACES INTERNATIONAL SSC MEETING
VANCOUVER, CANADA
15– 17 JULY 2015**

List of attendees

SSC Members:

Ed Boyle (co-chair)

Reiner Schlitzer (co-chair)

Andrew Bowie

Jordi Garcia-Orellana

Vanessa Hatje

Tung-Yuan Ho

Phoebe Lam

Maeve Lohan

Maite Maldonado

Olivier Marchal

Hajime Obata

Micha J.A. Rijkenberg

Alakendra N. Roychoudhury

Geraldine Sarthou

David Turner

Liping Zhou

Other participants:

Graham Allen (BODC Head, attended the morning of the second day only)

Bob Anderson (Past SSC co-chair)

Laurent Bopp (Data Management Committee member; attended the first day only)

Abby Bull (GEOTRACES data manager)

Greg Cutter (Standards and Intercalibration Committee co-chair)

Gideon Henderson (Past SSC co-chair)

Catherine Jeandel (IPO science director)

Bill Landing (Data Management Committee member; attended the first 2 days only)

Elena Masferrer (IPO executive officer)

Kristin Orians (Past SSC Member)

Sunil Kumar Singh (Data Management Committee member)

Alessandro Tagliabue (Data Management Committee member)

Ed Urban (SCOR)

WEDNESDAY 15 JULY 2015

Introduction

Roger Beckie, head of the University British Columbia (UBC) Earth, Ocean and Atmospheric Sciences Department, welcomed all participants. Dominique Weiss provided an overview of the Pacific Centre for Isotope and Geochemical Research Platform (PCIGR). Kristin Orians (past SSC member) reviewed the history of GEOTRACES in Canada. Finally, Susan Allen, Canadian GEOTRACES biophysical/chemical modeller) described the Canadian GEOTRACES modelling effort.

Ed Boyle thanked the local hosts for organizing the meeting. He welcomed new SSC members: Liping Zhou and Hajime Obata. He thanked Olivier Marchal and Andrew Bowie who are rotating off, and welcomed Bill Landing as a new DMC member and Abby Bull as the new GEOTRACES Data Manager.

National Reports

Australia – Andrew Bowie

Andrew Bowie started his presentation by reviewing all the meetings and workshops attended by Australian GEOTRACES researchers over the past year. They have three major voyages scheduled for the next 12 months: “HEOBI”, “K-axis”, “SOTS-Eddies-CAPRICORN”. They have been very successful with funding this year, with 4 proposals funded (2 research projects, 1 shiptime and 1 logistics proposals). They have published 21 journal articles and 2 special issues. They have new results on the KEOPS II and SIPEX II projects and have submitted the results for the intercalibration exercises for marine particulates led by Phoebe Lam. The new vessel *Investigator* was tested in April 2015.

Bowie then presented two science highlights: (1) Tasman Sea biological response to dust storm events during the austral spring of 2009 (Gabric et al. 2015); (2) FeCycle II GEOTRACES process studies - iron isotope paper published detailing iron isotope fraction during annual spring bloom.

New Zealand – Andrew Bowie (on behalf of Rob Middag)

Andrew Bowie started by reviewing the main meeting and workshops participations: (1) Sylvia Sander co-organised SCOR WG 139 symposium on “Organic Ligands – A Key Control on Trace Metal Biogeochemistry in the Ocean” (Croatia, 7-11 April 2015); (2) Rob Middag co-chaired workshop for new SCOR WG 145 MARCHEMSPEC “Modelling Chemical Speciation in Seawater to Meet 21st Century Needs”. New Zealand scientists participated in the GEOTRACES process study Phantastic II. NIWA/University of Otago Research Centre for Oceanography has acquired a new mobile clean lab.

Brazil – Vanessa Hatje

At the beginning of the year, Brazil conducted the first test of its clean sampling system. Unfortunately, due to bad weather conditions they had difficulty with the system and lot of cable was lost. They are going to test it again in January 2016 and plan to inter-calibrate with French scientists (Geraldine Sarthou).

They have received the new ship *RV Vital*. Unfortunately, it has no capacity for GEOTRACES work. The ship is currently at sea and its main objective is physical oceanography. Vanessa plans to contact the Navy and the Ministry of Science and Technology to get funding for a clean van and sampling system.

The first Brazilian GEOTRACES Meeting was held in March 2015. Seventeen individuals from 7 universities participated. They discussed about the infrastructure demands, training and tools needed and also, identified opportunities to collaborate and share technologies, and decided to write one paper together.

Brazilian scientists have collaborations ongoing with scientists from Argentina (José Luis Esteves) and Chile (Rodrigo Torres, José Luis Iriarte and Peter Croot).

Vanessa will participate in a meeting in October promoting South Atlantic Cooperation in Marine Sciences (South Africa, Argentina, Chile, Uruguay & Brazil). She is trying to incorporate more chemistry in this programme.

A course (Applications Radioisotopes in Coastal and Environmental Sciences) with Bill Burnett (SCOR Visiting Scholar) is planned for July 2015.

The Brazilian Congress on Oceanography will be held on October 22-27, 2016. They would like to organise the 2nd GEOTRACES Brazil Workshop and also a GEOTRACES session with 2 invited speakers (so far, money to invite one is available). Vanessa is also proposing to have a booth.

Canada – Maite Maldonado

Maite Maldonado reviewed the main activities completed this year, including participation of three Canadian researchers to the particulate intercalibration programme; the Line-P cruises (September 2014 and 2015); and participation of Maite in the WG145 and WG139 meetings.

One major programme is the GEOTRACES_CCAR: Biogeochemical and tracer study of a rapidly changing Arctic Ocean. Two meetings to organise the cruise were held in the past year. Maite showed the original plan. The planned crossover station with GEOVIDE was not possible to set, so they decided to collect replicates. The cruise left port on 10 July and will be completed on August 22. The second leg will leave port on September 4 and return on October _____. Maite showed the GEOTRACES stations. She then reviewed the objectives of the cruises, the list of parameters measured and the names of the analysts and their affiliations.

China – Liping Zhou

Two ships are being built in China that will be suitable for GEOTRACES work. One is for Xiamen University (Minhan Dai) and the second one is for the Ocean University of China. The Xiamen ship is scheduled to be delivered in the next year. There is still some need for funding. The ship will have clean sampling capabilities.

They plan to complete a cruise (along GP06) with Japan with *RV Dongfanghong* from October 19 to November 2, 2015. The chief scientists will be Jinglin Ren, Meixun Zhao and Minhan Dai. China has also undertaken two other cruises, one to look at “East Asian dust event and geochemical behaviour of particle active nuclides in Northwest Pacific” and another to look at “Radium isotopes and salinity”.

Zhou also presented several Chinese research activities, including Ra/Th disequilibrium: benthic flux of dissolved inorganic carbon into the Pearl River estuary (also Yangtze river); ^{228}Ra in the water column estimation of nutrient fluxes via submarine groundwater discharge into the Sanggou Bay; concentrations and fluxes of uranium in two major Chinese Rivers: the Changjiang River and the Huanghe River; non-traditional isotopes (Si and Ba) in the East China Sea; seawater DI^{14}C sampling stations in 2013 and 2014 (they have done some 3-D scenes about distribution of seawater DIC below 1000m in the northeast SCS; they have also a cruise funded to study DIC radiocarbon measurements at two reoccupation sites in Indian Ocean).

One important issue in China is that the government agencies do not view ocean chemistry as having high priority. Liping and other Chinese colleagues are making special efforts to get support from multiple sources. Another debate in China is whether they should focus on process studies or on sections. Also, because of the lack of expertise they would like to be able to collaborate and participate in other international cruises. They are interested in having more short and focused training opportunities for their students and researchers.

Because ocean chemistry is not a high priority for the funding agencies, it is difficult to encourage young scientists to do GEOTRACES work as they move to research lines that are more supported.

Questions:

Olivier Marchal – He asked whether SCOR has funding available for Chinese students to study abroad. Ed Urban reviewed the SCOR capacity building programme that includes funding for cruise participation and also for scientists to teach on development countries, which would include Chinese students.

France - Geraldine Sarthou

Geraldine Sarthou started her presentation describing the KEOPS 2 cruise that took place in 2011. From this cruise 44 articles were published. Also a special issue will be published in *Biogeosciences* with 33 papers. She then showed results from this cruise and also reported preliminary results from the GEOVIDE cruise.

In addition to these publications, 5 PhDs have been completed using GEOTRACES data. French scientists participated in 11 conferences with a total 28 presentations. They are

involved in the organization of 3 international conferences (Goldschmidt, GEOTRACES Royal Society Workshop and Ocean Science 2016).

In terms of future cruises, as reported by Vanessa, French scientists will be involved in the Brazilian GEOBRAMA cruise helping setting up the clean rosette. They are also involved in the German Arctic TransArc-II cruise.

Germany – Reiner Schlitzer

Reiner Schlitzer presented the report prepared by Katharina Pahnke, who was not able to attend the meeting. He started the presentation by showing some highlights of two papers published recently. Germany will be very active in cruises in the coming years, including the Arctic cruise leaving in August (and a second one next year); the GA08 cruise leaving in autumn 2015; the GI05 in the Indian Ocean planned for 2017, and also a process study foreseen for late 2015.

In terms of participation in GEOTRACES committees, there are two German members in the S&I committee, one SSC member and one SSC co-chair. Also, Lars-Eric ___ and Daniel Cossa coordinated the 2014 Hg intercalibration efforts.

One important task has been for Reiner to prepare version 2 of the IDP2014 and also to coordinate the IDP2014 publication in *Marine Chemistry*.

Reiner announced that GEOMAR received a winch (LEBUS) for their GO-FLO rosette, completing the acquisition of a trace metal-clean sampling system.

Reiner finished his presentation by informing meeting participants about a GEOTRACES study recently published in *Nature* that made the cover of the journal.

Resing, J., Sedwick, P.N., German, C.R., Jenkins, W.J., Moffett, J.W., Sohst, B.M., & Tagliabue, A. (2015). Basin-scale transport of hydrothermal dissolved metals across the South Pacific Ocean. *Nature*, 523(7559), 200–203. doi:10.1038/nature14577

India – Sunil Kumar Singh

Sunil Kumar Singh showed a map of completed cruise tracks from the Indian field programme. The initial programme was more ambitious, but due to weather conditions and other difficulties encountered they were not able to sample all the stations. However, they were able to do a crossover with Japan. Sunil followed by showing results from these cruises including distribution of epsilon neodymium in the Arabian Sea water column; and upper ocean carbon export using $^{210}\text{Po}/^{210}\text{Pb}$ disequilibrium.

Action: Sunil to send to Ken Bruland the results from the analysis of GEOTRACES reference samples.

Japan – Hajime Obata

Hajime Obata started his presentation reporting the Japanese scientific meetings related to GEOTRACES. There was a GEOTRACES session at the Annual Meeting of GSI 2014 on 16

Sept. in Toyama. In addition, GEOTRACES Japan will be strongly involved in the Goldschmidt 2016 conference to be held in Japan.

They completed the KH-14-6 (GP19) cruise from 2 December 2014 to 26 February 2015, with stations each 5 degrees and 2 crossover stations with Australia (GP13). They also had another non-GEOTRACES cruise. The cruise KH-15-3 biogeochemical study in the East China Sea is planned for October 2015 with Jing Zhang as the chief scientist. In terms of future planned cruises (2016-2018), they would like to repeat GP02 section (KH-17-1 cruise), tentatively planned for 23 June-7 August 2017 (Tokyo to Vancouver) with Hajime Obata as chief scientist.

Japanese scientists published 30 GEOTRACES-related papers in the past year. Hajime presented science highlights from two publications.

In terms of funding they have a grant from 2011 to 2015, so they have to submit a new proposal for the coming years. Some researchers got individual funding so activities can continue.

For GP03, the cruise time is funded but not yet the science.

Questions:

Greg Cutter – He wanted to know whether they plan to cover all key TEIs during the GP03 cruise. Hajime responded that they plan to cover all key TEIs.

Gideon Henderson – He reminded that in case of having issues to cover a parameter Japanese scientists can ask for international collaboration.

Netherlands – Micha Rijkenberg

Micha Rijkenberg explained that the work during the past year focused on (1) the compilation and analysis of the data collected in the West Atlantic and in the Med Black Sea cruise; (2) preparing the *Polarstern* cruise in the Arctic; (3) preparing for the GRIFF cruise for 2016; (4) participating in “DustTraffic” (cruise opportunity); and (5) finalizing the work on Rothera.

Dutch GEOTRACES scientists have done 17 presentations in international conferences, had 1 PhD thesis completed and published 15 articles (2 more submitted).

There will be several contributions to future GEOTRACES cruises, including Arctic GN04 (TransArc-II) and GN05 (GRIFF) cruises, and ViciFe process studies. The TransArc-II cruise did not obtain Russian permission to sample in Russian EEZ waters so they have to take an alternative cruise track. Resources and facilities are stretched by concurrent cruises (the Arctic cruises and ViciFe process study). The NIOZ sampling system will be on board the ViciFe process studies, so they cannot use it for the Arctic cruises.

Micha presented scientific highlights on “Organic complexation of Fe in the West Atlantic”.

He finished his presentation by reviewing the cruise opportunity Dust traffic III. Patrick Lam measured Fe, Zn, Ni, Cd, Pb, Mn and calibrated sensor data and nutrients. He showed preliminary results, for example “Low oxygen high Fe zone spanning the equatorial Atlantic”. There is a crossover station with GA02.

Action: Micha to send coordinates of the Dust Traffic III cruise to Maeve to investigate further possible crossover stations.

Questions:

Reiner – He asked whether Dust Traffic III could be included as compliant data. Micha answered that this was possible. He added that these data could be ready for the IDP2017.

Russia – Ed Boyle

Ed Boyle presented on behalf of Ludmila Demina. The presentation showed science highlights from Russian researchers, for example, distribution of particulate organic carbon (POC) isotopic composition at the transect from the Yenisei estuary to the Kara Sea; trace metal speciation in the surface bottom sediments of the subarctic semi-enclosed White Sea; and geochemical indicators of paleo-typhoons in shelf sediments of the Amur Bay, Sea of Japan.

Russian scientists have published 21 GEOTRACES-related papers and participated in 3 international conferences, where they have made around 30 presentations. Ludmila presented “GEOTRACES highlights in the Indian Ocean and plans for the future the IDP2014” at the 26th IUGG General Assembly in Prague (22 June- 2 July 2015).

Ed Boyle reviewed all the Russian cruises completed in the past year or planned. In 2016, there is an international multidisciplinary expedition in the Arctic Ocean (RV “*Academik Lavrent'yev*”) where participants from other nations are welcomed.

Russian scientists obtained financial support for 15 projects related to GEOTRACES objective, as well as 2 initiative projects from the recently organised Russian Scientific Foundation (www.rscf.ru). Among the aims of these projects, the Northern Atlantic Ocean, Barents and Kara Seas will be sampled in July-September 2015.

South Africa – Alakendra Roychoudhury

Alakendra Roychoudhury reported that they have received good news: an Antarctic Polar Research Institute is being established and he believes this will encourage oceanography work.

They had a cruise last summer, but due to bad weather they lost part of the equipment and data. They completed 10 stations measuring trace metals.

They are developing new capabilities that includes the acquisition of a new pico-Fast[®] system for pre-concentration of seawater. Validations are on-going.

Other work includes incubation experiments to compare Fe and light limitation.

3 publications have been published and 4 proposals have been funded.

Spain – Jordi Garcia-Orellana

Jordi Garcia-Orellana made an effort to contact other researchers in Spain working on trace metals. 5 research teams were identified (UAB-Barcelona, Cádiz-CSIC, Vigo-CSIC, Canarias-ULPGC and UIB-Mallorca), but the community is pretty small. Pere Masqué from UAB has moved to Australia to work with sediment research mainly. In Las Canarias, J.M. Santana-Casiano and M. González-Dávila work on iron and Langlera is focused on ligands.

As far as UAB-Barcelona, most of the activities on the past year have focused on the GEOTRACES Med cruise, where most of the analyses are completed, some already published.

Jordi made a presentation of GEOTRACES and the IDP2014 at the Ocean Research Meeting on November 2014 in Barcelona where many EU stakeholders were present. Most of the people who attended the talk were impressed by the success of GEOTRACES.

Spanish scientists have participated in the GEOVIDE cruise and plan to participate in the Arctic cruises. They also participated in the post-cruise MedBlack cruise meeting and the preparation meeting for TransArc II, and will participate in a Fukushima expedition.

There is a positive change in Spain regarding funding; they got 4 GEOTRACES-related projects funded. 2 PhD theses were completed (V. Rodellas and Clara Almécija-Pereda). They published 18 papers and made 23 presentations in several international meetings.

Jordi then presented some science highlights, including distribution of $^{236}\text{U}/^{238}\text{U}$ in the Mediterranean Sea; Submarine Groundwater Discharge from Ra-228 into the entire Mediterranean Sea; and showed the first profiles of ^{231}Pa , ^{230}Th and ^{232}Th in the Mediterranean Sea (unpublished work).

Questions:

Catherine Jeandel – She wanted to know if Jordi is in contact with the scientists in Vigo that participated in the GEOVIDE cruise. Jordi answered that he knows them, but that they are more focused on ocean acidification.

Sweden – David Turner

David Turner started the presentation by explaining that Per Anderson has now rotated off the S&I Committee. However, he participated in the S&I meeting in January 2015.

Per Anderson has managed to include his project in the GN04 cruise in the Arctic.

David is working on setting up SCOR WG 145 on Modelling Chemical Speciation in Seawater to Meet 21st Century Needs (MARCHEMSPEC), which is related to GEOTRACES.

Taiwan – Tung-Yuan Ho

Tung-Yuan Ho reminded meeting participants about the Taiwan Ocean Research Institute (TORI) cruise that sank last year and had some words for the colleagues that passed away.

TORI has now ordered 2 new research vessels. A 2000-ton new RV will be delivered at the end of 2016, but Tung-Yuan is unsure whether it will be useable for GEOTRACES research. Another vessel will be constructed and delivered in 2018. This will include trace metal-clean equipment.

Work this year has focused on the seasonal variation of aerosol deposition (winter-spring). Tung-Yuan showed some results from his work. He has received 5-year funding (2015-2019) from Academia Sinica to study trace metal-nitrogen fixation interaction in marine diazotrophs and will visit UC Santa Cruz in November for 8 months. His group will join the Japanese GEOTRACES cruise in ECS and WPS. The Council of Marine Affairs, including 3 major agencies, has been established, which should be positive for GEOTRACES.

Two new researchers have joined the Taiwanese GEOTRACES community: Kuo-Fang (Denner) Huang and Haojia (Abby) Ren.

UK – Maeve Lohan

Maeve Lohan reviewed the main UK GEOTRACES activities. UK GEOTRACES scientists have participated in several meetings and given several presentations. They have 14 journal articles published, and 6 more submitted. In addition, the SCOR WG 139 special issue is published. 3 PhDs have been completed. They have submitted the results for the particles' intercalibration.

As far as cruises, the Shelf Sea (process study) cruise is currently on-going. Unfortunately, the RidgeMix proposal (GEOTRACES process study) was not approved, but it will be resubmitted this year. They got the ZIPLOC (Zinc Iron and Phosphorus co-Limitation in the Ocean) funded so next year they will apply to GEOTRACES for this to be a process study.

Gideon has organised the Royal Society meeting and workshop.

Maeve showed some science highlights from UK work, including the impact of hydrothermal iron and some preliminary results from the Shelf Sea cruise iron biogeochemistry.

As far as new capabilities, the new Polar ice-strengthened ship will be operational in 2019. It will have trace metal-clean operations. A new conducting Kevlar winch has been installed on the *RSS Discovery* and another winch will be on the *RSS Cook*.

US – Bob Anderson

Bob Anderson described the main US GEOTRACES activities regarding the main expeditions:

- (1) Atlantic (GA03): had a special issue of *Deep-Sea Research-2* issue published.
- (2) Pacific (GP16): had high visibility, with a paper published in *Nature* including a GEOTRACES figure on the cover.
- (3) Arctic (GN01): *Healy* will be loaded in Seattle on 15-18 June.

The U.S. GEOTRACES project office proposal was funded for 3 years. Bob can no longer serve as the U.S. GEOTRACES SSC chair and project office senior scientist, so Bill Jenkins will replace Bob as the U.S. GEOTRACES SSC chair.

Bob then presented the forthcoming Arctic cruise. It will start on August 9. There were 27 science and 3 management proposals funded. It is funded by the Chemical Oceanography and the Arctic Natural Systems Programmes from NSF. It will crossover with the German GN04 cruise. The goals of the cruise were reviewed.

As far as publications, the North Atlantic transect (GA03) resulted in 37 publications to date, from which 25 are included in the *DSR-II* Special Issue. Overall, in the last 12 months, 44 publications appeared in print.

Bob encouraged all SSC members to develop high-profile publications.

He then reviewed the U.S. GEOTRACES outreach initiatives:

- A webinar series was developed by Ben Twining, consisting of 4 webinars. All the presentations are available on-line on the GEOTRACES website.
- The U.S. GEOTRACES Arctic cruise (GN01) has an outreach programme coordinated by Bill Landing. It includes (1) presentation by Ana Aguilar-Islas (Univ. Alaska.) at the 2015 Kawerak Regional Conference in Nome, Alaska (1-4 June 2015); (2) one Teacher-at-Sea (programme sponsored by PolarTrec) will participate on the cruise and maintain a blog; (3) “Float Your Boat” outreach programme, where youth will have the opportunity to prepare pre-cut toy boat hulls (planned 1,300) for deployment as an ocean drifter and learn about polar currents and polar research.

Bob finished by describing the future cruise plans approved by the U.S. SSC. They would like to undertake GP15 (in 2018, chief scientists: Greg Cutter, Karen Casciotti and Phoebe Lam) and GP17 (in 2020), both contingent on funding.

Question: About the future of NSF funding for GEOTRACES activities. Bob believes that the NSF policy is that as long as that GEOTRACES produces exciting science it will continue receiving funding.

Other countries

Geraldine Sarthou pointed out that some researchers from Portugal were involved in GEOVIDE.

Micha informed that someone from Tunisia (Adadi Aymen) worked on sediment water fluxes in the Mediterranean programme and SCOR supported his participation in the cruise and in the post-cruise meeting. Micha has contacts with someone in Turkey as well.

Biogeotraces – Maite Maldonado

Maite Maldonado started by presenting ulie LaRoche’s paper published in the GA03 *DSR-II* Special Issue. She then reviewed the information received from BioGEOTRACES labs. She noted that the Chisholm lab and LaRoche lab are the historical labs working with BioGEOTRACES, but she believes that Mak Saito is doing an important job in pushing the programme.

Chisholm lab: They secured funding for metagenomic sequencing on all of the GEOTRACES samples. They are sequencing now.

LaRoche Lab: French GEOVIDE cruise samples are partially analysed. Julie was a late addition to the Arctic Canadian cruise.

Mak Saito is pushing proteomics.

Maite is updating an Excel file of all the bioGEOTRACES data that are being collected on cruises. This file is available on the biological parameters webpage of the GEOTRACES website (see: <http://www.geotraces.org/science/biological-parameters>).

Maite chaired a BioGEOTRACES session at the ASLO meeting in February 2015.

Maite and Philip Boyd want to encourage more discussion among bioGEOTRACES people so they plan to put together a special issue in *Biogeosciences*. They want to capture the wide range of BioGEOTRACES activities on GEOTRACES voyages and also provide a valuable repository. Some researchers have already confirmed their interest in such a special issue

What limits BioGEOTRACES research is the sampling. A new sampling system (Clio) has been developed by Chip Breier (WHOI). The design is completed and the construction is beginning. It will allow particulate metal and -omics samples (with preservation) to be collected simultaneously at each depth. It will not require additional ship-time since it is deployed at the same time as the rosette.

In the past, it was agreed for three parameter groups to be included in GDAC: HPLC pigments, flow cytometry data, and gene copy numbers.

In order to get data from national research into GDAC, Maite realised that she needs a representative in each country. She has identified a list of possible national representatives and asked SSC members for help in identifying other representatives. However, since she is experiencing problems in getting data, Maite proposed to task 2 persons (Mak Saito and Julie LaRoche) to submit their data and publicize that they are submitting data, to appeal to others to submit the data.

Reiner – He reminded participants that the IDP2014 was possible because there was a core of persons pushing it, so he agreed with Maite's approach. However, the question whether bioGEOTRACES data should be included in the IDP2017 or in a separate database still needs to be discussed.

Gideon - He asked about the nature of the data. Maite suggested including the 3 parameter groups agreed last year, that is, HPLC pigments, flow cytometry data, and gene copy numbers.

Reiner- He suggested establishing a working group to identify the data available and that should be useful to have in GDAC. He also suggested identifying who shall participate in this meeting during the SSC meeting.

Andrew – He asked about the intercalibration of BioGEOTRACES data. Maite explained that Julie LaRoche and Pen Chrisholm have started to talk about intercalibration in the terms of exchanging samples, but this is as far they have gone. Phoebe mentioned that Mak Saito pointed out issues in calibration of the parameters.

Reiner - He asked for details about the nature of the data. Maite explained that there are 3 types or levels: (1) presence of a gene or not; (2) expression of the gene or not; (3) protein level – number of proteins present.

Gideon – He proposed to establish a group that prioritizes the parameters. Bob noted the risk of loss of bioGEOTRACES data that are not included in the IDP (in the future someone might be interested by a parameter that it is not included in the IDP). Access to data not included in the IDP should be ensured.

Action: Maite Maldonado to organise a BioGEOTRACES workshop including GEOTRACES and BioGEOTRACES researchers and also GDAC, to decide how to prepare a subset of BioGEOTRACES data for the next IDP.

Catherine - She suggested that after the workshop BioGEOTRACES might consider submitting a SCOR WG proposal that includes scientists from the TARA project.

Gideon – He congratulated and thanked Maite for the work done. He also asked about the third original BioGEOTRACES group: Herndl lab. Maite answered that she has never received an answer from him.

Reiner – He pointed out that another possibility is for BioGEOTRACES to create a new programme in the future.

International Partnership Issues

Report on progress of SCOR WG 139 on Organic Ligands – A Key Control on Trace Metal Biogeochemistry in the Ocean – Maeve Lohan

Maeve noted that this would be the last time she presents a report from this working group since its work has now been completed.

The group has published a special issue in *Marine Chemistry* that includes 28 papers. She reviewed the different topics included in the papers.

They had a training workshop with 20 people in Croatia. It lasted 3 days and included 51 students and professors with 10 invited talks and 10 student talks. Maeve thanked Ed Urban and SCOR for funding the workshop.

Future plans include the preparation of a special issue in *Frontiers of Marine Science* (topic editors: Kristen Buck, Maeve Lohan, Ivanka Pizeta, Christel Hassler, Sylvia Sander). They chose this journal because Eric Achterberg is the editor. They also want to publish a “best practice” manual to cover sample collection through data analyses. It will include a section on organic geochemistry collecting samples for identification of ligands.

In terms of field intercalibration, 88 samples from the Gulf Mexico were collected and distributed. In the Southern Ocean, samples will be collected by the German cruise (Sept 2016) and possibly by the Southern Ocean cruise lead by Philip Boyd.

Report on progress of SCOR WG 145 on Modelling Chemical Speciation in Seawater to Meet 21st Century Needs (MARCHEMSPEC) – David Turner

This working group has just started. David reviewed the terms of reference of the group. (1) International agreement on a trace metal speciation model – they will first make a review of what is available and identify the gaps. (2) A modelling tool that will make chemical

speciation calculations easily accessible for a wide range of applications in oceanography research and teaching, and thus improve understanding and spread best practice in modelling;
(3) Implement the web-based tool for chemical speciation calculations.

The group had its first meeting in Sibenik, Croatia (12-13 April, 2015) where it drafted the scope of the model with priorities. They also made an internal review of existing user interfaces and investigated sources for additional funding.

David showed the draft scope for the WG. He also explained the group's communication plan. The main aim is getting feedback on the draft scope. They had a poster accepted at the SOLAS Open Science Conference and plan to have a Session and a Town Hall at Ocean Sciences 2016.

Also some articles are planned (*IUPAC Chemistry International*, *Eos*, *Elements*, *Frontiers in Marine Biogeochemistry*). A website is available: <http://neon.otago.ac.nz/research/scor145/index.html>

Report on progress of SCOR WG 146 on Radioactivity in the Ocean, 5 Decades Later (RiO5) – Ed Urban

Ed Urban presented on behalf of Ken Buesseler and Minhan Dai. He firstly noted that the working groups are possible thanks to the enthusiasm of the scientists involved. He especially thanked Maeve Lohan in relation to her work with WG 139.

WG 146 has a nice balance of regional coverage. It has been developed in response to the Fukushima nuclear disaster, and the need to communicate information to the public about radioactivity in the ocean. The group has already a website: <http://www.whoi.edu/CMER/rio5-working-group>.

Ed U. presented the terms of reference of the WG. They are proposing to have a workshop to bring together different stakeholders. He then showed a message from Ken Buesseler that said: “we do want to coordinate at some point with Paul Morris, Michio Aoyama and Reiner, on getting GEOTRACES radiochemistry data into merged data sets”.

Questions:

Reiner – He asked whether artificial radionuclides are relevant for GEOTRACES. The answer was that not all are relevant. Phoebe pointed out that Ken Buesseler was suggesting for the data to flow from GEOTRACES to WG146 and not at the other way around.

International Project Office – Catherine Jeandel and Elena Masferrer

Elena Masferrer has a permanent position at University Paul Sabatier, after a long process. However, this permanent position is strongly dependent on the funds raised by GEOTRACES to support the budget supporting Elena's salary. This underlines again the need for all of the countries to contribute to the collective GEOTRACES effort.

IPO outreach products include the GEOTRACES website, Mailing lists, Brochures, Posters, eNewsletter, Facebook and Twitter, Outreach resources in a library and in a devoted website and 3 databases (publications, researchers' analytical competences and PhD and Master dissertations).

The GEOTRACES website is updated 3 times each year, and undergoes a major revision every 2 years when Joomla is released in a new version. It was a huge effort to re-do the website in April-June 2015.

New website features include major visibility of GEOTRACES products, a new page devoted to Outreach and strengthened links to GDAC. Elena gave a live demo of the website.

Gideon noted that www.geotraces.org is not listed in the first position when making a search on Google.

Action: Elena to get www.geotraces.org back to the first position in Google and other search engines.

Elena urged everyone to submit news (meetings, publications, science highlights) to the IPO. In the future, only one new item will be distributed at the departure of each cruise.

14 eNewsletter issues have been published, 218 likes on Facebook and GEOTRACES has 78 Twitter followers.

Ludmila Demina presented a talk at the IUGG General Assembly in Prague and Gideon will present a poster on Monday 17 August at Goldschmidt 2015. Also, a contribution has been published in the SOLAS Newsletter and a presentation about GEOTRACES has been done at IMBER SSC meeting by Ed Urban.

Catherine emphasized the need to receive all outreach information for the new web page devoted to Outreach: www.geotraces.org/outreach. A GEOVIDE video was viewed.

In addition, Catherine has approached Fiamma Luzzatti to include a cartoon about GEOTRACES in *Le Monde*.

Action: SSC members to send to the IPO outreach and educational materials that can be used to publicize GEOTRACES.

There are 120 registered analysts in the database. There are 545 papers and 21 PhD dissertations in Mendeley's database.

Ed Urban – He announced that SCOR intends to have a booth at Ocean Sciences 2016. Catherine recommended including again a screen to display 3-D scenes.

So far, no national report has been received from Greece, Israel, Mexico (no work) and Korea.

The IPO suggest preparing a form to submit request for approval of process studies Agreed.

Action: Elena to work with Abby to put together a form for request for process studies.

Action: SSC members to respond to S&I request for information about people who claim analytical expertise for the analytical database; it is important that SSC members respond.

GEOTRACES Publications

IDP2014 Paper in *Marine Chemistry* published - Reiner Schlitzer

The IDP2014 paper is now in press. AWI paid for the open access. Elsevier promised that all the authors in the paper would receive citations.

Recent published GEOTRACES Special Issues

2011 Data-Model Workshop's Special Issue – Catherine Jeandel

Catherine explained that the papers are now available in *Progress in Oceanography*. The special issue includes 9 papers and it is edited by Catherine Jeandel, Olivier Marchal, Phoebe J. Lam and Robert F. Anderson. Catherine thanked Phoebe, Olivier and Bob for all their efforts in preparing this issue.

Deep Sea Research II Special Issue – Ed Boyle

Ed Boyle informed participants that the GA03 special issue on *Deep Sea Research II (DSR-II)* is now published. There was a hang-up in the production at Elsevier that delayed publication by a few months.

Future special issues:

KEOPS-II – Andrew Bowie

32 Papers published in *Biogeosciences*, volume 11. Available at:
http://www.biogeosciences.net/special_issue164.html

SIPEX-II – Andrew Bowie

A special issue about the SIPEX-II will be published in *Deep-Sea Research II* at the end of 2-15. It will include 19 papers.

Marine Chemistry – Alessandro Tagliabue

This special issue in *Marine Chemistry* derives from a session at Ocean Sciences 2014. The review process is now completed. They got 23 submissions in total. From these, 17 papers were accepted, 4 rejected and 2 withdrawn.

BioGEOTRACES – Maite Maldonado

This was already mentioned during the BioGEOTRACES presentation. They are gathering persons interested to publish a special issue in *Biogeosciences* (so far 10 people already interested). At this point they have not yet contacted the journal.

International Union of Pure and Applied Chemistry. IUPAC's Chemistry International – David Turner

This was an action item from last year. They decided to wait until the IDP paper was published so that they could include the complete reference and DOI. The paper was completed on Friday 10 July and they got accepted the day before the SSC meeting starts (15 July). David will send the link to IPO to put it on the site.

Action: David Turner to send the link to the IUPAC's paper to the IPO.

New Scientist – Alessandro Tagliabue

This was an action item from last SSC meeting also. Alessandro tried to approach the editors of *New Scientist*, but he was not successful. The problem is that there are no direct contacts on the website, only a contact form. He did send to this address, but never received an answer.

Action: Gideon to contact the person that was involved with *New Scientist* to see if he can help in approaching the journal.

Bill Landing suggested proposing that *Chemical and Engineering News* (American Chemical Society) write an article about GEOTRACES, to follow up on the article they published in 2008.

Action: Bill Landing to approach *Chemical and Engineering news* to see if they are interested in writing a follow-up article about GEOTRACES.

GEOTRACES Regional Activities

Latin American coordination – Vanessa Hatje

Vanessa contacted 25 participants of the Latin American workshop, but she got very few responses, mainly from Argentina and Chile. Those from Argentina were mainly people working on submarine groundwater discharge (SGD). The lack of interest is probably because there is no funding for TEI research.

Gideon suggested that the best approach might be to focus nationally; if Brazil shows some success, then it may be appeal other nations. Chile might be one target in the future (they are doing copper and iron measurements).

Alessandro noted that he has been in contact with a dust modeller in Chile (Fabrice Lambert: lambert@uc.cl) who could be interested in joining GEOTRACES. Alessandro also provided contact details of a French colleague working currently in Chile (Italo Masotti <italo.masotti@uv.cl>). He is not directly involved in GEOTRACES, but is a marine biogeochemist, so Alessandro believes it would be worth contacting him.

Vanessa will invite all the Latin American contacts to participate in the 2nd GEOTRACES Brazil meeting.

Asian Coordination – Hajime Obata

Hajime showed the cruise track for an international joint cruise involving Japan-China, along GP06. There will be participants from Japan and China, but also from Taiwan, Korea, Rep. Indonesia, Republic of Mozambique and also from Singapore (Ed Boyle's lab).

They need help with measurements of ^{230}Th and ^{231}Pa .

They plan to make an international crossover in the Pacific Ocean and a semi-cross station in the western end of GP06.

Sunil Kumar Singh (India) will visit Japan and also Pinghe Cai (China) plans to collaborate with Japan. Korea expressed interest in collaborating as well; they are getting a new ship with a trace metal-clean sampling system.

Catherine – She reminded participants that when a crossover station is not possible, then replicate samples are required.

European Coordination – Catherine Jeandel

Catherine explained that the IPO is monitoring calls for proposals that may help to coordinate GEOTRACES research. So far, the only option is the Marie Skłodowska-Curie's Innovative Training Network (ITN) programme.

Alessandro Tagliabue explained that there are discussions on-going about putting together an ITN in modelling. Laurent will help in giving examples of a successful ITN. Alessandro would review and decide whether he submits one or not. Gideon and Jordi mentioned the fact that the ITN requires the participation from private companies.

Action: Alessandro to explore the possibility to prepare a Marie Skłodowska-Curie's Innovative Training Network (ITN) proposal.

Elena – She pointed out that GEOTRACES needs to start lobbying now if we want to have an European Horizon 2020 call by 2018 that is relevant for GEOTRACES.

Olivier – He suggested heavy metal pollution as a topic of interest. Gideon found an article on managing mining of the deep seabed in the 10 July issue of *Science*: <http://www.sciencemag.org/content/349/6244/144>.

Budget – Ed Urban

Ed Urban reported that GEOTRACES has currently funding from two NSF grants since there was money left over from 2012 NSF grant that can be still used.

The annual budget is 78kUSD for the SSC, 110kUSD for GDAC and 50kUSD for the IPO. Ed U. thanked all the IPO funding contributors, NSF, GEOMAR, AWI and CNRS/UPS. He explained that Jing Zhang had announced a contribution of 5kUSD from Japan. There are also other additional 19kUSD to be added.

Ed U. then showed a slide of the expenses: GDAC cost is 130kUSD per year, including salaries, and some funding money for computer and other services. The IPO budget is 77kUSD. SSC meeting is 45kUSD per year, and S&I meetings cost is 15kUSD.

The new grant includes 8 months of 2018 funding, so if no new funds are provided, SCOR could probably cover GDAC and IPO through 2018.

Ed U. proposed to review the budget items to allocate the funding for each meeting:

1. S&I meeting – 15kUS
2. DMC and S&I meetings – There will be a combined DMC and S&I meeting in 2016, so it necessary that enough funding is allocated. There will be 1 DMC, 2 S&I and 1 joint DMC and S&I. There is a need to add other 15kUSD for the joint DMC and S&I meeting.
3. OCB – A meeting will be held next year with OCB. There is 15kUSD for the OCB meeting in the budget. Is it necessary? Bob is hoping for this money not to be necessary, since OCB will cover part of the costs. Decision was to keep it in the budget for now.
4. Data-Model Synthesis Meeting – Gideon believes that there will be a workshop in 2018, but it might not be named Data-Model.
5. Royal Society Meeting – The budget includes 20kUSD for this meeting.
6. Indian Ocean Workshop – Catherine believes it is not necessary anymore. Should be removed from the budget.

Other events?

As agreed during the BioGEOTRACES discussion, a BioGEOTRACES meeting is planned, so 15kUSD should be included, as well (8 participants). There should 10kUSD for the launch of the IDP2017.

There is also the joint PAGES workshop. NSF (Candace Major) is interested in this workshop, so funding might be available from NSF for it.

Action: Ed Urban to update the budget as follows: remove Indian Ocean Workshop, add for 10kUSD for the joint DMC and S&I; add 10kUSD for IDP2017 launch; and 15kUSD for the BioGEOTRACES workshop.

Elena and Ed Urban had been working on updating an Excel file about “national funding contribution to the GEOTRACES Programme”. He showed a graphic that showed that the percentage of NSF funding has been increasing (in 2015 is more than 80%), and noted the risk of being so dependent from NSF funding.

Catherine – She pointed that France is providing office space for free to the IPO.

Action: Ed Urban to add the cost of the IPO office space as an “in kind” contribution.

THURSDAY 16 JULY 2015

Reiner Schlitzer explained that the agenda has been rearranged so that “Data Management” will be presented before “Standards and Intercalibration”.

Data Management

Report from GDAC activities – Abby Bull

Reiner warmly welcomed Abby Bull as new GEOTRACES Data Manager. Abby explained that she took over Ed Mawji’s position in February 2015. She introduced her background and reviewed her responsibilities at GDAC.

Then, Reiner introduced Graham Allen, who is the new director of BODC since August 2014. Graham attended the DMC meeting held prior the SSC meeting. Reiner mentioned that it has been very important to have Graham attending the DMC meeting to strengthen relations.

Abby reviewed the transition and training period. She explained that the transition was done in 2 weeks. During this time, Ed and Abby addressed DMC/SSC action items, creation of maps; entry of cruises to the GDAC programme; data tracking; SSC/DMC/GEOTRACES contacts; SCOR Report and; review of the process for IDP2014.

In the past year, Abby has completed several meetings and visits. (1) She visited the GEOTRACES IPO, where she met Catherine and Elena, but also Catherine Schmechtig, the French Data manager (2) Abby visited Reiner in Bremen, where they discussed version 2 of the 2014 IDP, the GDAC website’s interactive map, IDP parameter codes, and preparations for the 2017 IDP. Abby noted that this meeting was useful for identifying priorities. (3) Abby has regular meetings with Alessandro Tagliabue in Liverpool. (4) Cyndy Chandler (U.S. BCO-DMO) went to Liverpool, and Graham and Abby visited Chandler at WHOI to establish close working relations. In the future, Abby would like to visit Japanese colleagues. A good relationship with the IPO, with regular contact, is established.

Data tracking: Abby emphasized the value of the pre-cruise metadata forms for tracking data. She has been tracking outstanding metadata/data for ingestion into GDAC. She explained that DMC decided for Abby to send the pre-cruise metadata form as soon as the cruise is funded and the post-cruise metadata form as soon as the cruise has finalised.

Abby announced that BODC agreed to put extra resources to help her whenever there is a peak of work, but also during her absences. Two people will help: one will mainly help Abby in name assigning (Rob Thomas) and the second person (Lisa Marsh) will help on data processing.

Abby reported that the DMC decided that the GDAC delivery data page will deliver IDP2014 data only. In regard of the IDP2014, one important task completed was to update the IDP2014 page to include its version 2.

Abby then presented the IDP data download statistics: 211 unique downloads for version 1 and 41 downloads for version 2. The most popular download format is ODV, followed by Excel. She showed the number of people from each country that had downloaded data: the U.S. is in the first position.

Abby ended her presentation by showing the list of her achievements since she started in the role and by reminding SSC members on the importance of providing data and metadata in a timely manner.

Questions:

Reiner - He emphasized that national representatives have an important role in helping Abby to chase data.

Ed Urban – He asked whether a document explaining the GEOTRACES requirements and especially data management requirements is sent to chief scientists. He believes that in the past GEOTRACES had developed a document detailing data management requirements. Maeve noted that S&I Committee does send the S&I procedures to chief scientists.

It was noticed that no one is sending chief scientists of GEOTRACES cruises reminders about data submission. Bob Anderson noted that in the past a letter was being sent. He provided DMC and S&I co-chairs (as well as GDAC and IPO) a draft letter from 2009.

Action: DMC co-chairs and Abby to prepare a brief cover letter informing chief scientists of the data management requirements and, specially, the need to compile data expected from their cruise.

Maite - She proposed removing from the pre-cruise metadata form the information on the calibration for each parameter. Abby agreed and explained that during the DMC meeting it was agreed for this form to be simplified.

Reiner – He mentioned that DMC and S&I should not each contact the chief scientist to request similar information. He proposed to unify their requests. Agreed.

Decision: DMC and S&I cruise requirements communications to cruise chief scientists should be unified. Abby to provide the S&I procedures along with the pre-metadata cruise form.

Action: Abby and Maeve to work together to unify and streamline requests to chief scientists (e.g. Abby to provide the S&I procedures at the same time as the pre-metadata cruise form).

Report on DMC Meeting – Andrew Bowie and Alessandro Tagliabue

Andrew started the presentation by reviewing DMC membership. There are 2 new members: Bill Landing and Abby Bull (GDAC). Also Graham Allen (Head of BODC) participated in the meeting and this has been very important to improve linkages to BODC.

Andrew then reviewed the main outcomes of the meeting:

- The cruise section policy has been reviewed: the pre-metadata form has been reinstated, as it contains important information for GDAC and the S&I.
- A comprehensive review of the status of the data for each basin was done. This included section cruises, but also process studies and compliant data. Andrew reported that a discussion was held about including CLIVAR data in the IDP2017 as compliant data (this was a proposal from Bill Landing).
- Process studies: Dynalife existed as IPY and process studies; after reviewing this, it has been decided to be a process study.

Decision: SSC members agreed for Dynalife cruise to be designed as process study instead of section cruise.

- A decision was taken to make the IDP a holistic product; data will not be in different files or products; there will be in the unique product (e.g. process studies will not be as a separate file).
- Reiner will make the decision on which images to include in eGEOTRACES.
- DMC discussed gridded products and decided that GEOTRACES will not provide gridded data sets. Modellers would prefer to grid data by themselves according to their needs.
- The GDAC delivery portal was discussed. The aim is to have a data portal for IDP2017 to enable direct download of specific datasets. It will be removed from the GEOTRACES site until it can deliver IDP data.
- Goldschmidt 2016: It was decided to organise a session at Goldschmidt 2016 and also to organise an ODV training workshop titled “Working with IDP2014”. There was an open discussion about organizing a Town Hall or not.

Discussion - Gridded data sets

Reiner – He explained that the original idea for IDP2017 is to build a dataset that includes original data only. However, GEOTRACES expect for modellers to grid the data according to their needs.

Olivier – He requested definition of difference between gridding (averaging of all data within a grid space) and interpolating (calculating values in grid spaces between data values). He suggested whenever gridded products are provided it has to make clear which method has been used and inform about other potential methods that can be used.

Alessandro – He noted that a benefit of providing gridded products is the potential to interact with other communities.

Olivier - He mentioned MARGO SST data as a product whose value was increased by gridding.

Reiner – He agreed, but pointed out that the gridded product would evolve as more data are produced. He suggested that the gridded data product should be kept separate from the IDP. The question is: Who will produce the gridded data products?

Any gridded data product would need a statement clarifying that data continue to be added and will evolve with time.

Gideon - He noted that the evolving character of the data makes it premature to produce a gridded data set.

Alessandro – He also noted that the gridding scale needed will vary from one user to another (e.g., what should be the vertical and horizontal grid resolution?). He proposed adding on the website a list of unendorsed gridded data products.

Reiner - He asked: “Would a viable alternative be to provide web links to gridded data products produced by various data users? With IDP 2014, the data are too sparse for gridding. In the future, GEOTRACES should discuss this

Action: DMC to continue discussion during next DMC meeting about including gridded products

Discussion – Template for data submission

Bob – He suggested providing users with a preferred data format (optional template) for submitting process study and compliant data to facilitate data processing. Abby explained that most of the scientists submit data in Excel format. Bob suggested that a template would help and speed data processing. Reiner pointed that in the past it was decided not to do so because there was the fear that this might reduce the amount of data submitted. Bob noted that next IDP would include several process studies so it might be helpful to have a template. Agreed.

Action: DMC-co-chairs and Abby to work on providing a template for data submission to be sent to data generators. Investigators will be informed that the template is not mandatory, but that providing data in the specified format by a defined date will guarantee that the data will be included in IDP2017.

Discussion – IDP Data delivery portal

Reiner - He stated that it would be very valuable for GEOTRACES to have included in the GDAC data delivery portal a feature that allows users to extract and download individual datasets (e.g. individual sections, parameters, subset by region...). This would address a user request we learned about from the survey. He encouraged SSC members to investigate whether within their institutions there are experts able to do so, since it would be good to ask for help.

Action: SSC members to investigate whether there are experts in their institutions having capabilities to help GDAC in developing a feature to extract subsets of data from the IDP data delivery portal.

Bill Landing - He mentioned that this capability already exists in ODV.

Alessandro – He explained that the ODV training workshop at Goldschmidt could help us explain this capability to users.

Discussion – ODV Workshop at Goldschmidt 2016

Phoebe – She asked about the target audience for this workshop and the level of knowledge it is required to participate. She asked “should they have already knowledge of the ODV or this would be basic?” It could be done as a two-level workshop.

Reiner – He explained that his vision was to have two parts. A first part would introduce ODV techniques (e.g. how to prepare a section plot), followed by a second part where scientists would show some examples.

Are we looking for modellers or analysts? Bill Landing proposed to do an interactive workshop where those who participate could tell what they want to learn.

Vanessa – She suggested that once the ODV workshop is prepared it could be repeated at later meetings, as for example the Brazilian Oceanographic Conference to be held in October 24-27, 2016

Action: Reiner to consider organising an ODV Workshop at Goldschmidt 2016.

Discussion – Town Hall meeting at Goldschmidt 2016

Is it necessary to have a Town Hall meeting at Goldschmidt? Bill Landing and others believe that it might not be worth the expense, since there would not be new data to present.

Bob proposed deferring the discussion until the “Special Sessions” discussion item.

Intermediate Data Product – Review of decisions of DMC meeting – Alessandro Tagliabue

(1) IDP2017 Timelines

Alessandro presented the timeline decided during the DMC meeting. He first described the key steps: (1) submission of data, (2) S&I evaluation, (3) permission to release publicly, (4) release of data to Reiner, and (5) request of publication reference for each data submitted.

The goal is to avoid “last minute” submissions. For this, they decided that there would be 3 “streams” to submit data:

(1) 1st November 2015 submission of data > January 2016 approval > Data to Reiner ---- This is an incentive-based submission. One incentive could be offering a reception at Ocean Sciences 2016 to thank early data submitters.

(2) 1st April 2016 submission of data > June 2016 approval > Data to Reiner --- This is the latest deadline GEOTRACES guarantees the inclusion of data in the IDP2017.

(3) 1st of December submission of data -> March 2017 approval -> Data to Reiner – Final deadline, there is no guarantee that the data will be included, it will depend on the workload.

> The IDP2017 will be released on August 2017 at Goldschmidt in Paris. No data will be released publicly until that time.

Discussion – Incentives for submitting data early

Alessandro reminded SSC members that national representatives have an important role in reminding colleagues about the importance of submitting data on time. He explained that the DMC has discussed the possibility of offering a reception at Ocean Sciences for early data submitters. Any other ideas?

Gideon – He noted that the incentives might be different in each country, so he encouraged SSC members to think, propose and use any incentive that they believe is necessary.

Olivier - He pointed out that trust is very important. He believes that data submitters need to be assured again by means of the download agreement that there will not be any abuse of their data.

No one is aware of any abuse of IDP2014 data. In the community, there are several journal editors, as well as reviewers, who watch out for any abuse.

Action: SSC members to send to DMC co-chairs ideas for incentives for early data submission.

Micha – He asked whether there would be a publication for IDP2017. This could be seen as an incentive for submitting data. Andrew explained that the IDP2014 publication in *Marine Chemistry* was done in order to have a DOI assigned to IDP2014. Gideon pointed that the IDP2017 may double the number of authors (133 in IDP2014) so having a publication with all authors might be an issue.

Maite - She suggested that contacting directly PhD students and postdocs (the people who produced the data) would be more effective than contacting the chief scientists. She would produce a list of people to contact from the Canadian cruises and help Abby to chase the data.

Action: Maite to send Abby the list of persons to contact (those who actually produced the data) from past Canadian cruises. Maite to help Abby in chasing data from them.

Back to IDP2017 Timeline:

Jordi – He asked whether the IDP2017 would include the IDP2014 data or just the new data. Alessandro explained that it will include IDP2014 data as well, but some IDP2014 datasets that do not meet the S&I criteria might not be included.

Action: S&I committee to review data in IDP2014 that are no longer considered reliably intercalibrated and, therefore should not be included in IDP2017.

Alessandro – He asked whether it was necessary to ask for permission again to those that already agreed to submit their data. Answer: Only for the new data.

Alessandro explained that DMC co-chairs would not be asking about permission to release data until December 1st 2016. The reason is that they want to wait until the last moment possible so that people have more opportunities to have the data accepted and published.

(2) Priorities

DMC decided the following data-processing priorities: (1) sections, (2) process studies and (3) compliant data.

(3) Naming convention parameters

During the DMC there was also a decision to set a virtual committee to create the naming convention on a case-by-case basis.

(4) IDP2017 Communication

Alessandro explained that one lesson learned from IDP2014 was that GEOTRACES needs to communicate more clearly the deadline and requirements for data submissions. He presented the communication strategy. The following steps will be followed:

- (1) IPO to send a general advert for IDP2017.
- (2) DMC to detail specific deadlines.
- (3) S&I to send a specific e-mail to analysts (August 2015).
- (4) DMC to send e-mail to PIs to request permission for inclusion (from December 2016).

Alessandro finished his presentation by stressing that no data will be released BEFORE August 2017.

Bob – He proposed deferring the point 4 until after the S&I meeting review, thus in January 2017. Decision was for DMC to start in December 2016.

Gideon – He proposed including in the agenda for next year's SSC meeting a discussion about the need to have a DOI and/or a publication.

Action: DMC co-chairs to include in the agenda for next DMC the discussion about having a DOI and/or publication for IDP2017.

David – He noted that the number of citations the IDP2014 receives would help in deciding whether or not to have a paper on IDP2017. If it has a lot of citations Elsevier might be interested in having another publication about the IDP.

Action: DMC co-chairs to follow IDP2014 paper's citations.

Discussion – User registration and download agreement

Reiner – He explained that the next minutes would be dedicated to discuss the requirement of having user registration and a download agreement. Having them convinced some data submitters to put their data in the IDP, but this step prevented us from having a DOI assigned for the data by BODC.

Catherine – In her opinion, creating trust is very important, so she argued in favour of maintaining the registration and the download agreement.

Phoebe – She pointed out that it is very important to clarify to data submitters that submission of data to GDAC does not lead to public release and that permission to release data would be obtained separately.

Bob – He proposed the final decision to be delayed until the e-mail from DMC co-chairs the asking permission is sent to data submitters, including an explanation that having the requirement of signing an agreement preventing GEOTRACES from receiving a DOI from BODC. The email should ask data submitters to provide their thoughts about this issue.

Gideon – He noted that the risk is that one single person could veto the availability of data.

Alessandro – He mentioned that if GEOTRACES is going to ask IDP2017 data submitters about the registration step, then those IDP2014 submitters that already agreed to submit data need to be contacted too.

Olivier - He is in favour of keeping the registration step and agreement because it played a very important role in the past. Maite agreed.

Micha – He asked about whether data submitted to GDAC are being released or not. Abby clarified that data sent to GDAC is restricted by default. Data are not released until the data submitter gives permission.

Bob – He pointed out that IDP2014 has demonstrated that GEOTRACES is trustworthy. This point needs to be publicised to generate trust in submitting data in the future.

Phoebe – She asked whether it would be possible for BODC to provide a DOI in 2017 even if there is a registration and download agreement.

Graham Allen – He explained that he would investigate further whether a DOI could be issued even if a download agreement is required. During the DMC meeting an action item has been assigned to him about this issue.

Standards and Intercalibration Committee – Greg Cutter

Greg Cutter started the presentation by introducing the members of the Committee and noting the new members: Tina van de Flierdt, Karen Casciotti, Lars-Eric Heimburger and Walter Geibert.

He then reviewed the major accomplishments for 2014:

(1) a new version of the cookbook is available; the main changes are: (a) the requirements are now written as “must” and not “recommended”, (b) hydrographic methods follow GO-SHIP protocols, (c) and added new artificial radionuclide methods.

The S&I Committee decided that a major revisions will be done every 2 years, except if additions are needed more frequently (for example for aerosols, so a version 2.1 might be available in the near future).

(2) Intercalibration procedures for cruises were written and are now posted on the site.

(3) They had a meeting in January 2015 in Galway (Ireland) hosted by Peter Croot. Some results of the meeting will be now reviewed, including (a) updated acceptability criteria for key TEIs for upcoming data reviews; (b) review of standards and reference materials for key TEIs; SAFE and GEOTRACES waters running out; new reference waters; (c) Intercalibration status for: particles (Phoebe); aerosols, Co, Hg, Si isotopes (Greg); (d) IDP timing and procedures for TEI reviews, and (e) tracking intercalibration status and interfacing with DMC (Maeve).

Review of standards and reference materials for key TEIs; SAFE and GEOTRACES waters running out; new reference waters - Maeve Lohan

Maeve explained that SAFE and GEOTRACES reference waters are running out. Since Geoffrey Smith has retired, Claire Parker is distributing samples. She will do so until she graduates, but it might be necessary to look for a replacement. Phoebe agreed to distribute the samples.

Action: Phoebe to contact Geoffrey Smith and Ken Bruland to take over the distribution of SAFE and GEOTRACES reference samples.

Collection of new reference samples: New samples will be collected during the GA08 cruise (late 2015) by Eric Achtenberg and Christian Schlosser. Ken Bruland sent SAFE tanks to Germany and also provided 1,000 clean bottles and some cartridge filters. Christian went to UCSC to get trained by Geoffrey Smith. Tanks will be returned to UCSC after the cruise.

Phoebe – She explained that the idea is to keep them in Santa Cruz until a group in the United States is funded to take over the supply of reference water (in 2018).

SAFE and GEOTRACES data need to go to Ken Bruland. Kiel will distribute GA08 samples and collect consensus data for GA08 samples.

Particle intercalibration – Phoebe Lam

Phoebe started by reviewing the process: samples were distributed in October 2013 with an initial deadline in March 2014 and a revised data deadline on 31 December 2014. The latest data were received in January 2015. Phoebe received results back from a half of the samples distributed.

She reviewed the results: for particulate TMs (pTM) there was, in addition of the international effort, an U.S. intercalibration effort involving only 4 labs. Reproducibility for particulate TM was not very good for the international effort: standard deviation among different elements varies between 30 and 200% in oligotrophic regions, and 10-40% for most labs in particle-rich coastal waters. High standard deviations are mainly due to a small number of labs that appear to produce bad data.

Phoebe would like to repeat the exercise with those labs that need improvement, but unfortunately there is no enough material available to do so.

For SPM, Phoebe summarised the results as follows: POC intercalibration (IC) is good, PIC IC is so-so (1 lab very low- 3 methods used), bSi IC is so so, litho IC is not great (standard deviation around 80%). 4 labs have analysed all four components to calculate SPM.

Future steps: Phoebe (helped by Maeve and Andrew) plans to publish the results. SPM intercalibration still needs work; the first step would be to work with individual labs.

ISSUE: how to continue this exercise to allow participants to improve and new participants to engage if no more samples are available?

Catherine – She suggested that this exercise served to identify labs that could be a reference. She proposed that the intercalibration could continue as a two-way exchange between the

reference lab and the lab needing further intercalibration, instead of a holistic intercalibration effort.

Intercalibration status for: aerosols, Co, Hg, Si isotopes - Greg Cutter

Greg Cutter reminded participants that intercalibration involves on-going interaction among participants to resolve inconsistencies.

Aerosols: Bill Landing is proposing to use Arizona Road dust as a certified reference material (CRM). Aerosols will be included in the next IDP.

Si isotopes: This is an effort led by Mark Brezinski. He collected samples from the Hawaiian Ocean Time-series (HOT) site at 300m and 1000m depths. There were 15 labs involved, but only 3 sets of results received by December 2014 (more are promised this summer). He would like the data to be included in the next IDP.

Hg: This effort is led by Eric Heimburger and Carl Lamborg. There were 10 labs involved. They did 2 different exercises, but variability is still very high due to extremely low concentrations. The S&I Committee still has issues regarding the results. They plan to do another intercalibration exercise in summer 2016 in the Mediterranean Sea. Also 3 groups will do an intercalibration exercise in the Arctic.

Co: It still has some issues, but will hopefully be in the next IDP. Still debated whether or not samples collected in OMZs need to be stored in gas-sealed bags to prevent exposure to high levels of oxygen. Abigail Noble in the Saito Lab found huge differences in Co concentrations depending on storage methods.

Ligands: They should be in next IDP.

Other parameters that will be intercalibrated for next IDP

The following list is presented:

- N & C & O isotopes – Karen Casciotti
- Alkalinity – Maeve Lohan
- Ligands- Fe, Cu, Co – Peter Croot
- Soluble trace elements-discussion still on-going but hopefully in next IDP – Peter Croot
- Trace metal isotopes- Fe, Zn, Cu, Cd, Ni?? – Maeve Lohan
- Nd & Pb isotopes – Tina van de Flierdt
- $^{210}\text{Pb}/^{210}\text{Po}$, ^{227}Ac , ^{137}Cs –Walter Geibert
- ^3He , Tritium, CFC – use established procedures – Greg Cutter

Upcoming cruise intercalibration procedures – Arctic as example

The Arctic cruises are serving as a test for the intercalibration procedures. There has been very good communication between the German, Canadian and U.S. expeditions about crossover stations. No longer a crossover between French GA01 and Canada, but replicate sampling has been agreed.

Tracking intercalibration status and interfacing with DMC

A cruise intercalibration tracking spreadsheet has been created in collaboration with the DMC. The file shows who is the responsible for each parameter and whether or not the parameter is intercalibrated.

Data handlers and timelines for IDP2017

Greg also showed about the data handlers for IDP2017:

- Karen Casciotti: Nitrate and carbon isotopes; Si and Oxygen isotopes
- Peter Croot: Hydrography (T,S, O₂), Nutrients; Speciation-ligands, redox, soluble
- Greg Cutter: Particles and Aerosols; ³He, CFC, Tritium
- Walter Geibert: Key Radionuclide dissolved and particulate; Other radionuclides
- Lars-Eric Heimbürger: Hg
- Maeve Lohan: Contamination prone elements & isotopes; Alkalinity, POC
- Tina van de Flierdt: Radiogenic isotopes, REE

Greg finished by showing the timeline and data submission and S&I reviews for next IDP2017 (which has been already discussed previously).

Questions:

Reiner – He asked about the steps involved in the intercalibration process. Maeve explained that the e-mail that the S&I Committee will send to data analysts would be an invitation for them to work together (compare their data) and report the results back to the S&I Committee. If analysts do not respond, then the data will not be included in the IDP. This process will also be followed for replicate samples.

Maeve – She recommended that SSC co-chairs send an e-mail explaining that there would not be tier-1 and tier-2 data in the IDP2017. Parameters will require intercalibration or not. For those parameters that require intercalibration, data included in the IDP must be intercalibrated otherwise will not be included.

The S&I needs to provide the list of parameters that require intercalibration.

Action: S&I Committee to provide a list of the parameters that need to be intercalibrated for IDP2017.

Gideon – He clarified that what is needed is a list of all parameters that are going to be intercalibrated from IDP2014 and also the new parameters that will be intercalibrated. This information needs to be communicated to everyone.

Reiner – He asked: “who should be sending this?” Maeve answered that SSC co-chairs should send the e-mail. Gideon suggested a joint SSC and S&I communication.

Discussion – IDP2017 communication steps (cont.)

The communication steps discussed previously were projected:

1. IPO to send a general advert for IDP2017 (ASAP)
2. DMC to send an e-mail detailing specific deadlines (ASAP)
3. S&I to send a specific e-mail to analysts (August 2015).
4. DMC to send e-mail to PIs to request permission for inclusion (from December 2016).

A new step needs to be added to include the communication from SSC co-chairs informing of the list of parameters that will be intercalibrated.

Gideon – He proposed that this list to be included in the DMC communication detailing the IDP2017 timeline.

Alessandro - The subject of the message and the first line needs to be very explicit like “You must follow this instructions if you want to be in the IDP”. Also it is important to include it as a pdf file and put on the GDAC and GEOTRACES websites and everywhere.

Action: Elena to send a general advertisement about next IDP2017 (in July).

Action: DMC co-chairs to draft a message providing the timeline and including the list of parameters to be intercalibrated. This e-mail to be signed by SSC, DMC and S&I co-chairs.

Action: Elena to send the e-mail detailing the specific deadlines and including the list of parameters through the mailing list. It must include the text in pdf. IPO to put the information also on the website.

****NOTE:** Later discussions concluded that instead of providing a list of parameters to be intercalibrated the following statement should be included in the step 2 e-mail above (the final e-mail is included in Annex I):

(1) All key TEI data submitted for the IDP require intercalibration. Intercalibration can be achieved via cross over stations, duplicate sampling and additional analysis of Certified Reference Materials (CRMs). Details are provided in the intercalibration procedure documents: <http://geotraces.org/library-88/geotraces-policies/946-intercalibration-procedures-2>

(2) All other TEI data (non-key TEIs) to be submitted for the IDP still need to demonstrate the method used for quality control, which ideally follows the same intercalibration procedures as outlined for key TEIs.

(3) All data reports and metadata should be submitted to the S&I Committee co-chairs and will be evaluated by the S&I Committee.

Other questions:

Bob - He asked about intercalibration qualifications where a lab is helping a nation that can't make all key TEI analyses or when a cruise cannot be intercalibrated (no crossover nor replicates), but the lab has been intercalibrated in the past. Maeve answered that

intercalibration procedures allows exceptions when intercalibration can be traced via other methods.

Review of the Ocean Sections

Atlantic Ocean – Gideon Henderson

Gideon presented the Atlantic Ocean sections map.

He then reviewed the details of a forthcoming German cruise along GA08 section (21 November to 27 December 2015), including the main goals for this cruise and the list of parameters that will be measured. They cover all parameters; however, for $d^{13}C$ samples they are still working on who will measure it. Gideon pointed out that stored samples are missing from the list.

Maeve – She asked about the intercalibration plans. Gideon pointed that they do not have a crossover station. Ed Boyle pointed that the GA08 cruise might crossover CoFeMUG.

Decision: Proposed German cruise along GA08 is approved as GA08 section cruise.

Action: Gideon to inform GA08 chief scientists that it is recommended that they occupy a crossover station with CoFeMUG. Also, Gideon to propose chief scientists to check the GEOTRACES analytical expertise database available on the GEOTRACES site to identify an analyst for $d^{13}C$.

Gideon noted that there are 3 section cruise tracks that have not been covered yet: GA05, GA07, GA09.

GA09: Geraldine Sarthou explained that in collaboration with Brazil they would like to undertake 2 cruises in winter 2017 and 2018 along this section.

Olivier – He asked whether the cruises along GA09 would be process studies or section cruises. Gideon explained that to be designated section cruises they should cover all the section cruise criteria.

Action: Geraldine Sarthou and Vanessa Hatje to report at the next SSC about plans for a cruise along GA09.

GA07 and GA05: In the past, there was some interest from France and the U.S. to undertake a cruise along these sections. Catherine wrote a proposal, but the proposal was not funded. Catherine sent the proposal to Bill Landing and Greg Cutter. The U.S. is not interested in undertaking this section, but instead to focus on the Pacific.

Decision: For GA07 and GA05 to leave the section lines on the map and try to look for opportunities to complete at least part of these sections, or at least some TEIs, as a process study.

Action: SSC members to look for opportunities to complete at least part of the GA07 and GA05 sections, or at least some TEIs, as a process study.

Discussion - Are other lines that should be drawn on the Atlantic Ocean map?

Alessandro – He suggested a line that crosses the South Atlantic (extension of GA11 down until about 60°S). This line could be added as GA12. Agreed.

Action: Abby to update the Atlantic Ocean map to include the GA12 section (extension of GA11 down to 60°S)

Catherine – She noted that GEOVIDE did not sample the Iceland-Scotland Overflow Water (ISOW) and Denmark Strait Overflow Water (DSOW) very well. She suggested sampling these water masses as a future process study.

What about covering the gap between GA01 and GA03? This could be considered in the future.

Pacific Ocean – Hajime Obata and Tung-Yuan Ho

Hajime started the presentation by showing the Pacific Ocean cruise map. He announced that Japan plans to re-do and complete the GP02 section. The cruise will be held from 23 June to 17 August 2017 (cruise KH-17-1). Some data from GP03 cruise (chief scientist: Jing Zhang) are already available.

He then reviewed the other completed sections: GP13 (by Australia and New Zealand); GP19 (by Japan; it had a crossover with GP13); GP12 (by France); GP16 (by the U.S.).

Tung-Yuan Ho explained that the North-West Pacific is seriously influenced by terrestrial input from Asia. Taiwan completed two process studies in the area (Gpr06 and GPpr06 bis). The cruises served as GEOTRACES test cruises. Tung-Yuan would like to contribute to other cruises, but needs to wait for the new ship. GP06 and GP08 to be completed jointly by Japan and China. The GP07 so far covered as a process study by Taiwan.

GP18 (KH-11-07) was completed by Japan. Tung-Yuan Ho's Lab was invited to participate. Intercalibration exercises are on-going between Sohrin and Ho's labs.

Liping added that Minhan Dai would like to complete a GEOTRACES section in the Pacific in 2018.

Discussion – Sections in the Pacific Ocean that are not covered so far:

Bob – He explained that U.S. is interested in completing the section GP15 and also at the end of the decade they would like to complete GP17.

Gideon – He asked if a ship couldn't go from Chile to New Zealand (this will allow GP17 to crossover GP19) and close off the entire Southern Ocean and another ship do the Tahiti to Antarctica cruise. Bob called for other nations to get involved.

Andrew – He explained that he had conversations about using an Australian cruise to complete GP14.

Catherine – She asked whether Chilean scientists could partner with other nations to complete the cruise from Chile to New Zealand. Vanessa proposed Sandor Mulsow.

Gideon – He pointed out that GP11 has no taker. In the past, this line was proposed by Chris Measures. Bob mentioned that most of this line has been done for iron, but not for other parameters.

Gideon – He noted that GP05 was a U.S. interest as well. Bob confirmed that there is an interest, but that the SSC had prioritized the GP15 and GP17.

Bob – He noted that the German process study by Katharina Pahnke from Chile to New Zealand will cross the GP17 area. Katharina will measure neodymium and REE, Peter Croot several transition metals and Bob Anderson will measure thorium and protactinium. There will be full water column only for thorium and protactinium.

Alessandro – He asked about future interest of CLIVAR in these regions. Bill Landing explained that they are doing meridional sections (ex. GP16). They have a ten-year rotating plan. The Arctic cruise showed U.S. scientists that it is difficult to host CLIVAR and GEOTRACES science together in the same ship.

Reiner concluded that the Pacific Ocean still has some sections to be covered.

Arctic Ocean – Bob Anderson

Bob presented a map of the GEOTRACES International Arctic Programme. The Canadian cruise has already left port and the German and U.S. expeditions will depart in the coming weeks. In the past it was hoped that Russia would conduct some process studies on their shelves where the chemical composition of deep water is formed, but it seems that this will not happen. Bob reviewed the cruise tracks from the U.S., German and Canadian cruises. In general, the original goals for the Arctic Ocean, except for the processes on the shelves, will be very well covered.

Discussion - Arctic Workshop with Russian scientists

Bob explained that Michiel Rutgers van der Loeff is proposing an Arctic workshop about exchanging data within Russian, European and some U.S. scientists. The main goal is to strengthen collaborations with Russia. Reiner explained that AWI has a long tradition of collaboration with Russia, but the intensity of collaborative work and the approval rate of planned expeditions have changed over time. Michiel and AWI are willing to maintain at least the collaboration with Russian scientists so that once the political situation improves they can restart some operations.

Bob noted that the list of objectives of the workshop do not include a joint cruise with Russia. Reiner pointed that Michiel might have considered this would not be possible. Bob and Catherine stressed the importance of having this cruise. Reiner asked for clarification whether it should be a GEOTRACES cruise. Bob and Gideon suggested it should be possible to have a GEOTRACES cruise or at least data-compliant. Reiner noted that since *RV Polarstern* cannot be used, then this needs to be a Russian ship and if so, it needs to be big enough to carry the containers.

Bob emphasized the importance of getting data on the Russian shelves as they play an important role on the water mass formation.

Action: Reiner to contact Michiel and ask the reasons why the cruise has not been included in the objectives and inquiry about the possibility to reach a joint cruise plan in the Russian shelves.

Reiner summarised: the open Arctic is covered very well except for north of Greenland, the Canadian Basin, and the Russian shelves—very important for the water mass formation—are not covered adequately. An important message is for AWI and Michiel to explore ways to improve this. Collaboration with Russia is essential.

Indian Ocean – Catherine Jeandel and Andrew Bowie

Catherine Jeandel started the presentation listing the important processes and features in the Indian Ocean that need to be covered. This includes circulation (fronts, throughflow, Agulhas and water masses - i.e. Red Sea, Pacific Waters); biological hot spots (fronts, upwellings margins); hydrothermal activity; and river and margin inputs, and atmospheric dust. She showed a map where the main processes and features are located.

She then reviewed the past and future cruises. She showed the German cruise track that will happen in the first half of 2017 from Durban to Perth with the chief scientist being Eric Achterberg. Martin Frank told her that the list of parameters would be the same as in the GA08.

She then showed a map where she plotted all cruises to see what is missing. GEOTRACES is missing Indonesian throughflow, Red Sea outflow and Somalian upwelling. On the other side hydrothermalism is correctly covered.

She then reviewed planned German and French cruises.

Questions:

Sunil – He noted that the Indians plan to re-do the Arabian Sea section and continue north to the Pakistan EEZ (21°N).

Action: Abby to update the Indian Ocean map and the Indian basin on the global GEOTRACES section map.

Andrew - Australia has 2 expeditions for this coming Austral summer to study the region around Kerguelan. He has submitted them as process studies. The Australian cruise would extend the CLIVAR I-8S line into the ice, because the *Ron Brown* cannot go into the ice.

Steve Rintoul has a cruise funded in 2016-17 to repeat SR03 for physical oceanography. Andrew will request funds to measure as many TEIs as possible, although it would not include all key TEIs.

Catherine – She discussed extending French cruise across the Kerguelan Plateau to intersect with the Australians.

Sunil – He suggested that Indian GEOTRACES could investigate the Indonesian Throughflow region.

Alessandro – He asked whether South Africa could contribute. Roy said that he believes it would be possible to do so in the future, but not in the short term.

Reiner – He suggested that an Indian Ocean Planning workshop might be necessary and that it could be done virtually.

Gideon – He proposed the outcome of the discussion be presented at the IIOE-2 meeting “Dynamics of the Indian Ocean: Perspective and Retrospective International Symposium on the Indian Ocean” that will be held from 30 November to 4 December in India.

Action: Catherine, Sunil, Andrew, Katharina and Roy to discuss Indian Ocean plans and consider presenting the plans at the IIOE-2 meeting “Dynamics of the Indian Ocean: Perspective and Retrospective International Symposium on the Indian Ocean” that will be held in India in November - December 2015.

IIOE-2 – Ed Urban

SCOR supported a planning committee for a second International Indian Ocean Expedition (IIOE-2). The group developed a 5-year plan. The draft science plan had been distributed for comments.

There is a cruise leaving from Goa on 4 December that made an invitation from non-Indian scientists. He believes it was for very general measurements.

The overarching goal of IIOE-2 is « to advance our understanding of interactions among geological, ocean and atmospheric processes that give rise to the complex physical dynamics of the Indian Ocean region, and to determine how those dynamics affect climate, extreme events, marine biogeochemical cycles, ecosystems and human populations ».

He then presented the scientific themes:

Theme 1: Human impacts

Theme 2: Boundary current dynamics, upwelling variability and ecosystem impacts

Theme 3: Monsoon variability and ecosystem response

Theme 4: Circulation, climate variability and change

Theme 5: Extreme events and their impacts on ecosystems and human populations

Theme 6: Unique geological, physical, biogeochemical and ecological features of the Indian Ocean

There are not many GEOTRACECS « words » in the Science Plan, but Ed Urban believes that there is place for GEOTRACES as part of the project. Ed Urban has the feeling that there will be a mismatch between what the international community versus what local scientists want. He finished by showing the structure of IIOE-2, where GEOTRACES is mentioned as a relevant programme.

Questions:

Catherine – She asked whether GEOTRACES could benefit by participating in the IIOE-2. “Would it be possible to get any IOC or UNESCO funding contribution?” Ed Urban responded that IOC has no money available and plans to raise funds from other institutions. He believes GEOTRACES can be proactive by proposing its plans and its needs. One clear benefit would be to encourage other disciplines to make use of GEOTRACES data.

Action: Catherine to send the Indian Ocean GEOTRACES section map to IIOE-2 so that the GEOTRACES cruises are included in their map.

Bob noted that James Moffett might attend the IIOE-2 meeting in Goa (November-December 2015). James is member of the U.S. SSC, so he could present GEOTRACES plans at the meeting.

Action: Bob Anderson to contact James Moffett and ask whether he could make a presentation about GEOTRACES at the IIOE-2 meeting.

Process Studies and Compliant data

HEOBI – Andrew Bowie

Mike Coffin is the chief scientist of the cruise and Andrew Bowie is the GEOTRACES scientist. The cruise will be held in January-February 2016. The objectives of the cruise are (1) to constrain the magnitude and chemical nature of iron enrichment associated with undersea volcanoes in the vicinity of Heard/McDonald Islands and map the extent of buoyant hydrothermal plumes; (2) to determine the importance of hydrothermal iron relative to other iron sources, both in terms of abundance and bio-availability, in supporting ocean productivity in the Heard Island region; and (3) to extrapolate findings from Heard Island to estimate the importance of hydrothermal iron to the broader Southern Ocean.

Andrew then specified the compliance of cruise with process studies criteria.

Questions:

Greg Cutter – He asked about their intercalibration plans and recommended to take replicates. Andrew explained that there would be a crossover with KEOPS.

Bill Landing – He asked if aerosols would be collected. Andrew responded that there would be aerosols collected.

Decision: SSC approved HEOBI as process study.

K-Axis – Andrew Bowie

This cruise has a strong ecosystem component. The chief scientist is Andrew Constable. It will be held from January to March 2016 on the *RSV Aurora Australis*, in the Indian sector of the Southern Ocean. The main objective is to determine the relationships of phytoplankton species, productivity and food web structure to essential habitat variables, including iron and micronutrient supply (sea-ice melting vs. sediments vs. islands), in three zones: (i) near the Antarctic continent, (ii) on the BANZARE Bank, and (iii) on the Kerguelen Plateau.

Andrew then justified the compliance with the process studies criteria.

Questions:

Greg – He asked about the number of sampling systems. Andrew explained that they would have two sampling systems, since they borrowed one from New Zealand.

Catherine – She suggested moving the track so that they cross the future French-Australia cruise. Andrew is working on this.

Decision: SSC approved K-Axis as process study.

Eddies – Andrew Bowie

The cruise is linking eddy physics and biogeochemistry in the Antarctic Circumpolar Current. The chief scientist is Peter Strutton and the GEOTRACES scientists will be Philip Boyd and Michael Ellwood. It will be held on the *RV Investigator* (Australia), in the Southern Ocean, south of Tasmania from March-April 2016. The aims are (1) during the 12-14 day occupation of the centre of a candidate eddy, selected by remote sensing, an upper ocean iron biogeochemical budget will be constructed; and (2) trace metal gradients across the eddy, along with coupled bio-optical and biogeochemical measurements, will be mapped and compared with a detailed characterisation using towed undulating sensor package and profiling bio-floats.

Andrew then justified the compliance with the process study criteria.

Questions:

Reiner – He noted that one of the chief scientists has been late in submitting data. So far, no data have been submitted from previous process studies. Andrew answered that he has personally chased data for these cruises. Since the previous SSC meeting, most of the FeCycle II data have been submitted. For FeCycle III, Abby explained that Philip Boyd responded to her that the data would be submitted by the end of 2015. Andrew believes that this could be a case where the request for data needs to go direct to the analyst and not to the chief scientist.

Decision: SSC approved Eddies as process study.

SOSCEx-III – Alakendra Roychoudhury

This project consists on a seasonal study called “Southern Ocean Seasonal Cycle Experiment”. They have already completed two cruises, so the cruise presented is the third one of this experiment. The chief scientist is Pedro Monteiro. Roy presented the goals of the cruise, the cruise plan, and a detailed sampling strategy. The GEOTRACES parameters that will be submitted to the GDAC is Fe. But, other parameters will be measured.

Questions:

Andrew – He asked about the timing for the cruises. Roy answered that the first cruise will be leaving in the next 5 days. All these cruises will constitute one single process study.

Greg Cutter – He asked about the intercalibration plans. Roy explained that they will be occupying the Bonus-Good Hope crossover and that they will also take replicates. Alessandro reminded Roy of the requirement to follow the data management procedures.

Roy wanted to know whether it is necessary to provide the cruise report. The answer was “YES”.

Decision: SSC approved SOSCEx II as process study.

RidgeMix – Alessandro Tagliabue

Alessandro explained that the RidgeMix proposal was not approved last year by NERC, but that they will resubmit it again. RidgeMix was approved as a process study during the previous SSC meeting.

Other comments:

Olivier – He proposed to add the list of BioGEOTRACES parameters in the criteria for process studies and section cruises and ask chief scientists to report these data.

Action: IPO to add under the section “Recommendations” of the section cruise and process studies criteria the recommendation of reporting biological parameters along with TEI and ancillary data. It should include a hyperlink to the list of BioGEOTRACES parameters. This task needs to be completed as soon as the list of BioGEOTRACES parameters are available.

Interaction with other programmes

What can we learn from complete or more advanced programmes? What did WOCE, JGOFS etc. do in their second half that was successful, and what were their failings? – Gideon Henderson

Gideon explained that the purpose of this topic is to have a brainstorming about what can be learned from other programmes.

Ed Urban – He pointed out that in terms of data management, GEOTRACES learned from JGOFS and WOCE. Gideon noted that one lesson learned from JGOFS and other programmes is that data management started too late in the process, this is the reason that data management was started early in GEOTRACES.

Reiner - He noted that IDP and eGEOTRACES would not have existed without the lessons learned from WOCE.

Joint Global Ocean Flux Study (JGOFS) – Bob Anderson

Bob provided an overview of the Joint Global Ocean Flux Study (JGOFS). It was conceived to evaluate chemical fluxes in the ocean, but the mission changed mid-life to focus more on microbial ecology. It was successful in understanding microbial transformation of C, N, and P. The lessons to be learned are the following: coordination was done at the international level and interpretation and synthesis were done at the national level; synthesis was deferred to the end of the programme; and no central data archive/assembly centre was created (it was done nationally). Because of JGOFS, Bob advocated last year for starting the synthesis early.

Reiner – He noted that GEOTRACES has a very good base for synthesis: the intercalibration and standardization work started even before the programme launch; it has strong international data management and it has the IDP already released. Gideon agreed.

Bob - At the end of JGOFS in the United States they continued funding for synthesis and asked the community to submit proposals. The U.S. GEOTRACES SSC discussed this

approach and rejected it. The feeling is that it would be better to hold a meeting where the community defines the goals and works from the beginning on these goals. Bob's feeling is that the JGOFS programme did not achieve a global result. One of the lessons that GEOTRACES could learn is that a global approach for synthesis is needed.

Discussion –Future of the GEOTRACES programme

Micha – He asked about the length of GEOTRACES. Gideon explained that the SCOR programmes last 10 years, but he suggested that extensions are possible.

Ed Urban – He informed the SSC that IMBER and SOLAS have applied for 10-year extensions. However, he pointed out that for GEOTRACES it would be more complicated to extend the programme since it might not make sense to add more sections to the map. GEOTRACES should decide when the job is done based on the science.

Catherine – She argued that in the future GEOTRACES might need more process studies. She noted that one weak point of GEOTRACES is the paucity of research on the geological archives of paleo-proxies; thus, this could be an on-going goal for GEOTRACES. Also, she pointed that the JGOFS database is not user-friendly; this is another lesson to learn from this programme.

Reiner - JGOFS failed on coordinating national data centers, the idea was for national data centers to process and send the data to JGOFS at the end of the programme, but it did not work. WOCE had already learned this lesson by setting their own data centers.

Olivier – He argued that JGOFS time-series measurements have been very powerful. GEOTRACES has no time series. To meet the goal of sensitivity to environmental change, time-series data are helpful.

Gideon – He noted that GEOTRACES might be a programme that lasts for 10 to 12 years only. At some point, the GEOTRACES sections will be sufficient to meet the goals of the GEOTRACES Science Plan. After the final product is released and the final report is completed, there might not be a reason for renewing it for 10 other years. However, then the community can decide whether to design another programme.

Micha – He mentioned that the process of putting together another project needs to start before the end of the programme and at least 5 years before the end of GEOTRACES.

Maeve – She asked for a timeline for the release of the final product. After discussion the answer was 2022.

Alessandro – It might be important to reoccupy the sections to assess temporal variability.

Bill – He noted that in the United States, even if GEOTRACES has officially ended internationally, they would be able to submit proposals for funding, but he believes it would be a pity to lose the structure that promotes communication, the S&I activities that ensure quality, and the data management that makes the data easily accessible.

Gideon – He noted that it would not be possible for Europeans to submit proposals once GEOTRACES has ended.

Bob – He stressed that it is very important to highlight any novel and the exciting science in the proposals, otherwise there is the risk that the reviewers will consider that there is no novelty anymore.

Alessandro – He reiterated the value of assessing temporal variability. Gideon agreed. Future programmes evolving from GEOTRACES may include time series.

Bill – He explained that some people believe that GEOTRACES is like JGOFS, where most people felt it was a “closed shop”. GEOTRACES needs to do everything it can to be open and add new participants and ideas.

Reiner – He noted that broadening the use of the data will help in making GEOTRACES appear more open to the broader community.

Ed Urban – He noted that one reason GEOTRACES is successful is that it happened 30 years after GEOSECS. So they might be value in allowing some time to elapse between two GEOTRACES and any follow-on project.

Other programmes that might use GEOTRACES Data

IMBER and SOLAS New Science Plans – Ed Urban

SOLAS

Ed Urban explained that SOLAS applied for a second 10-year phase. The science plan is being reviewed and it should be finalised by September. This is mainly to adapt to Future Earth. SOLAS does not have a data centre. Ed U. reviewed the themes of SOLAS. Theme 3 on “Atmospheric deposition and ocean biogeochemistry” is most relevant to GEOTRACES. He showed the map of SOLAS study regions. For some of these areas there are common interests with GEOTRACES, so GEOTRACES data available in these regions could be useful to SOLAS. He believes the way to interact with SOLAS is to contact the SOLAS chair and inform her of the data GEOTRACES can contribute. It might be useful to propose a joint workshop.

Reiner – He will participate in the SOLAS Open Conference. He will present a poster and have an IDP2014 demonstration.

IMBER

IMBER is also producing a new science and implementation plan. IMBER was criticized as being too broad, so they are trying to focus and specify the goals. He showed the proposed structure of IMBER for 2016-2025. Ed Urban believes there is no much room for interaction with IMBER. Ed Urban proposed to send the new draft science plan to all SSC.

Action: Ed Urban to send the draft IMBER science plan to SSC members as soon as available.

PAGES-GEOTRACES Workshop and/or Special Session at International Conference on Paleoceanography (Utrecht, 29 August – 2 September 2016) – Bob Anderson

Bob reported that during last SSC meeting he proposed having a joint workshop with PAGES; however, he realized that there is still a lot of work to do before this. At the same time, he recognizes that there is a need to inform paleoceanographers about the GEOTRACES results, so he believes there is an advantage of doing a common action. He did a talk at the International Conference on Paleoceanography (ICP 2014) and this was very well received.

Liping – He confirmed that GEOTRACES results will be very relevant for the PAGES community. The current director of PAGES is moving to Future Earth.

Olivier – He mentioned that one important joint topic is the calibration of proxies and this could be done with process studies.

Reiner – He noted that there is strong desire to have a workshop.

Bob – He pointed out that it would be good to express an interest to PAGES soon. As already mentioned, Candace Major, NSF programme office for paleoceanography, already expressed an interest in this workshop, so funding might be available.

Looking at the timeline, should we wait until after the release of IDP2017 to hold the workshop? Bob pointed out that there is an advantage in having a more completed product before having the workshop. Gideon proposed to hold it during the first trimester of 2017, as the data would already be available. Reiner spoke in favor of waiting until after the IDP2017 release, as there are already several workshops being prepared. There was a long discussion. General consensus was reached for 2017.

Decision: The SSC agreed to strengthen collaboration with PAGES and work to prepare a joint workshop for 2017.

Liping – He suggested it would be good to have some GEOTRACES talks during the next ICP meeting in the Netherlands in 2016.

Action: Liping to find out how to include GEOTRACES talks in the ICP 2016.

Action: Gideon to lead a working group to discuss interactions with the paleo community and consider the workshop with PAGES.

Joint European, Canada, U.S. initiative on the North Atlantic and Arctic Oceans – Bob Anderson

Bob has already reported about this initiative during previous SSC meeting, where he asked for SSC members to try to influence the initiative since the science plan had very little information about chemistry on it. Although several comments were sent, the revised science plan only mentions micronutrients once.

Bob explained that the initiative is an outcome of the Galway Statement. The idea is to bring together several existing physical and biological programmes working on the North Atlantic and the Arctic. He showed the topics of this initiative. It is quite biology and physics focused. Bob Anderson and other SSC members (such as David Turner) sent detailed comments, but did not have a substantial impact.

In the United States, there will be a “Dear colleague letter” inviting proposals to study small-mesoscales processes in the North Atlantic and Arctic that influence marine ecosystems and Atlantic Meridional Overturning Circulation (AMOC). The European side of the partnership is more applied to industry and commercial issues. No information is available from Canada.

There will not be funds at the U.S. NSF for this initiative. Funding must be taken from core programs. In the EU, the funding is included in the Blue Growth strategy of the Horizon 2020 programme.

EXport Processes in the Ocean from Remote Sensing (EXPORTS) – Bob Anderson

EXPORTS is one of the projects that will be integrated in the North Atlantic initiative. The science plan is being reviewed. The goal of EXPORTS is to quantify the state of the biological pump from satellite observations. This is an U.S. programme, which is not yet funded but the decision will be made soon. Given the role of micronutrients in regulating ecosystem structure and biological export of carbon; this may be the best programme in the United States in which to embed some GEOTRACES synthesis.

Southern Ocean Carbon and Climate Observations and Modeling (SOCCOM) – Bob Anderson

It is a NSF-sponsored programme focusing on the carbon cycle in the Southern Ocean. It has 3 themes: observations, modeling and broader impacts (a very strong outreach and education component). Initially, it was conceived as a plan for a science and technology center. Bob was requested to be the chair of the external advising committee. He is not involved anymore since there is no longer an advising committee. One of the modellers participating in the programme was not aware of GEOTRACES data.

Interdisciplinary Coordinated Experiment of the Southern Ocean Carbon Cycle (ICESOCC) – Bob Anderson

This is a programme funded by NASA. Its goal is “to define an interdisciplinary and international field campaign to develop improved capability for measuring seasonal variations in NCP and subsurface ventilation at the scale of the entire Southern Ocean and to constrain satellite-derived estimates with atmospheric and oceanic observations and models.”

In this programme, Kathy Barbeau, from U.S. GEOTRACES, is included to provide iron biogeochemistry in their planning. Bob noted that GEOTRACES has knowledge to offer to this programme.

Bob mentioned that there are many emerging programmes that may need micronutrient data and expertise on its use, thus, it is necessary to further publicise GEOTRACES to reach all these communities. Bob advocated organising a Town Hall and a Booth at Ocean Science even if there are no new data. U.S. GEOTRACES is willing to organise a booth even if there is not international collaboration nor SCOR involved. Bill Jenkins, the new U.S. GEOTRACES chair, strongly believes that this is absolutely necessary.

Catherine - She proposed to edit one-page summary of GEOTRACES to be sent it to any emerging programme. She also noted that physical oceanographers are another important community that needs to be targeted.

THURSDAY 16 JULY 2015

Reiner opened the day's session by thanking Maite Maldonado for organizing the meeting.

Arctic Workshop with Russian scientists (cont.)

Reiner reported that Michiel has replied saying that the workshop with Russian scientists does include a discussion for a joint cruise on the Russian shelves. Reiner explained that AWI will provide funding for the workshop and the Russian partners as well. Does the SSC agree to co-fund the workshop? General agreement.

Decision: SSC agreed to contribute 5000 k€ to the Arctic workshop with Russian scientists.

SOLAS and Future Earth

Reiner explained that Emilie Breviere, the SOLAS Executive Officer, has invited GEOTRACES to participate to a meeting with other projects that have a marine component to discuss topics that could help in having marine sciences more present on Future Earth. In the past, a couple of meetings of this network have already been held (in March and in April 2015). As a result, a preliminary list of topics is already available. SOLAS invited GEOTRACES to propose other topics.

Reiner reported that Gideon has proposed a topic around deep-sea mining. In the past, GEOTRACES has kept distance from Future Earth (FE), but in Europe FE is having an influence on some funding programmes, so GEOTRACES might miss an opportunity if not involved. Reiner clarified that while in Europe the FE topics are being included in H2020, in the United States, FE has not that influence.

Ed Urban – He explained that SCOR helped in organizing the meeting among projects in Kiel in March 2015. The projects invited were IMBER, SOLAS and PAGES, projects that are currently sponsored by IGBP. The outcome of this meeting was a recommendation to these projects to consider coordinating their input to FE. Martin Visbeek offered two years' funding for a coordinator of the network to be hosted at the SCOR office. However, the projects involved did not want another layer of bureaucracy by having a coordinator and wanted to make recommendations on their own. They decided to meet and develop a list of topics where they can work together. Ed's intention was to wait and see and if the network developed, then for GEOTRACES to step in, but he believes that Gideon's suggestion is good and it makes sense to send someone to this meeting.

Gideon – He proposed to write and submit a topic. Reiner noted that this will not involve a lot of work and it may lead to a new research interest area for GEOTRACES.

Reiner – The meeting will be held in Kiel on September 7. However, Reiner will not be able to participate. David Turner is attending the SOLAS Open Conference and can participate in the meeting on behalf of GEOTRACES.

Ed Urban – He explained it is not clear that FE will fund any of these topics.

Gideon – He asked whether there are other topics. These were proposed: ocean contaminants both diffuse and point sources such as decommissioned oil rigs.

Action: David Turner to attend the meeting about coordinating with Future Earth that will be held in Kiel on September 7, 2015.

Action: Gideon to write a topic on deep-sea mining and send it to both SSC co-chairs and David Turner. SSC co-chairs to send the topic to Emilie Breviere and inform her that David Turner will attend the meeting in Kiel on September 7, 2015.

****NOTE:** The topic submitted is included in the Annex II of these minutes.

GEOTRACES Special Sessions

Goldschmidt 2015 – Geraldine Sarthou and Andrew Bowie

There will be 7 sessions at the meeting. Andrew Bowie and Geraldine Sarthou are coordinating the Theme 2 “Ocean Geochemistry. Present Conditions and Past Variation: fluxes, reservoirs and processes”. It is the largest theme of the conference.

Goldschmidt 2016 – Catherine Jeandel

Do we need to have a Town Hall there? Jing Zhang suggested organising a workshop to encourage Asian scientists to participate. Gideon’s opinion is that there is no need for a Town Hall, instead having several good sessions with keynote talks. Andrew agreed. Catherine pointed out that there would be also the ODV Workshop. Reiner is still gathering information to decide whether he will organise the workshop. He will contact Catherine with questions regarding the formal requirements to organise the workshop.

Goldschmidt 2017

It will be discussed next year.

Ocean Sciences 2016

Tung-Yuan Ho was a member of the Planning Committee. He reported that 8 GEOTRACES-related sessions were submitted, but that two were merged. He presented the resulting seven sessions. CE

Alessandro - He explained that he is co-charing the session on “Variability in Southern Ocean Productivity over Different Timescales” and he has a tutorial about what controls the distribution of iron as well.

AGU Fall 2015 – Bob Anderson

Bob presented three GEOTRACES-related sessions. One of them is dedicated to Russ Flegal, who is retiring from UC Santa Cruz.

Ra and Rn isotopes Workshop – Jordi Garcia-Orellana

Jordi explained that he is organising the next Ra and Rn isotopes International Workshop, which will be held in Girona. He wanted to know if he could use the GEOTRACES logo in the brochure of this meeting. He plans to have a GEOTRACES session. SSC members agreed for Jordi to use the GEOTRACES logo.

Bob Anderson – He informed the SSC that there is a special issue in *Marine Chemistry* on Radium coming soon. Can this be considered a GEOTRACES issue? No one had information about this.

Other relevant events

Gideon – He will give a keynote talk introducing GEOTRACES at the 22nd International Society for Environmental Biogeochemistry (ISEB) Symposium, Dynamics of Biogeochemical Systems: Processes and Modeling, 28 September to 2 October in Piran, Slovenia.

Discussion - Ocean Sciences 2016 Town Hall (cont.)

Bob Anderson summarized the discussion from the previous day about whether or not it would be of value to hold a Town Hall session at Ocean Sciences. The motivations for organizing it are to publicize the products of GEOTRACES to the broader ocean community and engage more people. One constraint is whether GEOTRACES has new material to present that could attract the audience.

Bob has been informed by Alessandro Tagliabue of the results of an iron model intercomparison experiment (FeMIP) and he believes it would be a good topic for the Town Hall. Two important messages are that the iron models are in severe disagreement and also that modellers still have fundamental questions that need to be answered. He believes this topic can be of interest to a broad audience.

He also proposed for Reiner to present plans for improving the IDP2017 based on feedback from the IDP2014 survey and solicit input from audience. And also to show a selection of highlights. Reiner and Gideon agreed.

Phoebe – She suggested the Town Hall to be titled “Opportunities to strengthen your proposals by using GEOTRACES data”.

If it is agreed to have the Town Hall and Booth (cost to be shared by U.S. GEOTRACES), who would like to be involved in the organization of the Town Hall? Alessandro, Reiner and Greg Cutter volunteered.

Decision: SSC agreed for GEOTRACES to have a Town Hall and a Booth at Ocean Sciences 2016.

Action: Bob Anderson, Alessandro Tagliabue, Reiner Schlitzer and Greg Cutter to organise a Town Hall at Ocean Sciences 2016.

Report results on IDP2014 Survey – Elena Masferrer

Elena presented the results of the survey designed by the DMC co-chairs and Ed Urban. A total of 262 total responses were received and from them 197 responses were completed (responded to all the questions).

Summary:

- Profile of respondents:
 - Total 262 responses from the U.S. (34%), France (12%), GB (8,5%)
 - Main Prof. level: Professor (38%), Research Scientist (21%)
 - 16% (44) are data contributors – 27% (72) plans to contribute data in the future
- Dissemination:
 - 76% (200) were aware of the IDP2014
 - 44% were aware of the IDP2014 through GEOTRACES media (website and mailing list)
 - Ocean Science Town Hall and Booth made significant contributions in disseminating the product (24%)
 - Word of mouth is in the third position (22%)
- Use of Data:
 - 33% (89) said they have downloaded data – 83% in ODV format
 - 49% (128) anticipate downloading data in the future
 - 42% used data from other scientists
 - Main IDP2014 uses: Comparison with other data, teaching and data synthesis.
- Completion of the product: Well done!
 - 89% responded that there was no missing metadata or other information
 - 97% did not notice errors or inaccuracies
 - 11 % suggested other organization or packaging of the data
 - 16% would like other formats (net cdf, Excel, matlab)

GEOTRACES Activities Plan and Synthesis Strategy

GEOTRACES Activities for the next 3 years – Catherine Jeandel

Catherine Jeandel explained that the document was prepared to seek funding for GEOTRACES and it was submitted to NSF by SCOR.

GEOTRACES Synthesis Strategy

Royal Society Science Meeting and Workshop – Gideon Henderson

The first 2 days (7-8 December 2015) are open to anyone, with a capacity of 300 people. The goal is to publicize the success of GEOTRACES. The meeting will be held at the same time as the AGU Fall meeting and also the COP21 meeting to be held in Paris.

Gideon reviewed the programme and the different sessions. The Royal Society seeks to attract journalists and government officials, so he advised to keep the topic broad; however, people shall not hesitate to include cutting-edge science.

Maite – She asked the type of audience. Gideon answered that people should target a broad ocean science audience.

Gideon explained that transport and living expenses for the 16 speakers and the 5 conveners will be covered by the Royal Society. U.S. GEOTRACES is covering the cost of about 20 U.S. scientists. GEOTRACES will contribute 20kUSD through SCOR, as agreed yesterday.

The second part of the meeting (9-10 December) will be held at Chicheley Hall under invitation only and it will be focused on synthesizing GEOTRACES findings related to TEI supply and removal at the ocean boundaries. It is limited to 90 people so participants need to be selected carefully to make sure that there are the best experts to ensure a good discussion. He believes that any of the participants to the SSC or committees should be invited to attend.

Gideon reviewed the goals of the workshops and the outputs. The workshop aims to produce 4 papers. Each paper would synthesise understanding about fluxes for one of the four boundaries.

There was discussion about the format. The suggested format includes 5 keynotes (on mid-ocean ridges; sediments; fluxes across the continental shelf; isotope tracing of boundary fluxes; and modeling of boundary fluxes). Gideon presented a preliminary list of speakers. The second day they will break into four groups. There will be 2 oral presentations, one about lessons learned from the SOLAS programme and a second one about lessons learned from Great Rivers Observatory.

Gideon then presented the breakout sessions:

- Session 1: Can we quantify the fluxes of TEIs from each boundary regionally and globally? Can we fully describe the processes that control boundary fluxes?
- Session 2: same questions as Session 1 and in addition: How do interface fluxes change in different climate/ocean conditions (past and future)?

They will encourage posters from participants. But with instructions to keep posters simple, focusing only on the data and on key interpretations.

Discussion:

Phoebe – She noted a possible overlap between “Fluxes across the continental shelf” and “Sediments”. Gideon clarified that the “across shelf” should be seen as more of a continental source term rather than an input from sediment diagenesis.

Maite - She asked whether biology would be included. Gideon answered that biology will be addressed during the OCB Workshop.

Maeve – She noted that there is not good gender balance in the composition of the keynotes.

Ed Urban – He suggested that the sessions use IDP data.

Bob – He suggested working groups be target to identify inconsistencies in interpretation of different TEIs in terms of fluxes and the processes that control them.

Discussion – How will the participants be selected? How will SCOR funds be used?

Olivier – He proposed for GEOTRACES to target students. Gideon agreed; however, he noted that it would be important for the discussion that professors are present.

Catherine – She proposed to target a broad geographical coverage (outside the normal EU and USA) and especially to encourage participation from Asia and South Africa. She also suggested funding only one person per lab.

Vanessa – She believes it would be good to invite people from Argentina.

Action: SSC members to suggest participants for the Royal Society Workshop to Gideon.

Gideon – He would make the website open as soon as the list of speakers is finalized. Then the committee will suggest national representatives to spread the word. He suggested that the Scientific Committee of the meeting plus Bob Anderson (representing the United States) be established as the group that will select who will receive the funding.

US GEOTRACES and OCB Synthesis Workshop – Bob Anderson

Bob has included the synthesis workshop on internal cycling of TEIs within the ocean (OCB Workshop) in two proposals that have been funded, so he believes U.S. GEOTRACES will be able to cover the costs of about 20 scientists from nations other than the United States.

Unlike the Royal Society Workshop, which has very well defined goals, the goals for the internal cycling meeting are more vague. Bob asked “how to pursue synthesis in this case?” He proposed to organise a scoping workshop, more like the Toulouse workshop in 2003 that defined the goals of GEOTRACES. The proposal is for the workshop participants to work on identifying the goals of a multi-year effort on synthesis in internal cycling and then the individuals to seek funding nationally to pursue the goals defined.

Bob explained that the week after this meeting, he would make a presentation at the OCB Summer meeting at Woods Hole. Also, a group of U.S. SSC members (4-5) have volunteered to participate in the planning meeting for the workshop. Bob invited members from nations other than the United States to get involved in the planning of the meeting and especially emphasized the need to include more biological expertise. Maite Maldonado accepted joining the planning committee.

Bob explained that there is no venue yet decided. The initial timeline for the meeting is late June next year, since this is the best moment for meetings for U.S. participants. A lot of the plan will be discussed during the OCB meeting next week.

Questions:

Olivier – He asked “Would that workshop be an opportunity to rephrase some of the objectives of GEOTRACES?” Bob explained that they have been advised from the beginning not to change the GEOTRACES Science Plan, but to complete it. Other programmes, such as JGOFS, have changed objectives and it did not work very well. There is a lot that can be brought into the GEOTRACES programme, but it would not be necessary to redefine the goals.

Alessandro – He underlined the value of this workshop for modellers. Bob agreed, it is not possible to have a generic model for micronutrients (Fe and Zn distributions show they are very different), so there is a need to focus on the internal cycling so that the broader community modeling can gain a better understanding of biogeochemistry.

Greg – He asked about the number of people that can participate. Bob answered that this normally is 60-70 participants, but it might be larger in this case.

Gideon – He asked about the plan to organise the workshop. Bob answered that during the OCB summer school, there will be discussions to create a joint planning committee.

Since all the funding is coming from U.S. sources, is it sensible to have a U.S.-only committee? Bob explained that OCB is an umbrella in the United States that covers SOLAS, IMBER and other ocean biogeochemistry programmes. OCB makes always an effort to bring people from the international community, so members from nations other than the United States are welcome. Bob emphasized again the need to have more biological expertise in the planning committee.

Multi basin-scale synthesis workshop to connect GEOTRACES with broader datasets - Alessandro Tagliabue

Alessandro explained that this workshop was suggested at the time of preparing the 3-year plan that Catherine presented previously. After the release of the next IDP it could be interesting to conduct a broader synthesis to place GEOTRACES in the context of other existing datasets. So far, there are no specific plans. The timeline would be 2017-2018, after the completion of the two other synthesis workshops.

Olivier – He asked whether this workshop would be held in addition to the data-model workshop included in Ed Urban’s budget? It is probably not necessary to have both workshops.

SSC rotations

Reiner’s term as an SSC member ends at the end of the year. Could this term be extended? Ed Urban clarified that Reiner had been SSC member for five years and SSC co-chair for a term of three years. Reiner could have a second term as SSC co-chair but it would require for GEOTRACES to ask SCOR for a special permission. Ed Urban suggested to request for an extension of two years so that he could oversee the production of the IDP2017. There was unanimous support for renewing Reiner as co-chair.

Ed Boyle will complete his second term as co-chair at the end of 2016. There is a need to find a replacement.

Gideon – He recommended for the future co-chair be invited to join the SSC in advance so that Reiner could train him/her.

Reiner – He thanked the SSC for the trust and agreed to continue as co-chair if SCOR approves the extension of his term.

Action: SSC co-chairs to request permission to SCOR to extend Reiner's term until the end of 2017.

Action: SSC members to propose names to replace Ed Boyle.

The meeting is interrupted to allow Susan Allen and Jim Christian presenting the MEOPAR Network. MEOPAR has contributed funding to this meeting.

Marine Environmental Observation Prediction and Response Network (MEOPAR) - Susan Allen and Jim Christian

MEOPAR is a network of 41 currently funded projects spread across 162 universities and partner organizations. It covers a broad range of ocean science disciplines, with a strong emphasis on societally relevant applications. It has several levels of activities divided into 4 cores. The themes are climate and weather. Some of the projects look at the interactions of these themes. Originally, there was an observational and prediction core, but now there is also a response core. There is funding available to allocate to projects. For further information, see <http://meopar.ca/>.

SSC rotations (cont.)

Three members are rotating off the SSC this year: Andrew Bowie, Angela Wagener and Olivier Marchal.

There is no need to replace Angela since Vanessa Hatje was already invited onto the SSC to overlap with Angela.

Should we add a modeller to replace Olivier? Maybe he/she should be from the United States to maintain country balance.

Discussion - Should it be necessary to discuss Ludmila's replacement?

Ludmila has not attended the past meetings.

Catherine – She suggested for Michiel to look for a replacement during the Russian workshop.

Olivier – He proposed for SSC co-chairs to contact Ludmila and see if she still has an interest.

Action: Reiner to ask Michiel to identify a possible replacement for Ludmila during the workshop.

Action: SSC co-chairs to ask Ludmila whether she is willing to continue serving.

Discussion - Replacement for Olivier Marchal

Olivier – He proposed Adrian Burd. In the past 15 years, he has been working on modeling particle dynamics to study aggregation processes. Olivier is meeting with him next week at WHOI.

Catherine – She noted that Adrian had a paper included in the Data-Model Workshop special issue. Catherine and Alessandro explained that Adrian wrote the paper without waiting for other large-scale modellers.

Reiner – He suggested Keith Moore. Olivier answered that he is doing a science very close to Alessandro's. So it might not be providing new perspective into GEOTRACES.

Catherine – She suggested Lars Stemmann. He is doing modeling, but he is very close to experimentalists. One constraint is that he does not have trace metal expertise.

Gideon – He proposed Eric Achterberg. He has been heavily involved in UK GEOTRACES and now that he has moved to Germany is also very involved bringing German data and also providing reference seawater samples. Bob spoke in favor of Eric Achterberg, as well.

Bob Anderson – He suggested 3 bioGEOTRACES names: Kathy Barbeau, Mak Saito and Ben Twining. Alessandro, Gideon and Phoebe spoke in favor of Mak. Mak is well positioned to link GEOTRACES to the -omics fields.

Gideon – He proposed replacing the 3 SSC members (Angela, Andrew and Olivier) and not only 2. Ed Urban said that there might be budget concerns because it means adding 1 more SSC member. Reiner proposed to compensate this by replacing 3 instead of 4 SSC members next year.

Reiner – He summarised: There are strong arguments for Eric Achterberg. Mak Saito has received very good comments too.

Gideon – He pointed that if Ed Boyle steps down we need a U.S. replacement and this could be an existing U.S. SSC member (Phoebe) or the new member elected. Whoever is nominated may become the next SSC co-chair.

Discussion - Replacement for Andrew Bowie

Andrew – He recommended three names: Michel Ellwood, Rob Middag, and Zanna Chase.

Zanna Chase: She is Canadian from origin and is working on radioisotopes, metals and bio-uptake.

Michel Ellwood: He has been involved in GEOTRACES for a long time (trace elements and stable isotopes, Zn-Si).

Rob Middag: He has been in New Zealand for 3 years. He is heavily involved in Dutch GEOTRACES projects, but not yet in Australia-New Zealand voyages.

Phoebe – She noted that Zanna is at the same university as Andrew, so she suggested that it might be better to involve other universities.

Greg– He spoke in favor Michel and Zanna.

Bob – He noted that Zanna Chase is involved in the coordination of Theme 2 of the Goldschmidt 2015 Conference.

Reiner – He pointed that if GEOTRACES would have a major focus on paleo, this is an argument to invite Zanna. Other members spoke in favor of Zanna.

Reiner –He summarized: Zanna Chase and Eric Achtenberg have received strong support.

General discussion:

Bob – He suggested decoupling the discussion of future co-chair from the discussion of SSC membership. He argued that there is a need to add more expertise on particle dynamics, as much as, -omics but at least Maite can cover the -omics topic. If Olivier rotates off, there is not enough expertise on particle dynamics in the SSC.

Gideon – He noted that the rules do not require for GEOTRACES to have a U.S. co-chair, just that co-chairs cannot be from the same country. So a possibility could be for a co-chair to be from Australia, for example.

The discussion ended by proposing the following three names: Eric Achtenberg, Zanna Chase and Adrian Burd.

Action: SSC co-chairs to invite Eric Achtenberg, Zanna Chase and Adrian Burd to serve on the GEOTRACES SSC, subject to approval by SCOR.

Action: Ed Urban and Elena to prepare the SSC nominations memo.

DMC Rotations

Alessandro has been co-chair for 3 years, so his term needs to be renewed. Agreed.

Decision: Alessandro Tagliabue is appointed for a second term as DMC co-chair.

S&I Rotations

Greg – He explained that the Committee has 4 new members this year. Greg, Maeve and Peter Croot are the only members having experience in the Committee. Greg Cutter proposed for him to rotate off next year, but to continue as ex-officio member to help the new co-chair. The plan is to rotate off after the S&I Committee meeting in June 2016. Reiner agreed that it is important to keep his expertise.

Discussion - Replacement for Greg Cutter

Which expertise is needed in the S&I Committee?

Phoebe – She suggested to include one person having particle experience. Geraldine suggested H el ene Planquette. Both Phoebe and Catherine supported the appointment of H el ene.

Bob – He noted that data from stable metal isotopes (Fe, Zn, Cu, Cd, Ni) is growing so the Committee might need someone to cover these data. Tina might cover this, but the committee might need additional expertise on this topic. Jun Nishioka and Tung-Yuan Ho were suggested.

Decision: Greg Cutter to rotate off as co-chair during next S&I Committee meeting in June 2016.

Action: S&I Committee to discuss and recommend a plan for Greg Cutter’s replacement. If required, the S&I Committee can consider adding new expertise (e.g. particles or stable isotopes expertise) even before the meeting in June 2016.

Venue for next SSC meeting

Venues: Four possible venues were discussed: Toulouse, Barcelona, Australia and Brazil.

Brazil- It will not be possible to organise the SSC in Brazil in 2016, but it is proposed for 2017.

Barcelona – Jordi is already organising an international meeting next year so it would be difficult for him to host the SSC as well.

Australia -It is not possible to organise a meeting in Australia without finding additional sources of funding. Andrew will continue exploring funding possibilities in order to organise a meeting in Australia.

Decision: 2016 SSC meeting to be held in Toulouse.

Action: Andrew to explore possibilities to raise funding for organising a SSC meeting in Australia.

Action: Elena to send a Doodle poll that includes the following weeks: 12-15 September / 19-23 September / 26-30 September 2016.

Any other business

Budget – Ed Urban

Ed Urban has updated the budget to include the outcome of the discussion held the previous day.

This budget includes these additions: joint DMC and S&I Committee meeting (15kUSD for 2016), BioGEOTRACES Workshop (15kUSD for 2015), Russian Workshop (5550 USD), OS2016 (3kUSD), Workshop with PAGES (15kUSD) and IDP2017 Launch (10kUSD).

Reiner thanked everybody for participating in the meeting and especially, he thanked Maite Maldonado for her hospitality.

Meeting adjourned.

Annex 1 - Email announcing IDP2017 Timelines

Dear GEOTRACES Investigator:

Following the very successful release of the first GEOTRACES Intermediate Data Product in 2014 (IDP2014, <http://www.bodc.ac.uk/geotraces/data/idp2014/>), **we plan to release IDP2017 at the Goldschmidt meeting in Paris in August 2017.**

This email details the approach that will be undertaken in preparing the IDP2017. Ensuring that data can be processed in an ongoing manner instead of at the last minute has motivated the creation of three data submission timelines:

- A) November 1st 2015** for January 2016 review and recommendation
- B) April 1st 2016** for June 2016 review and recommendation
- C) December 1st 2016** for March 2017 review and recommendation

We **encourage people to submit their data by Deadline A** if at all possible to facilitate the workload of the Standards and Intercalibration (S&I) committee and the GEOTRACES Data Assembly Centre (GDAC). It will make the effort of compiling the next IDP significantly more straightforward if a significant fraction of data is received at an early stage. We are therefore asking the community for its support; please try to find the time to submit data as soon as you can.

Deadline B is the latest date for submission at which the GEOTRACES Programme will guarantee that data can appear in the IDP2017.

Deadline C is the final deadline to submit data. No data will be accepted to the IDP after that date. The programme will make every effort to process all data submitted before this deadline but, depending on workload, cannot guarantee that all data can appear in the IDP2017. In that case it is anticipated that sections will have priority over process studies, which will have priority over compliant data.

We wish to emphasize that submission of data at any point does not result in public release of that data. The only people who will have access to your data will be the S&I committee. The Data Management Committee will contact all PIs from December 2016 onwards to request permission to publicly release data in the IDP2017. Final decisions about release of data always remains with the scientist who collected and submitted that data.

We welcome submission of data from GEOTRACES Sections, Process Studies and Compliant Data (<http://www.bodc.ac.uk/geotraces/cruises>).

As data quality is a corner stone of GEOTRACES Data products, for IDP 2017 all data must pass one of the following quality control steps:

- (1) All key TEI data submitted for the IDP require intercalibration. Intercalibration can be achieved via cross over stations, duplicate sampling and additional analysis of

Certified Reference Materials (CRMs). Details are provided in the intercalibration procedure documents <http://geotraces.org/library-88/geotraces-policies/946-intercalibration-procedures-2>

(2) All other TEI data (non-key TEIs) to be submitted for the IDP still need to demonstrate the method used for quality control, which ideally follows the same intercalibration procedures as outlined for key TEIs.

(3) All data reports and metadata should be submitted to the S&I co-chairs and will be evaluated by the S&I.

If you are a PI or key analyst for GEOTRACES parameters, you will shortly receive an email from the S&I Committee to encourage you to undertake intercalibration. Please take a moment to revisit the criteria for intercalibration (<http://geotraces.org/library-88/geotraces-policies/946-intercalibration-procedures-2>).

We encourage you to submit data to GDAC (geotraces.dac@bodc.ac.uk) in a timely manner and look forward to working with you towards building an exciting Data Product for 2017.

Best regards,

Ed Boyle and Reiner Schlitzer (GEOTRACES Scientific Steering Committee co-chairs)

Andrew Bowie and Alessandro Tagliabue (GEOTRACES Data Management Committee co-chairs)

Greg Cutter and Maeve Lohan (GEOTRACES S&I Committee co-chairs)

Annex 2 - Topic to be contributed to the meeting

Prepared by Gideon Henderson

Environmental consequence of resource exploitation in the deep sea

The deep ocean remains relatively untouched by human influence compared to surface environments, but societal need for energy and mineral resources suggests this pristine condition is unlikely to persist. Oil and gas exploration are extending into increasingly deep waters to seek new fields, and there is significant interest in mining of minerals from the deep sea floor (e.g. manganese nodules) or subsurface (e.g. from mid-ocean-ridge hydrothermal systems). Such resource exploitation will alter the chemical cycles of all elements in the deep-sea, including nutrient elements (e.g. P, N, Fe) and those that are toxic to life at high concentration (e.g. Cd, Cu, Pb). Predicting the magnitude of these chemical perturbations is challenging, but possible given new and advancing knowledge of ocean chemical cycles derived from the GEOTRACES programme. Such prediction is essential if scientists (e.g. in the IMBER programme) are to assess the impacts on deep-ocean ecosystems that deep-sea resource exploitation will have, and the subsequent changes in surface water geochemistry and ecosystems that will occur as chemical signals are mixed and advected upwards. Close liaison between relevant industries, regulatory bodies, and scientists is important for assessment of the likely scale and style of future resource extraction and the consequence for the global ocean ecosystem.

We propose that international science programmes including GEOTRACES and IMBER work together, in collaboration with relevant industries, to assess the geochemical and ecosystem response of various future scenarios for deep-sea resource exploration and production. Such collaboration would seek to mitigate against catastrophic environmental change resulting from such resource exploitation. It would also ensure that controversy around such activity, well illustrated by the NGO-industry stand-off surrounding the proposed deep-sea disposal of the Brent Spar oil platform, would be minimised, and would help to provide a social license to operate for industries pursuing resource exploration in the deep sea.

Foreseen stakeholders: NOAA (US); DEFRA (UK); Food and Agriculture of the United Nations; Intergovernmental Oceanographic Commission of UNESCO; International Seabed Authority; industry organization from the oil and gas, and mining sectors; fisheries;