

Draft Minutes of the 12th POGO Annual Meeting
24 – 26 January 2011
Plaza Hotel, Seoul, Republic of Korea

Monday 24 January

Inauguration

Dr. Kang extended a warm welcome to all participants. He informed the participants that KORDI has recently made much progress in advancing its capability and infrastructure for ocean observations. He wished POGO-12 to be productive in enhancing ocean observations for world society, to help predict extreme weather events and mitigate disasters.

The minutes of POGO-11 were approved by consensus and no comments were made on the Action Items from POGO-11. Dr Suyehiro then handed over the meeting to the new Chairman, Prof. Herzig.

Prof. Herzig thanked Dr. Suyehiro for his hard work, thanked Dr Kang and his team, the POGO Secretariat and the participants, with a good turn-out of 28 out of 38 member institutions. For an economic geologist his new role is not only an honour but also a challenge. He then introduced his SWOT analysis of POGO, which was discussed later in the meeting (see p. 14).

The POGO-12 agenda was adopted by consensus, after an additional presentation on Chinese POGO-relevant activities, as suggested by Dr. Qiao, was approved.

Dr. Haymet introduced the system for nominating the incoming Chair and invited nominations over the course of the next 3 days, also proposals to host one of the coming Annual Meetings.

Dr. Sathyendranath presented the 2010 budget and projected budget for 2011. Dr. Claridge noted that PML was still very committed to hosting the Secretariat and that the charge had been maintained constant since the beginning and represented only direct costs, while overheads were covered from other sources. The School of Ocean and Earth Science and Technology (SOEST) in Hawaii was welcomed as a new member of the US Consortium.

Opportunities for International Cooperation in Ocean Observations (Chair Susan Avery)

Beijing Summit: Trevor Platt

The 7th GEO Plenary Session and 2010 Ministerial Summit was attended by a strong POGO delegation, consisting of Kiyoshi Suyehiro, Jesse Ausubel, Sun Song, Yin Hong, Gao Li (from IOCAS, Qingdao), Trevor Platt, Shubha Sathyendranath and Sophie Seeyave. The delegation manned an exhibit on behalf of POGO and Oceans United with contributions from CoML and GOOS. POGO also issued a press release which received an excellent response from the media. The delegation also attended a User Engagement Session and contributed ocean-related presentations on SAFARI (Platt), ChloroGIN (Sathyendranath), Census of Marine Life(Ausubel), and Arctic Observing System (Alverson). There was also a presentation on the Coastal Community of Practice. POGO made a 2-min statement at the Ministerial Summit, stressing the importance of the oceans for GEO and for society. The "Oceans" movie was screened in the POGO-Oceans United exhibit and in the main auditorium. POGO also Participated in GEO press conference for the Chinese media.

One of the issues is that the profile of oceans should be raised within GEO. POGO spoke to members of the GEO Secretariat, including the Executive Director and national delegates, about how to achieve this. It can be achieved through the creation of a new GEO Task, to run for the next 5 years. Proposals are being accepted at the moment for such new tasks. The possibility of submitting a task, and its scope should be finalised at this meeting. The theme could be "climate and ecosystems of the ocean". POGO members should also approach their national representatives and other participating organisations within GEO to help give ocean issues the attention they deserve.

Framework for Ocean Observing: Mike Meredith

A task team was formed after the Ocean Obs' 09 meeting in Venice to put forward ideas for a framework for ocean observing over the next decade, and advance the implementation of a sustainable global observing system. The members were sponsored by various organisations including POGO. The remit of the framework is to provide guiding principles and best practices for setting ocean observing requirements, but not to specify the ocean variables to be measured or any specific observing system plans.

The idea of the task team was to apply systems thinking to a complex process, whereby the inputs are driven by societal needs, the process is the observations themselves, and the output is the data/products. There are elements that can already be placed within the framework, e.g. climate/physical variables, currently the most mature ocean observations. Here, the input is the societal need for climate predictions. The process is composed of various platforms/networks currently doing those measurements and the output is data products via data assembly centres. Data quality assessment represents a feedback loop in the process. The Framework is structured around Essential Ocean Variables, and aims to expand the suite of EOVs measured from just weather and climate to a more comprehensive, cross-disciplinary range. The EOVs weren't defined by the Framework, the idea is for them to be determined by groups working within the Framework. The EOVs can develop over time, as new requirements are identified, and allowing for technological innovation.

The oversight task is performed by an expert scientific group who will develop sampling strategies and implementation plans. The observations would be coordinated by JCOMM-like bodies. These would be charged with developing the optimal configuration of platforms and technologies, and maximising the return on investment in infrastructure etc. An important principle of the Framework is also free and open exchange of data. The framework can identify gaps where organisational bodies don't exist to oversee certain types of measurements, e.g. biological variables. The Framework also identifies different readiness levels, i.e. "concept", "pilot" or "mature".

A central tenet of the working group's discussions was to build on existing structures and use historical data. It is now soliciting feedback from the sponsors. POGO members should give the Framework developers their views, areas of uncertainty/concern, suggestions, and help determine the role POGO would like to play in further developing or implementing the Framework. The Framework also needs a connection to education/outreach and a link to capacity development, and possibly a sub-group in charge of the networking aspect of bringing all the data and people together (e.g. via websites and/or social networks). The 2nd consultative draft will become available at the end of January. The aim is to finalise the recommendations with feedback from sponsors by the end of March, for submission as a formal information document to the IOC Assembly at its June 2011 meeting.

US Ocean Observatories Initiative: Tim Cowles

The OOI is a system of systems that will last for 25-30 years, measuring air-sea, water column and seafloor processes. It is funded by NSF and managed by the Consortium for Ocean Leadership. The OOI is now in its implementation stage, in its second year of construction out of 5.5 years. The early stages of the planning process are guided by scientists who frame science questions and propose solutions, however the engineering and management aspects take over given the financial scope of the construction project (400 M USD over 5 years).

The OOI addresses 6 Science themes with 4 overarching science foci (climate change, carbon cycling, ocean acidification and ecosystem health). From the science requirements comes the foundation for science mandates: (1) to provide sustained delivery of high quality data for 2-3 decades, and (2) to maintain expandability of the infrastructure. The baseline design consists of 4 sites in the North and South Pacific, North and South Atlantic, 3 regional cabled sites, and 2 coastal arrays including fixed and mobile arrays (i.e. gliders/AUVs). Cyber infrastructure connects the various components, providing open access data. There are 49 types of sensors, covering biology, chemistry, physics and geology, distributed throughout the water column, e.g. echosounders, pH, pCO₂, nutrients, dissolved oxygen, irradiance, optical absorption, zooplankton, etc. Once fully deployed, the system will comprise over 1000 sensors working full-time.

Lessons learnt:

- Essential that rigorous system engineering practices are in place.
- Need to expand institutional processes, anticipate an increase in money flow, people flow and people problems with the transition from planning to construction.
- Prepare for the pace of construction, have to report progress/expenditures on a regular basis (e.g. monthly).

- Need sufficient numbers of skilled staff.
- The planning team may not be the building team.

The OOI is only a piece of the global problem. Others in progress or in planning can provide lessons, e.g. Canada, EU, Australia, Japan, Korea, China, India. A major issue is interoperability between the different systems, especially since some systems are already being implemented. We need to put pressure on our governments and colleagues to work together because ultimately we will want to use these systems for a global assessment or global experiments, so we need a shared objective. We also need to expand relationships with the newer systems (Australia/Asia). The key is the implementation of intergovernmental and interagency processes to agree on data and instrument protocols.

The funding schedule has allowed for no coordination with GEO or the rest of the world. There had been discussions but no formal alignments or memoranda. They published technical details for new systems to be built in the USA, but the process was not consultative.

The implementation of observing systems in the current financial climate: Andrew Willmott

The main thrust of the presentation was to address the question "What does IOC do for sustained ocean observations?". The IOC has significant political influence, successful programmes such as Argo and the Global Sea Level Observing System (GLOSS), and some not so successful programmes, such as GOOS, due to lack of funding. There must be end-users requiring EOVS, as defined by the Framework for Ocean Observing, and these would be useful for further implementation of GOOS.

Successes of POGO:

- Founding institutions had the operational capability to conduct sustained ocean observations;
- Training and education;
- Good advocate for oceans within GEO.

Perceived limitations of POGO:

- POGO declarations have low visibility;
- Mission drift as more members join with different capabilities;
- No strong partnership with IOC.

In UK there will be a decrease in funding over the next 4 years and there will be a review of sustained observations. Most observatories around the UK are often located for convenience, not for strategic reasons. The UK does not have the right network for sustained observations of the NW European shelf (e.g. nothing in Celtic or North Sea), thus there is a need to coordinate with other areas. NOC is currently discussing plans for a new observation network that meets scientific and statutory (EU) requirements. The network could be built in a more cost-effective way using new technologies such as gliders and AUVs.

Recommendations:

- IOC and POGO should collaborate to make GOOS and GCOS successful. IOC has the political influence whereas POGO has the operational capability.
- GOOS-endorsed sustained observations will help develop an enduring network throughout good/bad economic times.

Dr. Luyten underlined that the IOC was not the proper vehicle for POGO to reach policymakers, and that ocean issues couldn't be discussed within WMO. The functions and people in IOC and POGO have to be different (implementers in POGO) but because of this difference there is an increasing need for IOC and POGO to work together. To make GOOS work, there are 2 directions to consider: (1) regionalise to increase efficiency, and POGO has been invited to provide input to the IOC Assembly discussion; (2) use the FOO to make the global array work.

Oceans Community of Practice: Bob Weller

The concept of a community of practice comes from business, and can be defined as "a group who share a common interest and desire to learn from and contribute to the community with their varied experiences". The CoP should serve the individual's interests and those of the community. It is a pragmatic, focused effort, with positive feedbacks that sustain its existence.

POGO has been supportive of GEO for many years. However, the input to GEO through various committees has not been very successful, therefore GEO is now starting to focus more on CoPs. IEEE and MTS have sponsored CoP workshops for existing CoPs, e.g. Biodiversity Observation Network, Coastal Zone, etc. A

GEOSS CoP is a user-led community of stakeholders, from providers to financial beneficiaries, of Earth observation data and information, with a common interest in specific aspects of societal benefits to be realized by GEOSS implementation. There are many requirements from GEO, such as reporting, providing points of contact, and so on. We're at a critical point in the community, struggling to justify blue water research and not always successful in setting up coastal observatories or explaining the relevance of sustained ocean observations. A CoP wouldn't duplicate what POGO and IOC are already doing. With IEEE/MTS sponsorship we could focus on sensor development. Perhaps there is a real need for a CoP, with an end-to-end infrastructure.

UN Regular process for global reporting and assessment of the state of the marine environment, including socio-economic aspects: Sophie Seeyave

The Regular Process was agreed at the World Summit on Sustainable Development in Johannesburg (2002). It is an intergovernmental process, guided by international law. The start-up phase consisted of an "Assessment of assessments", which was one of the main foundations for the Regular Process, co-lead by IOC and UNEP and concluded in 2009. A regular assessment of the marine environment is required to provide a clear overview at the national, regional and global levels, because there are currently relatively few marine areas subjected to broadly based assessments. The report of the UN Secretary General (April 2010) stated that the Global Environmental Facility (GEF), the World Bank and the donor community should be encouraged to interact with the Regular Process with regard to capacity building.

The Regular Process should be based on sound scientific information and adequate data on all aspects of the marine environment collected on a regular basis. This expertise resides in POGO member institutions, but are they involved? Apparently KORDI are contributing to the process but no other members at the POGO meeting provided information about the involvement of their institutions. Furthermore, the Regular Process could provide additional justification for enhanced ocean observations at the global scale. Ways in which POGO members could contribute might be through individual members acting at the national level, through joint actions with IOC, or through POGO seeking consultative status.

Gap analyses as part of the Assessment of Assessments are underway at the regional level. Dr. Avery said the data issue was big problem of the Assessment of Assessments, which was too complex and comprehensive, and some relevant data may have been ignored. This was an issue with the first IPCC assessment which had too much focus on gap analyses. Dr. Svendsen added that it is not easy to do a proper Assessment of Assessments even where there are good data. For example, UNEP recently had to withdraw a report because they hadn't looked at all data that were available.

General Discussion on Ocean Observations

Dr. Knap suggested POGO should put energy behind OceanSITES (60 time-series sites around the world sharing data). The data coming out of some of the time-series observatories has shown unprecedented changes in the biogeochemistry of the ocean. Concrete ways for this would be more coordination, or money to help fund a project office.

Dr. Haymet suggested defining POGO's role. His definition would be an organisation that supports the development of an effective IOC. IOC should be about implementation, not just a political organisation. For this, IOC would need to be independent from UNESCO, with more flexible funding. In addition, the ocean should be considered as a single entity, as the atmosphere has been, and no longer divided into sectors (IMO for transport, FAO for fisheries, IOC for research), a structure that is not very efficient. We have to start by explaining (maybe within GEO framework) that the existing UN arrangements are not satisfactory and help IOC become more effective (and include implementation) then deal with the fractionalisation of sectors.

Dr. Dosdat commented that there had been no presentations on behalf of POGO. We need a stronger agenda with a few selected issues on which POGO should publish recommendations to its "clients" (e.g. governments/intergovernmental organisations). For this we need to define who our clients are (IOC? GEO?) and what type of products they want. The documents POGO has been releasing have had a very poor visibility. POGO has no capacity to implement, apart from some active members and the Secretariat. It should make recommendations to its members on how to self-organise to implement an observing system.

Dr. Weller suggested setting up an ocean trust fund, an idea that has been in discussion in the US. POGO might support the notion that part of the revenue from the oceans (e.g. fines for environmental damage) could be transferred to an international trust fund to support sustained ocean observations. POGO members could pull together to propose a new way of funding ocean observations.

Dr. Svendsen said we need to focus on products then define what end-to-end infrastructure is needed to deliver these. Neighbouring countries conducting observations in adjacent areas are not able to cooperate to deliver products. Furthermore, observations are not enough due to their limited spatial and temporal scales, therefore products will need to come through models. Finally, it is disappointing to see how little the international organisations are contributing to deliver the products that are needed by society.

Prof. Herzig suggested producing a Declaration from the meeting to deliver to POGO's customers.

Prof. Wiltshire said that the POGO members attending the meetings need to get beyond representing their own institutions/GEO/disciplines and their interests. They need to think in POGO/ global terms, step outside personal boundaries, and this takes a huge shift in thinking. Every year the same issues are discussed.

Dr. Cowles said the POGO institutions have the expertise and experience but don't have operational capability. Accurate scoping is essential to establish an operational system. This is hard to do for researchers, and it is a struggle to define actual costs to funding agencies. Dr. Taylor disagreed that POGO members don't have operational capacity. Some institutions have operational capacity, although at the engineering level there are some incompatibilities (different funding streams, different observing systems...).

Prof. Willmott said GOOS and GCOS were in danger of stalling or shrinking. There is currently no rallying point for POGO. It may be that POGO and IOC should help get those existing programmes back on track rather than inventing something new.

International Disaster Response and Preparation (Chair Tony Haymet)

Example of the Gulf of Mexico oil spill

The NOAA perspective: Robert Haddad

The Gulf of Mexico oil spill resulted in the release of 200 million gallons of crude oil over a period of 3 months, impacting an area of 31,000 square miles. NOAA's role in the oil spill response was:

- To predict the oil trajectory, develop shoreline assessment and clean-up strategies; provide weather support and oceanographic support. Very little incremental funding was received for this work, and academic, NGOs and intergovernmental organisations were very involved for the first time.
- Enforcing closed areas and implementing strict re-opening protocols using a rigorous testing regime.
- Protecting wildlife and habitat
- Assessing ecosystem injury.

The lessons learned were very similar to those learned from the Exxon-Valdez oil spill, which were never implemented. The 24h news culture that exists now makes it more challenging to ensure that the correct messages are sent to the public. Research and development is facing a decline in funding, exacerbating the need for robust R&D efforts between spills. Of course, it would have made a big difference if an observing system had been put in place in the Gulf of Mexico 5 yrs ago. The projected opening up of shipping lanes in the Arctic pose a big risk, because of its fragile nature, the lack of infrastructure, lack of baseline data, and many unknowns regarding the behaviour of oil in ice. NOAA would like to see a deep ocean observing system as a result of the Deepwater Horizon oil spill.

The NSF perspective: David Conover

75% ocean research is funded by the NSF Division of Ocean Sciences. Peer-review of grant proposals typically takes 3-4 months, which is too long to allow for a rapid response to urgent opportunities. NSF has a new system since 1999 for this type of need, which was used for the GoM oil spill. The first Rapid Response Grant (RRG) request was received 2 weeks after the Deepwater Horizon oil rig explosion occurred, and the first grant was awarded 2 weeks after that. Two cruises started the following day. At the end of May the community was informed about the rapid response grant opportunity. A series of workshops was held in late August to coordinate academic and federal agency research efforts.

A large proportion of NSF funding was spent on RRGs (7 out of 20M USD). The average award processing time in OCE was 11 days. There is no special budget allocation for the RRGs, therefore they used end of year money that would normally have been used for other projects funded through the regular system.

There was a huge interest in doing research on this topic. The institutions themselves made funds available before the NSF grant actually arrived. The first publications on the oil spill appeared in August, showing that the Rapid Response award programme worked well. Some of these publications led to advances in the general knowledge of oceanic processes (e.g. methane degradation).

BP has made a 500M USD commitment to support independent research led by an institution from a Gulf of Mexico state over the next 10 years. However, only 40% of RRGs were awarded to GoM states, therefore >50% of US institutions will be excluded from this opportunity. NSF is to renew RRF proposals ("RAPID Renewals"), through submission of proposals that will be subject to full external review.

The system worked efficiently because it was an extremely high-profile event, there was a lot of motivation to work quickly to get data out. RAPID award system was already in place, requiring only very short proposals (lesson learned from previous disasters).

Other examples:

JAMSTEC programme for earthquake monitoring (DONET): Yoshiyuki Kaneda

An M8+ earthquake occurs every 100-200 yrs around Japan, the last time being in 1944/46. JAMSTEC developed a simulation based on physical modelling to find where the ruptures start. This identified the Tonankai seismogenic zone, consistent with the last 2 earthquakes. Real-time monitoring of the seismogenic zone is very important. This is achieved through the Dense Ocean floor Network system for Earthquakes and Tsunamis (DONET). The system consists of a landing station and 5 science nodes connected by a backbone cable and sensors. Eventually 20 observatories will be deployed (currently 8). ROVs are used to maintain the system. Earthquakes are detected through ground motion sensors and pressure sensors for

broadband phenomena. DONET provides data earlier than the land stations, and shows a clear tsunami signal that coastal observations don't.

DONET 2 has already started since 2010. It will cover a wider area and consist of 29 observatories (very dense array) and use a higher voltage system. Simulation models are being improved with data assimilation. It is also hoped to deploy DONET 3 in the future. International collaboration is very important (with China, Canada, Korea etc). A key question was how to integrate the standardisation and development. Borehole observatories will be integrated with DONET (funded by JAMSTEC).

Purdy asked what the relationship was between JAMSTEC and the agency in charge of issuing the warnings. JAMSTEC provides raw data and the Japan Meteorological Agency does the analysis/decision making. The cost of DONET is 50 million and DONET 2 is 90M USD, although it prevents damage in the trillions. There is a maintenance fund to cover the cost of maintenance and repairs in case of any failures.

Recovery of science from Chilean earthquake: Leonardo Castro

Damages:

The tsunami struck several islands and coastal towns in Southern Chile, including Dichato where the Marine Biological Station of the University of Concepcion was located. The research boat Kay Kay was damaged but has been repaired and re-launched in 2010. A new Chilean research vessel to be launched on same day as the tsunami, was lifted onto dockside and partly damaged. It is now to be launched in 2012. Coquimbo current-meter mooring lines were in storage in Dichato and were lost. The current metres were recovered but are out of date (no spare parts).

Recovery:

Support was received from various sources. A new project has been set up to create an associated international laboratory in collaboration with France, including funding to help rebuild research laboratories in Concepcion and Dichato. The MARUM centre in Bremen donated 45K EUR worth of scientific equipment. Luckily, the new oceanography building at the University of Concepcion was not damaged, and the inauguration took place in Dec 2010. The Austral Summer Institute (ASI) continues, with 207 applications for the 2011 programme (for 54 places). The public workshop on tsunamis was well received by community. The clean-up at Dichato has been completed, and in early February some laboratories that were not badly damaged will be operating again. Plans have been prepared for a new station to be located at a different site, above 30m altitude.

How can POGO help:

- Continue with Coquimbo mooring (annual maintenance 56K USD) –needs help to replace equipment.
- New infrastructure at Dichato: help find funding sources
- Continue to fund ASI –very successful course important for the region and attracting students from around the world.

UDEC doesn't expect POGO to finance all this but POGO could help to find alternative funding sources, promote the need for the Coquimbo mooring station, and for other institutions/programmes to share the mooring, add their own instruments etc. The new station in Dichato aims to be an international station that could be used as a base for researchers from around the world.

Prof Herzig suggested putting these ideas on the POGO website to publicise the sort of help that is needed and opportunities for collaboration.

The UN Global Impact and Vulnerability Alert System: Sophie Seeyave

Against the backdrop of the global economic crisis, the G20 Summit in London (2009) called upon the UN to establish an effective mechanism to monitor the impact of crises on the poorest and most vulnerable. This will take the form of a global alert system linking existing alert systems and capturing new real-time data streams using innovative technologies, to provide evidence-based information to decision-makers.

The first report of the Secretary General was published in Sept 2009 on the impact of the economic crisis on the poor and vulnerable. In Dec 2009, the Rapid Impact and Vulnerability Analysis Fund was launched (funding for UN projects, mainly on impacts of economic crisis). In June 2010, GIVAS officially changed its name to Global Pulse. Plans for 2011 are to develop an analytical framework, core indicators and methodology; to conduct a UN-wide survey of existing vulnerability and impact monitoring systems; to engage with experts and software developers to help build technology; and to develop a network of regional "Innovation Laboratories".

Global Pulse seems very much focussed on socio-economic aspects, such as impacts of the economic crisis on education, crime, migration, tourism etc. There is no mention of climate-related impacts, tsunami early warning systems, monsoon predictions, and so on. It is not clear how POGO could contribute to this initiative.

General discussion of disaster response:

Every country could benefit from having a system like the NSF RAPID grants. POGO could write a letter underlining the value of such a well-planned mechanism that could be triggered in response to any man-made or natural disaster. However, even without an official system, the POGO network should be used to plan ad-hoc research in response to disasters. Furthermore, responses have to be integrated within each jurisdiction's existing plans.

POGO members could develop an international contingency plan for rapid intervention (and 3D modelling), especially for vulnerable regions, and create a group that could address this task internationally. Fleet operators in Europe had created a task force to respond to crises. Good 3D models are needed to aid rapid response. POGO could do something more in-depth than one line in a Memorandum of Understanding.

The Australian oil spill in 2009 occurred under very similar circumstances to the GoM spill (cost-cutting, poor management), pointing to the lack of due diligence in the management of ocean ecosystems.

Dr. Campos asked if POGO would help the Brazilian oceanographic community to provide scientific advice on establishing a deep sea observatory. The idea has been issued by the Minister of Science and Technology to build this observatory on a newly-discovered oil reservoir ~300 miles offshore in 3000-4000 m of water. The Minister's idea seems to be to use money from oil companies to establish a platform for the observatory. He will be attending a meeting with the Minister in February and would welcome input from the POGO community.

We need to address the lack of commitment of operational agencies to take on their responsibilities. With enough support from people, governments should address this problem. POGO could produce a document for governments to help change policy, showing where the money needs to be spent and how much could be saved in the long run.

Interoperability is important to promote international collaboration, including in the context of disaster response. Little progress has been made on the interoperability issue. This requires advance work and should be a priority for the funding agencies. POGO could plan a meeting of systems engineers from the different networks that are being built and already operating to discuss interoperability issues. They need to see what the benefit of uniformity will be to them in the long run. The meteorological community was successful in doing this. Interoperability of heavy equipment (ROVs, AUVs with ships) is also important. The issue of international standards of data formats is equally important and this is already underway, at least in Europe.

Discussion on the relationship between POGO and GEO

The idea of the new GEO task would be to use GEO as a forum to highlight what we're already doing (e.g. OceanSITES, OOI etc packaged together for higher visibility). There are some reservations about the added value of being part of GEO, especially in relation to progress made on an ocean observing system and data curation, relative to the cost of participating in GEO meetings. There are concerns that POGO would lose some independence by having to report to GEO.

However, even small issues brought up in the GEO arena can have a high visibility at the ministerial level, and impact on obtaining funding. The fractionation of GEO into 9 societal benefit areas (all impacted by oceans) removes focus from the ocean as a whole. Now is the opportunity to create a single Task that covers all areas of oceans. Can we afford to ignore this opportunity to reach the ministerial level? POGO would not be a sub-contractor, but would be telling GEO what POGO wants to do. It is also true that in Canada and Europe GEO has been used to obtain funds. There are practical advantages to being part of GEO but these may not be uniform across all countries. This opportunity comes once in 5 years. We could put in a "place holder" broad enough to embrace anything we later decide to include, as long as it refers to societal benefits (e.g. climate change and ecosystems). The cost would be minimal, and we could review the situation next year. The commitment of POGO would simply be reporting on projects that are already being carried out, thus increasing their visibility.

Coordination between POGO, GOOS and IOC is already underway through Oceans United, which was created to provide a common voice to all parties interested in raising the profile of the oceans within GEO. The initial steps have been taken but more work is needed to achieve this goal. IOC/GOOS have been asking some of the same questions as POGO with respect to the relevance of GEO but lately there has been more hope.

Discussion on POGO's participation in Expo 2012

The 2012 Expo in Yeosu, Korea, will have very much a marine, ecosystem-relevant theme. POGO has been invited to participate in the Thematic Pavilion "Ocean and Coasts Best Practice Areas". There are 3 sub-areas: (1) Science & Technology, (2) Business and Industry, (3) Policy. POGO, GOOS, CoML and JAMSTEC have been invited to the S&T area. YCLME and NOWPAP will be in the policy area.

The detailed proposal is due 31st Jan, with further negotiations taking place until May. The issues are (1) What are the possibilities of coordination with other exhibitors? (2) What are implications for budget/manpower?, (3) Are there POGO members that already have suitable exhibits for the general public, i.e. hands-on and suitable for non-specialists. (4) Do members have an interest to participate? (5) What is possible and what is beyond our means?

Nations will approach individual institutes through the diplomatic channels through which POGO members might already be providing exhibits. It's not clear if these would end up in the International Pavilion or in the Thematic Pavilion. If audience is the general public rather than policy makers it may not be in POGO's means, although the public could be the channel to the politicians. Also, at least in Europe, the public are the end-users and pay for our science. POGO should be able to explain to the public that the oceans are important.

IFM-GEOMAR put 200 K EUR in an exhibit for the German Parliament, which was very successful (Martin Viesbeck). AWI also has an exhibit. With coordination, different members could contribute.

For the Lisbon Expo NOCS provided a research ship for a short period. Perhaps this could be done for Yeosu. IFREMER was also approached by the French committee, which has a 7M euro fund for its exhibit, and would be happy to see POGO coordinating this. There may also be the option of giving talks, in which case POGO could select the best speakers.

IOC is also planning a JCOMM symposium in Yeosu in May 2012, with the possibility of a scientific and technical symposium; a 2nd IOC/ICES/PICES symposium on climate change and impact on the ocean in Yeosu May 2012. POGO will liaise with JAMSTEC ("Deep-Sea Biosphere") about what they are planning and other members could build on this collaboration.

Tuesday 25 January

Remarks by Executive Secretary of IOC (Wendy Watson-Wright) and discussion

The focus should be on how IOC and POGO could work together to address the issues they are both concerned with, namely the need for sustained observations and raising profile of the oceans. There were frequent mentions of IOC on the first day, and the POGO-IOC relationship seems to be improving, and should continue to improve. IOC needs POGO's advice on implementing an ocean observing system, on how to make GOOS progress beyond 60% implementation. She urged POGO to get involved in the Framework for Ocean Observing, in particular the Essential Ocean Variables as an organising structure. POGO gave valuable input to the Baker Report. IOC invites POGO to participate in discussions on a new i-GOOS proposal that will take place at the IOC assembly in June.

IOC and POGO are on the same page with regard to GEO and the conversation should continue. IOC is interested in how to make the best use of existing mechanisms such as Oceans United. IOC contributes to POGO capacity building through IODE and would like to discuss formalising the arrangement into a longer-term arrangement. Both POGO and IOC were at the Capacity Building workshop in Bremen, where a lot of progress was made. IODE is also developing an on-line summer school database. Capacity Building is one of IOC's important mandates, and they wish to enhance linkages with institutions in developing countries, in particular in Africa. POGO and IOC could work better together on Capacity Building, in particular in terms of contributing to the Regular Process. IOC has been providing support and is keen to have a central role along with POGO.

Expo 2012 is a good opportunity since it is devoted entirely to living ocean and coasts. POGO and IOC are in the same boat regarding what to do now that proposals have been accepted and IOC is looking forward to further dialogue with POGO.

What can we do to help IOC explain the importance of oceans to the broader UN/UNESCO community? There are 2 governing bodies, the member states of IOC and UNESCO, and the money comes through the UNESCO delegations, not the IOC delegations. IOC is now trying to engage the UNESCO delegations, who have been responsive. IOC currently receives only 1.45% of the total UNESCO budget, even though IOC is supposed to be a flagship programme. POGO members wouldn't have much interaction with UNESCO delegations, however interacting with Ministries could have added value. It is also important to get the scientific community engaged with IOC as much as possible, for example via secondments.

What is POGO asking the IOC to do in order to be more efficient? We would like IOC to be the WMO of the oceans, to organise ocean observing systems and data sharing. IOC deserves a status at least equal to WMO, which would require it to be independent from UNESCO. Letters to the DG can be helpful. The current DG is very supportive of IOC, but also needs the support of member states. UNESCO has such a broad mandate it is hard to concentrate on a single thing. To become like WMO would require engaging operational organisations, and having a legally binding Convention. It is important to have the support of operational institutes, but also finance and foreign affairs Ministries. It is important to note that if there were a move to propose an independent WMO-like organisation, there is the risk that IOC would be asked to join WMO or UNEP.

International Science Coordination (Chair Tony Knap)

European Science Foundation (ESF) Marine Board Overview and Activities: Antoine Dosdat

The Marine Board is a European platform to develop priorities to advance marine research and build a bridge between science and policy. It is an independent body linked with other organisations and networks to provide a forum for exchange of information and future strategies. The secretariat is made up of 5 permanent people. It has a budget of 500K, 350K from memberships, the rest from contracts/clients such as FP7 projects. The Marine Board represents the bulk of marine research institutions in Europe. The Board also has a Communications Panel and a Scientific Diving Panel.

Scientific activities are carried out by experts nominated by the member directors. The Marine Board meets twice per year, and implements a variety of Working Groups decided by General Assembly. The Board decides on topics around which to form working groups for development of common positions. The main products are Position Papers outlining strategic recommendations at the institute, national or European level. Other types of products include Vision Papers, which are very short documents, easy to read for policy

makers. The Board also organises conferences and symposia, and publishes Proceedings. The Board also cooperates with industry. These products have been very successful in having an impact on European research and policy.

World Association of Marine Stations (WAMS): Herman Ridderinkhof

The members of this new network grouped together because they did not feel represented by existing organisations. There are currently regional networks (Europe, Australia etc...) in existence, so the idea is to bring them together into a global network. The network is currently focussing on biological oceanography, with the theme "From Genes to Ecosystems". WAMS was created in April 2010, with its 1st meeting held in Paris. It aims to become an NGO affiliated with UNESCO. Activities will include exchange programmes and training/education. Marine stations need to be integrated with satellites, buoys, vessels, submersibles, and cabled systems.

Application of hydroacoustics to comprehensive nuclear test ban treaty monitoring: Mark Prior

The Treaty, which establishes a ban on nuclear explosions, opened for signature in 1996 but is still not in force, as it has not been ratified by all named nuclear capable nations. The CTBTO is the treaty implementing body, in charge of verification, through an international monitoring system. Data are transmitted via satellites to an international data centre, which then transmit the data to national authorities. The hydroacoustic network consists of hydrophones and seismometers. The data volume is 3 Gb/day and data are processed daily. Data analysis can differentiate between signals from explosions, earthquakes, seismic waves, volcanoes, whale calls, icebergs, and airgun surveys.

CTBTO is paid for through UN states, and will go on as long as the treaty does. The stations have a 20 yr lifetime, therefore they need to look for ways to update the technology. The total cost is in excess of one billion USD for the entire network. Data are currently not open-access. They can currently release data under contractual arrangements, and have recently initiated a legal framework for release of data free of cost for CTBTO-relevant research. After the Indian Ocean tsunami, a contract was signed with IOC to make the data available to accredited tsunami warning centres.

Report on International Quiet Ocean Experiment Workshop: David Farmer

This SCOR/POGO project, with support from the Sloan Foundation, has progressed since the idea was first proposed, and scientists in the field seem very interested in addressing the topic of increasing sound in the ocean and its impact on ocean life. Jesse Ausubel's provocative idea of shutting down the shipping industry for 1 day (cost 10B USD/day) has stimulated lively discussion about what might be done that would be both realistic and scientifically useful.

Shipping doubles every 2 years, anthropogenic noise is increasing, especially in the <500Hz bandwidth, and increased sound in the ocean is known to have both chronic and acute biological effects. There are many difficult scientific problems to be overcome such as that of extrapolating behavioural/physiological responses to the population level. Industry recognizes that change is inevitable and the precautionary principle is increasingly becoming accepted. This changing attitude suggests the time may be right for new initiatives that engage both the marine industry and scientific community.

At the first workshop in October, participants discussed what could be learned about effects of sound on marine organisms. Almost everyone realised that quieting an ocean basin was unrealistic but agreed that interesting experiments could be done (e.g. quieting limited regions for short periods). The possibility of an International Year of Ocean Sound was suggested as a means of raising awareness of the issues involved. There is a need to coordinate across disciplines and international boundaries and to quantify the global sound field. A range of experiments were discussed, from those not requiring shutting down noise sources (e.g. opportunistic, comparative studies) to complete shutdown, and on varying space and time scales. Experiments could conceivably be devised in acoustically isolated areas such as the "Tongue of the Ocean" or in Marine Protected Areas that could lead to a deeper understanding of acoustically induced behavioural changes in marine life.

POGO-related activities in China: Fangli Qiao

In the Indian Ocean, recognising that the summer dry/flood pattern of China is controlled by the Asian monsoon at time scales of months to years, the Chinese observations will deal with the whole of the Indian Ocean. They already have three moorings in the Indian Ocean, and this April they will have two ships in the eastern Indian Ocean. They also have projects in the Southern Ocean, where multi-decadal observations are

needed. More than 100 Argo buoys are needed in the next 5 years in the Southern Ocean. There are also plans for the Northwest Pacific, which is affected by typhoons, and where long-term observations (>10 buoys) are needed. There are a number of Chinese training initiatives, which could be shared with POGO (e.g. IOC Regional Training and Research Centre on Ocean Dynamics and Climate).

Suggestions to POGO:

- Set up an operational buoy array for global ocean (each member institution could contribute 2-4 buoys in open ocean it would enable setting up some 100 buoys globally over a five year period).
- Coordinate the development of ocean circulation and climate models.
- Share IOC Regional Training and Research Centre on Ocean Dynamics and Climate platform with POGO.

OceanSITES: Bob Weller

OceanSITES is a voluntary group of fixed open-ocean time-series sites (moorings/gliders/ships) that POGO has supported for several years. It has close to the 100 sites Dr. Qiao asked for.

It has matured into a Data Buoy Cooperation Panel (DBCP) Action Group (like Argo), with a Project Office in Toulouse, France. A major success has been introducing a common data format and developing a data format tester. Passing the test is a requirement to become an OceanSITES station.

However, OceanSITES is still not properly coordinated. There is a need to have a common sub-set of instruments that would be deployed at the same depths across the global ocean. There could be a subset of 20 or so sites that meet these requirements. A proposal is being developed for this initiative, which would require the support of POGO.

Capacity Building (Chair Tony Knap)

Marine capacity building in Africa: in search of new approaches to transfer knowledge and technology in marine sciences and operational oceanography: Justin Ahanhanzo

The elements of capacity building are the trainees, trainers, equipment and infrastructure. The missing link is the vision: Why do we need capacity building? We need an integrated, cross-disciplinary approach. The African coasts are a natural laboratory, where physical processes (e.g. upwelling) meet chemical processes (e.g. air-sea interactions) to control biology and impact on fisheries. However, Africa faces many challenges such as forest fires and coastal erosion and the engagement of policy makers is needed. GOOS-Africa connects different large marine ecosystems. Institutions are working with the oil and gas industry to share data (20% world oil on margins of African continent). The strategy for capacity building is capacity empowerment to meet societal development goals.

Successes:

- First South African satellite was built by Stellenbosch University students.
- Mauritius Oceanography Institute (work related to UN Convention on the Law of the Sea).
- Working with Kenya and Tanzania on satellite applications.
- Large Marine Ecosystem programme support to establish a regional centre in Ghana.
- Regional programme in mathematical modelling for West Africa in Benin (supported by UNESCO Chair).
- Involvement with GEO (ChloroGIN and Coastal Zone Community of Practice).

Challenges include fragmentation of disciplines, lack of critical mass (need for better networking) and lack of sustained funding. Suggestions are to develop twinning between POGO and African marine institutions, with joint research programmes, and to host a POGO meeting in Africa.

Japanese capacity building for Indonesia and Southern Africa (SATREPS): Shiro Imawaki

SATREPS was launched in 2008 as a joint project between Japan Science and Technology Agency (JST) and Japan International Cooperation Agency (JICA), to tackle global issues of environment/energy, bioresources, natural disaster prevention and infectious diseases control. SATREPS currently runs 49 projects for 28 developing countries worldwide.

The Indonesian project is a collaborative agreement between two Japanese institutions and several Indonesian institutions, which all contribute to a Centre of Excellence, which provides observations (through buoys and radars) and policy proposals. The buoys provide temperature and salinity data and the radars provide rainfall and wind data. There is a data centre for data handling and data distribution to the global community.

The Southern Africa project is a collaboration between two Japanese institutions and various institutions in South Africa. The aim is to improve seasonal climate prediction to apply to management of environmental problems in the Southern African region in general. Modelling capacity was installed in 2010 at the University of Pretoria and the Council for Scientific and Industrial Research (CSIR). The programme also runs lecture series in oceanography and meteorology every year.

POGO training programmes: Shubha Sathyendranath

The POGO-SCOR fellowship used to be co-sponsored by IOC, but is now jointly sponsored by POGO and SCOR only. There are usually around 10 fellowships each year, with a total of over 100 so far. This has spawned EU project EAMNet fellowships for Africa. The AMT fellowship offers a berth for 1 person from a developing country to participate in an AMT cruise (every year since 2008).

POGO provides support to the Austral Summer Institute every year to bring in students from neighbouring countries. A bursary is offered for students from Africa to study at the University of Cape Town (typically one per year).

The visiting professor programme (2004-2007) that used to be supported by the Nippon Foundation has metamorphosed into the Centre of Excellence in Bermuda. There is a new POGO visiting professorship programme running on a more modest scale. The Nippon Foundation wants to augment the benefits of the CofE by networking the former scholars. We don't achieve our goals in 1 year of training, therefore we need to sustain our efforts via an alumni network to monitor the progress of past scholars and facilitate further progress. An Alumni meeting is planned in Tokyo in Sept 2011.

POGO initiated the ChloroGIN project with GOOS, which is seen as one of the success stories within GEO.

Bermuda Centre of Excellence: Tony Knap & Gerry Plumley

The goal is to expand capacity to observe the ocean, develop human resources, and enhance international network of young scientists. Bermuda has a number of near-shore and deep water sites used for student training. A new ship with 22 berths and various shore lab facilities are available for the student training, and on-site accommodation is provided. The training includes core skills workshops, such as scientific writing, presentation skills and the opportunity to practice their English. Students are required to conduct an independent research project (MSc equivalent), write it up and present it to the BIOS faculty at the end.

Students must have a first degree, a position to return to, a history of working in a team, and the programme should be relevant to their home institution. The programme receives around 100 applications per year, from 36 countries. BIOS faculty conduct the first review/selection, then an advisory committee meeting takes place to finalise the selection. 20 countries are represented so far. A Regional Programme was conducted in Brazil last year (25 students), which was very successful. The next one will probably take place in Vietnam in 2011.

General discussion on Science Coordination and Capacity Building

There has been an unprecedented level of activity in the SW Indian Ocean, with the Agulhas Somali Current Large Marine Ecosystem (ASCLME), new buoys in Agulhas and off Madagascar, some coastal sites with a graduate programme, the Nansen-Tutu centre and computer centre in Cape Town. The goal is to improve capacity to make predictions on time scales from days to decades. There is a Nansen-Tutu Scholarship programme. At present the Nansen-Tutu Centre is currently bilateral, but they hope to expand to include more Southern African countries. There is a certain amount of overlap with Japanese activities, and perhaps a need for better coordination. The Nansen programmes could be brought to the POGO-IOC level, as they are very much in the spirit of POGO initiatives. IOC is currently cooperating with ASCLME, Indian institutions, and trying to extend their coordination to national institutions.

It would be useful to contribute to and expand on the IODE database of summer schools, and on the sharing of teaching materials that have been used in the past (there is already an IOC collection of training material (used in Ostend training course and others) called Ocean Teacher.

Discussion of the future of POGO

“Strength Weakness Opportunities and Threats (SWOT)” analysis:

Strengths:

- Networking among directors at annual meetings
- World-wide membership including all major marine science institutions
- Annual meetings well attended (70%)
- Education and training of young scientists

Weaknesses:

- Relatively few activities between meetings, except GEO Summits
- Interest largely restricted to global ocean observations, although this was major reason for founding POGO
- Other marine science disciplines under-represented
- Not visible as international ocean organisation

Opportunities:

- To become the international voice of the oceans
- To be recognised as the international ocean organisation
- To play a major role in political decision making

Threats:

- Loss of members due to budget considerations and thematic restriction to ocean observation
- To miss the chance to represent the international marine science community as a whole
- To continue business as usual.

Suggestions:

- To broaden the scope of POGO, recruit new members, increase budget and become more visible internationally.
- Put measures in place to become even more efficient (management, secretariat, executive)
- Use success of POGO to build a cross-disciplinary world association of marine research institutes and organisations (build on Oceans United).
- Start as soon as possible.

POGO “Identity Crisis”:

We need to evaluate the added value of POGO and update our Mission Statement. POGO’s role could be to bring inter-operability to interface with operational oceanography. This type of coordination has been spun down since WOCE.

In the early days POGO promoted Argo very successfully. Now is the time to move to another concrete action, for example OceanSITES and/or an element of the Framework for Ocean Observations to act upon efficiently and thus raise the profile of POGO. A new proposal for OceanSITES is currently underway, based on discussions at the Ocean Obs’ 09 meeting.

Should POGO’s role be to bring all ocean sciences together? Should it be to influence policy decisions? Is the restriction of POGO’s mandate to ocean observations too narrow?

In business there is a lot of emphasis on focus, and broadening the scope of POGO would introduce the risk of diluting our focus, particularly if POGO hasn’t achieved what it set out to do initially. The focus could be Marine Science, which is currently not represented by one organization, speaking with a common voice. In Geosciences, all disciplines have been successfully grouped together under one umbrella. However, being inclusive of all marine sciences can have the danger of including organizations with a very different agenda to POGO.

POGO has two options:

- Take on implementation and have to choose 1 or 2 areas to focus on.
- Produce recommendations (like the Marine Board) and have a broader scope.

POGO directors have resources to implement and should do it, but we perhaps also have a duty to influence the agencies that are funding our research. Promoting ocean observations is still important and POGO

should continue to do this. The other issue of bringing ocean sciences together should be left to SCOR, or could be advanced through Oceans United.

There is a lot of focus on the success of POGO in terms of Capacity Building, but not on how POGO has helped advance observation of the global ocean, for example in the implementation of Argo and time-series stations. The key for success is having “war stories”, simple statements of what we’ve done, without necessarily providing dates. POGO needs to focus on something tangible to push for, such as OceanSITES and encouraging all research vessels to deploy Argo floats and surface drifters.

If POGO is simply a forum for networking and exchange of information, the annual meetings are probably sufficient. If POGO aspires to implement an integrated observing system via the member institutions, this would require some inter-sessional activities, probably not requiring all members to participate. If POGO aspires to lobby politicians through GEO/IOC and other mechanisms, this would require a strong inter-sessional agenda. It was strongly felt that a stronger agenda/strategy for POGO was needed and that this should be reflected in the structure of future meetings (see questionnaire comments at the end).

In summary, POGO should retain focus on operational/sustainable oceanography. If we see a need for an ocean sciences organization, this could be done through Oceans United, with the support of POGO.

Climate Change and Ocean Observations: A KORDI Perspective (Chair Jung- Keuk Kang)

Updates on POSEIDON and GAIA ocean-climate projects: Jae Hak Lee

Increasing rates of temperature and sea level in the western Pacific marginal seas are about two times larger than the global ocean mean. Korea is seeing more precipitation both in summer and winter. Poseidon (2007-2015) and Gaia (2009-2019) are KORDI’s two major climate research projects. Poseidon is to examine and predict the influence of oceanic variability in the NW Pacific Ocean on the marginal seas in association with future climate change. It consists of moorings tailored for examining dynamics of the NEC, a buoy near Chuuk Island and a hydrographic survey from the East China Sea to Chuuk Island. Gaia comprises a modeling component and a substantial observational effort. The latter includes moorings in the western boundary current and the equatorial region. A focus is on equatorial thermocline mixing in the upper 400 m depth, for which CTD, LADCP and MSP will be deployed along a TAO/TRITON line. Observations using moorings in the Low Latitude Western Pacific and Indonesian Through Flow (ITF) are planned from 2012 onwards. KORDI is also involved in the North Pacific Ocean Circulation and Climate Experiment, endorsed by CLIVAR and involving many institutions worldwide (China, Japan, USA, Australia...). International cooperation is also underway for the ITF monitoring. A high-tech research vessel is scheduled to be commissioned in 2014 for the investigation of global climate change, the development of deep-sea mineral and bio-resources and the archiving of ocean information.

The world’s first Geostationary Ocean Colour Imager (GOCI): Joo Hyung Ryu

The mission concept of GOCI includes eight visible-to-near-infrared bands, 500 m spatial resolution, and a coverage region of 2,500 km² (1.2 % of Earth surface) centered around Korea. It is expected to provide SeaWiFS quality images 8 times per day. Applications include Harmful Algal Blooms, ecosystem health, sediment transport, fisheries and forecasting. Observation products cover ocean, land, atmosphere and cryosphere. GOCI has 4 times higher spatial resolution and 8 times higher temporal resolution than LEO/SeaWiFS. The satellite centre KOSC is responsible for designing new ocean color sensors, receiving, processing, calibrating/validating and to distributing GOCI data products. Data can be downloaded from the website (<http://kosc.kordi.re.kr>), and is provided in real-time to the Korean government. Data are validated against in situ measurements using research vessels, FerryBox, gliders, buoys, research stations and via inter-satellite calibrations. The Korea Operational Oceanography Network project has already constructed 2 ocean stations (with a third planned for 2012) and deployed 2 buoys. GOCI lifetime is 7 years, so the next generation is being planned for 2011-2017. GOCI-II is planned to have a higher spatial resolution and full disk coverage. KORDI is collaborating with various institutes worldwide on calibration/validation and application of GOCI data, and development of the next generation of GOCI.

R&D for high tech ocean observing instruments and vehicles: Pan-Muk Lee

KORDI uses ROV and depressor, AUVs, Mine Disposal Vehicles and Self-Propelling Mining Robots, and has an Underwater Acoustic Network. The ROV and depressor are equipped with cameras, altimeters, CTD etc. The ROV Hemire was used for a deep-sea survey (1,500 m) off Korea that discovered methane hydrates. The AUV is equipped with GPS, docking system, side-scan sonar, camera and a wireless communication system. The mine disposal system was developed for use in high turbidity and high tidal current areas. It includes surveillance and identification (multi-beam) sonars. The self-propelling mining robots are designed for environmentally-friendly collection of seafloor nodules. It was first tested in shallow water with artificial nodules. The Underwater Acoustic Network was designed for oceanographic monitoring and received 6 M USD funding from the Korean government (2003-2011). Future plans include surveying of cold seeps and hydrothermal vents with the ROV and depressor; developing a high-speed AUV for high tidal current areas and a deep-sea AUV; testing the mining robot in deep water, etc.

Korea polar research activities: Seonung Choi

The polar research lab was established in 1987, initially at KORDI. Since 2009, KOPRI has become an independent institute affiliated with KORDI. The Antarctic station was inaugurated in 1988 and the Arctic station in 2002. The ice-breaker Araon was launched in 2009. The role of KOPRI is to raise public awareness, conduct scientific research and observations in cooperation with institutes worldwide, and advise the Korean government on polar matters. A second Antarctic station is planned to be built in 2013. Research topics include climate (paleoclimate, atmosphere, glaciology), Earth system science and life science.

The ice-breaker has 85 berths and an endurance of 20,000 nm (70 days). Its purpose is to conduct multidisciplinary research and provide logistical support to the stations, including construction of the new Antarctic station. It is equipped with various oceanographic (CTD, thermosalinograph, SeaSoar), acoustic (multi-beam echosounder, ADCP, side-scan sonar) and geophysical equipment (multi-channel seismic system, sub-bottom profiler). Antarctic expeditions take place between November and April, and arctic expeditions between June and September. KOPRI has a collaborative project with SAMS in Scotland, involving remote sensing and ice mass balance studies using ice buoys, and with China on pollutants, bacterial diversity and black carbon in the Arctic.

Wednesday 26 January

POGO Business (Chair Peter Herzig)

Next Chairman: A motion was agreed to suspend the by-laws to delay the election of the next Chairman for 1 year so as to change the terms, perhaps to 1 year for Incoming Chair, 2 years for the current Chair, and 1 year as outgoing Chair. The proposed change to the by-laws is to be circulated by e-mail to the wider membership.

Discussion of POGO budget: POGO to contribute \$5K towards the OceanSITES initiative (setting up Secretariat within JCOMM). Dr. Knap suggested also asking POGO members to contribute \$5K. The members are to support the POGO Secretariat in seeking funds.

Press briefing and Seoul Declaration: As decided at POGO-11, a press briefing was written prior to POGO-12 and distributed to the press on Sunday. During the course of POGO-12, a Declaration was drafted. It was decided that it would be used by the members to send to funding agencies/ministries as appropriate, and distributed via the POGO mailing lists and on the website. Further comments on the draft were to be received by Friday 28 January.

Adoption of Action Items:

Dr. Dosdat suggested to designate champions for each Action Item rather than simply "Member Directors". The Executive Committee also needs to play an active role in implementation.

It was noted that POGO should seek interaction with other organisations in addition to IOC, e.g. ICES, the Marine Board and CLIVAR (make contact with new Director). IOC was discussed many times during the meeting, and thus appeared several times in the Action Items because POGO already has a close relationship with IOC. Interaction with other organisations should be on the agenda for POGO-13.

Dr. Dosdat noted that the Action Items reflected various types of activities and a lack of focus/strategy for POGO, and that we should be more selective and focus on one type of activity. A strategy document will be drafted during the Executive Committee Meeting, outlining specific areas for POGO to focus on, and within which the Action Items would fit, and which would guide the structure of future POGO Meetings. Items to be addressed at the Executive Committee Meeting include:

- Define topics for briefing papers to be produced by POGO
- Discuss interaction with other organisations such as the Marine Board.
- Draft a strategy for POGO that will help define important issues for POGO to tackle and shape the future annual meetings, with presentations along those lines rather than based on institutional topics.

There was some discussion about POGO recommending the establishment of a rapid response funding mechanism to enable scientific observations in the aftermath of disasters and for members to prepare an emergency contingency plan to deal with disasters. However, it was decided that these were not appropriate as POGO Actions, and that in many cases such funding mechanisms and contingency plans already existed. It was suggested that POGO should promote setting up an operational buoy array for the global ocean; each member, where possible, to contribute 2-5 of such buoys to reach 100 buoys in 5 years. It was agreed that this was not within the scope of POGO, and that this was already being done by OceanSITES. It was also agreed that POGO would communicate with the Secretariats of programmes such as JCOMM and a new EU project Euro-Argo) to support this initiative.

Regarding the action item to facilitate and promote public access to ocean data and model results, this is already being facilitated by the Coriolis Centre in Ifremer and the National Data Buoy Centre, and the Action could be to encourage people to format their data in the OceanSITES or Argo format and to submit it to national data assembly centres.

It was noted that the Member Directors should also be reminded to contribute to the Expo 2012 through other channels such as by contributing to the National Exhibits and by participating in IOC events held during the Expo.

Venue and dates of POGO-13: It was agreed that SOEST, University of Hawaii, would host the meeting from 9-11 January 2012 (no other dates possible). It was also decided to hold POGO-14 in Cape Town. This would help to strengthen collaboration with African institutions. There are also standing offers from the UK Consortium (NOC+PML+BAS) and from Brazil (Univ. Sao Paulo) to host future meetings.

Earth System on the Move: from Past to Future Changes (Chair Mike Purdy)

Review of marine geology, plate tectonics and massive sulphide deposits: Georgy Cherkashov

Harry Hess was the leader in developing the concept of seafloor spreading. It was later established that the morphostructures of plate margins was complicated. Plate margins are zones of tectonic and volcanic activity, associated with plate margins, and are zones of subduction. Relative plate velocities are variable, with highest rates in the Pacific. We now have an increasing interest in marine minerals, because of depletion of resources on land, while at the same time the GDP of many countries is increasing, and the cost of minerals, for example gold and copper, is very high and unaffected by economic crises. Marine minerals may be found in the shallow waters or in the deep sea. Deep sea minerals include manganese crusts, ferro-manganese nodules and seafloor massive sulphides (SMS). Manganese crusts are intraplate seamounts, found at 1000-2000m depth. Ferro-manganese nodules are found in deep ocean basins (>4000m). SMS are produced by a combination of tectonic and volcanic activity (e.g. hydrothermal vents), and their distribution is global. The economic interest is high for SMS and interest in others is growing. Some of the mounds associated with smokers can be very high and cover a large area. Some 30 elements can be found in the deposits, with a very high metal content. They are found by looking for the hydrothermal plumes associated with the deposits. ROVs and electromagnetic systems (to detect magnetic anomalies) are used in exploration. China and Russia have submitted applications for exploitation of polymetallic deposits in international waters. Production is expected by 2013 off Papua New Guinea where there are very high concentrations of gold and copper (100,000 USD invested in mining). There are many environmental issues related to seafloor mining. International cooperation for the study of marine minerals is coordinated through many organisations including International Marine Minerals Society, InterRidge and IODP. There is a need for collaboration with physical and biological oceanography in the future, which could be overseen by POGO. Cooperation with the establishment of MPAs and bottom observatories (e.g. NEPTUNE) is also planned.

International scientific drilling: Direction and ambition: Kiyoshi Suyehiro

IODP will come to an end in 2013, but extension is being sought for 2013-2023, with a new science plan. Name will change to International Ocean Discovery Programme. Information on planning is available on IODP website. Currently, IODP has 24 members. The new programme will be organised under four aspects: Climate, Biosphere, Earth Connections and Earth in motion, and include communication with the public. An example of geohazard that the project will address is earthquake monitoring, with plans to penetrate the seismogenic zone in 2012-2013. IODP is associated with the earthquake and tsunami monitoring network DONET and plans to link up to Neptune and OOI in the future. Links to other disciplines are important. There is a need for a network to observe the lithosphere which is constantly changing, and to establish oceanic Mohole observatories. Penetration of Moho has been a dream of scientists for over 50 years, which is now close to being realised. The Moho needs to be sampled to understand what it is, and what it does. Last September a workshop was organised, between IODP and the Deep Carbon Observatory group, at which there was a lot of interest from DCO in sampling the mantle. There are many unanswered questions about deep ocean carbon, such as the nature and extent of deep microbial life. By reaching deep into the Mohole, we will understand better the Earth in evolution. Drilling to the mantle may begin in 2017 and may last for 2-3 years. There are many technical obstacles and reaching the mantle could be more difficult than getting to the moon. There is a need to capture the public's imagination. IODP is planning to hire professionals for their outreach activities. IODP has published several brochures on their success stories, but not a thick document. The main successes were drilling the Arctic and creating a "deep biosphere" field.

Review of continental margin geology of Korea: Review and constraints of the opening of the East Sea: Han-Joon Kim

There are different modes of opening of the East Sea: fan-shaped or pull-apart opening. The Korean margin is important for a number of reasons: transition from continental to back-arc crust, rift architecture (rift basin, uplifted rift flank, slope); pronounced volcanic phase associated with margin tectonics and constraints on the opening of the East Sea and Japan Sea. Geophysical study of the Korean margin aims to investigate the crustal structure of the area. Data were collected from ocean bottom seismometer data from 28 sites over 10 years. The mantle structure of NE Asia has been inferred from global tomography. The crustal structure is characterised by a thicker than normal crust formed above a hotter than normal mantle, magmatic underplating and extrusive volcanism at the Korean margin.

Feedback from Meeting Evaluation Questionnaires

Scores out of 5 (average of 11 responses):

Overall meeting	3.2
Sessions	
International cooperation in ocean observations	3.9
Disaster response	2.6
Science coordination/capacity building	3.4
Earth system on the move	2.6
Presentations	
International cooperation in ocean observations	3.6
Disaster response	3.1
Science coordination/capacity building	3.3
Earth system on the move	3.0
Discussion	
International cooperation in ocean observations	3.7
Disaster response	2.7
Science coordination/capacity building	3.0
Earth system on the move	2.0

Comments:

Most comments were on the need for development of a POGO strategy to be at the centre of the meeting agenda. It was felt that the presentations were not relevant to POGO as a whole, that they were representing individual institutions. Future presentations should be "more general", focussing on "POGO issues" or a POGO strategy, and should leave more time for discussion. Information items could be done in poster format during breaks. Some of the smaller issues could be decided by e-mail in advance of the meeting. POGO achievements should be highlighted at the beginning of the meeting. Also, most of the background documents were not referenced by the speakers; perhaps they could be used more effectively.

Action Items

International Cooperation:

1. GEO: The meeting re-affirmed the POGO strategy to work with GEO towards raising the profile of oceans at the ministerial level within GEO and GEOSS. Specifically, it is proposed to submit an overarching Task to GEO that straddles across various societal benefit areas of GEO, with focus on oceans. Action: Secretariat.
2. OceanObs'09 Task Team Report: POGO to comment on Task Team Report ("Integrated Framework for Sustained Ocean Observing"). POGO members collectively to promote an element of ocean observations over the next 2-3 years, both with advocacy and in practical matters related to implementation. Initial focus: OceanSITES. Specific action: promote common framework of observations; facilitate establishment and maintenance of an international coordinating office. Action: Member Directors. Coordinator: Tony Knap (see notes).
3. Ocean observatories: organise an international workshop of system engineers involved in ocean observatories to promote interoperability. Action: Bob Weller, Kiyoshi Suyehiro and Secretariat (see notes).
4. Recommendation to IOC: POGO to request that IOC investigate procedures within the intergovernmental mechanism to formally endorse core observations. Action: Secretariat (See notes).

Disasters:

1. POGO to raise awareness of lessons learned from recent disasters about the value of an ocean observing system. Action: Member Directors. Coordinator: Jim Luyten.
2. POGO to help COPAS with its post-earthquake and tsunami recovery efforts, through (a) helping them to find potential funding sources; (b) continuing support of the COPAS Austral Summer Institute; Action: Member Directors. Coordinator: Carina Lange.

Science coordination:

1. POGO, in coordination with Oceans United, to begin developing plans to convene a meeting of ocean-interest organisations and institutions on world scale to take leadership role on ocean matters. Action: Secretariat and Executive.
2. POGO to help University of São Paulo respond to request for advice from government of Brazil on benefits to society of ocean observations. Action: Member Directors, as required. Coordinator: Edmo Campos.
3. POGO to develop a strategy document for next 3 to 5 years, including a 1-page summary of POGO success stories and priorities for possible production of briefing papers for policy makers. Action: Secretariat and Executive.
4. Facilitate and promote public access to ocean data and model results. Action: Member Directors. Coordinator: Fangli Qiao.
5. Expo Yeosu 2012. POGO to liaise with other exhibitors in the Expo 2012 to see what contribution POGO can make, jointly with other exhibitors, to the OCBPA part of the Expo. Action: Secretariat.
6. Continue to support the International Quiet Ocean Experiment, in particular the Open Science Meeting to be held in August-September 2011. Action: David Farmer and Sophie Seeyave.

Capacity Building:

1. POGO to offer coordination of selected training courses in the ocean arena and to contribute to IOC/IODE/SCOR compilation of existing training programmes. Action: Secretariat.
2. POGO to continue its sustained capacity building efforts. Advertise, select candidates, coordinate and support NF-POGO Centre of Excellence Year IV. Action: Secretariat.
3. POGO to work with IOC/GOOS-AFRICA to support dedicated African capacity building initiatives in operational oceanography at marine science institutes and universities within Africa. Action: Secretariat.
4. POGO to work with IODE to formalize an arrangement for IOC/IODE support for NF-POGO Centre of Excellence training module on data management. Action: Secretariat.

5. POGO to request IOC to make existing online training material, and related access information, available to POGO Members. Action: Secretariat and Boram Lee.
6. POGO to discuss with IOC the possibility of future POGO involvement in capacity building for UN Regular Process. Action: Secretariat and Boram Lee.

Liaison with IOC:

1. POGO to request IOC to name a POGO point of contact within the IOC to become effective after Boram Lee moves to WMO. Action: Secretariat.
2. POGO to participate in the 2011 IOC Assembly. Action: Secretariat.
3. POGO to review I-GOOS proposal for GOOS governance when the IOC Action Paper is issued in April, and provide comments to the IOC. Action: Secretariat and Executive.
4. POGO to complete transfer of Oceans United website. Action: Secretariat.
5. POGO to develop a new Oceans United mailing list. Action: POGO Secretariat.

POGO:

1. Revise the by-laws of POGO as and when required. Action: Secretariat and Executive.
2. In coordination with the Nippon Foundation, organise and deliver the first NF-POGO Scholars Alumni Meeting in Tokyo in September 2011. Action: Secretariat.
3. Finalise and distribute Seoul Declaration via mailing lists and website. Action: Secretariat. (members to send to funding agencies and Ministers, as appropriate).
4. Hold an Executive Committee Meeting before POGO-13. Action: Secretariat and Executive.

Notes to Actions:

Note to Action 2, International Cooperation

Prepared by Susan Avery and Tony Knap

Sustained time series observations are a fundamental and essential element of the sustained ocean observing system. These observations monitor and quantify change in the variability of key ocean parameters that are essential for the calibration and validation and further improvement of numerical models and remote sensing data. Assessments such as the IPCC required such data to anchor and improve projections of the climate system. The technology is ready for equatorial to mid-latitude sites and current programs worldwide are fast developing the technologies for high latitude sites.

POGO has previously supported the development of sustained observations through programs such as Argo. OceanSITES is at a critical point in its development in a transition from a voluntary effort to a more formalized program of the international sustained ocean observing system. It is therefore recommended that POGO take a leadership role in this transition by securing funding for a technical coordinator at JCOMM-OPS. The cost is estimated to be \$35K for .25FTE.

Common, multidisciplinary observations (biogeochemical, physical, ecosystem) are needed to fully quantify the complete suite of change that is anticipated. These sustained multidisciplinary times series across the globe together with modeling are needed to convey the seriousness of the change in the ocean to users and decision-makers. POGO will work to support the common suite of multi-disciplinary observations.

Note to Action 3, International Cooperation

Motion submitted by Mike Purdy

Given the healthy development over the past decade of several significant initiatives within POGO member countries to build and maintain networks to support sustained time series observations in the global ocean, it is recognized that substantial benefit could result from increased co-ordination and co-operation between and amongst the lead system engineers and technical teams that are responsible for these operations. The long-term goal of such co-ordination should be the design of systems that share common components and

data protocols that enable degrees of interoperability that will empower increased and more effective international co-operation in the maintenance and operation of the deployed systems.

As a first step towards this ambitious goal, POGO undertakes to initiate an annual program of focused workshops that will bring together the lead system engineers from the members' observation network initiatives. Each workshop will have a well-defined theme and a rigorous agenda that is directed towards maximizing the tangible and practical outcomes.

A small ad hoc group should be identified from among the POGO membership to develop a plan for the inaugural workshop, including suggestions for theme(s) and attendees. As appropriate, planning should proceed in conjunction with relevant JCOMM Ops action groups. The POGO Secretariat will provide logistical support to assist in the meeting organization, but travel costs will be supported by the individual attendees. The plan will be reviewed and approved by the POGO Executive Committee, with the goal of scheduling the first workshop for Fall 2011, a report from which will be provided to the 2012 annual meeting. At that time, based upon the perceived effectiveness of this first meeting the decision will be taken by POGO membership concerning later meetings to continue this long-term dialog.

Note to Action 4, International Cooperation

Submitted by Boram Lee

The POGO members agreed that an endorsement by recognized intergovernmental mechanisms of core observations would facilitate securing funding to maintain observing networks over a long period. In this context, POGO recommended that IOC investigate procedures within the intergovernmental mechanism to formally endorse core observations, preferably as a GOOS priority in the near future.