

WORLD METEOROLOGICAL ORGANIZATION
Final Report
EXECUTIVE COUNCIL
PANEL OF EXPERTS ON POLAR OBSERVATIONS, RESEARCH AND SERVICES
Fifth session
Wellington, New Zealand, 25-28 February 2014



Back group; V. Rachold, B. Angle, B. Goodison, J. Shanklin
Fifth group; A. Jönsson, N. Gordon, J. Lunny, J. Gill, A. Snorrason
Fourth group; A. Klepikov, J. Renwick, J. Ikävalko, H. Tangen, K. Andersen, C. Xiao
Third group; H-W. Hubberten, J. Key, S. Carpentier
Second group; J. Carrasco, K. Falkner, R. Tatusko, A. Devaris, S-J. Park, V. Ryabinin, G. Pedrini, R. Le Bris
Front group; P. Lennox, G. Béchard, D. Grimes, M. Hanson, W. Zhang, J. Stander, M. Ondráš

Victoria University of Wellington, Cotton Building, Kelburn Campus

Documentation and presentations are available at the following sites;

EC-PORS-5: http://www.wmo.int/pages/prog/www/WIGOS_6_EC_PORS/EC-PORS-5_DocPlan.html
ATT: http://www.wmo.int/pages/prog/www/Antarctica/Antarctic%20Task%20Team/ATT_2.html

Executive Summary

The Fifth Session of the Executive Council Panel of Experts on Polar Observations, Research, and Services (EC-PORS) was hosted by Victoria University of Wellington (VUW) and the New Zealand MetService with support from the National Institute of Water and Atmospheric Research (NIWA), the Antarctic Research Centre (ARC) and the Ministry of Business Innovation and Employment (MBIE) in Wellington, New Zealand, 25-28 February 2014. It was preceded by a meeting of the Antarctic Task Team on 24 February 2014.

The Panel approved the Implementation Plan of Global Cryosphere Watch (GCW) including the GCW governance and working structure, the establishment of a core GCW network called CryoNet and the need to mainstream GCW as a core WMO activity. Strategic issues related to climate (e.g., Polar Regional Climate Centre (PRCC) networks, Polar Region Climate Outlook Forums and interaction with IBCS of the GFCS) were highlighted. These strategic issues will be incorporated into the future work of the Panel and be a focus of the services team.

The Panel noted the need to strengthen the interface between services and the Global Integrated Polar Prediction System (including WWRP - PPP and WCRP – PCPI) on matters such as Search and Rescue and transportation that are of interest to bodies such as the Arctic Council. The International Conference on Arctic Research Planning (ICARP III) and the Year of Polar Prediction centred on the year 2018 present significant opportunities for community engagement. The Panel also concluded that it should be proactive in assisting the Polar Space Task Group in defining user requirements. Panel teams will reflect on how to harmonize PSTG strategies with a GCW and GIPPS focus.

The Panel concluded its regulatory responsibilities with respect to Antarctica and focused on how best to ensure the Antarctic Observing Network (AntON) is well situated in WIGOS and WIS given the unique requirements of this region. Building synergy with the Antarctic Treaty Consultative Meeting mechanisms and further development by, for example, encouraging ships to join the VOS scheme are critical to success.

With respect to the high Asian cryosphere, there is need to fully tabulate the observing network in this vast region. The Regional Climate Centre in Beijing and the International Centre for Integrated Mountain Development (ICIMOD), located in Nepal, are encouraged to coordinate efforts. The Panel also suggested the next CryoNet workshop could take place in the Andes.

The Panel reviewed the current concept paper for the International Polar Partnership Initiative (IPPI) developed during the February meeting of the extended Steering Group on a Long-Term Cooperative, International Initiative. The Panel stressed the need for distinguishable activities and tangible outcomes that are inexpensive to implement and clearly address WMO objectives. The concept remains under review by the Panel and will be considered during EC 66.

The Panel reviewed its relationship with a number of bodies active in Polar Regions with a view to seek mutual benefit. Panel members will continue to interact with, inter alia, the Arctic Council and the Antarctic Treaty Consultative Meeting to ensure objectives are aligned and for mutual recognition. Specific tasks have been identified with the International Association of Antarctic Tour Operators (IAATO), the International Ice Charting Working Group (IICWG).

The decisions on these and other matters are reflected in a series of draft resolutions that are annexed to this report. The Panel will seek the views of EC-66 in June 2014 on WMO Polar Activities and conclude these during the Seventeenth World Meteorological Congress and subsequent EC-67 in 2015. The next meeting will take place in Reykjavik, Iceland. The Co-chairs expressed deep appreciation to our hosts in New Zealand and noted the cooperative ethos of this Panel.

Detailed Report

1. Organization of the Session

The Fifth Session of the Executive Council Panel of Experts on Polar Observations, Research, and Services (EC-PORS) was hosted by Victoria University of Wellington (VUW) and the New Zealand MetService in Wellington, New Zealand, 25-28 February 2014, with support from the National Institute of Water and Atmospheric Research (NIWA), the Antarctic Research Centre (ARC) and the Ministry of Business Innovation and Employment (MBIE). It was preceded by a meeting of the Antarctic Task Team on 24 February 2014.

2. Stage setting

Welcoming remarks were provided by Peter Lennox, CEO of MetService and Permanent Representative of New Zealand with WMO. EC-PORS Co-Chair, Rob Vertessy, was unable to attend the first day of the session due to his required presence at a Senate committee in Australia. New members of the Panel, Scott Carpentier (Australia), Johanna Ikävalko (Finland), Genevieve Béchard (Canada) and Sang-Jong Park (Republic of Korea) were introduced. This was also the first meeting for Dr Katrine Krogh Andersen of Denmark and Dr. Kelly Falkner of the USA.

Co-Chair David Grimes provided an overview of the EC PORS Terms of Reference & priority areas that highlighted the research initiatives (e.g. GIPPS), the Global Cryosphere Watch (GCW) and the Panel's regulatory responsibilities with respect to the Antarctic. He noted that the emphasis for this meeting is to plan for the Seventeenth World Meteorological Congress (Cg-17) in May 2015 during which the Panel's mandate and a workplan will be renewed. The key outcome was a series of draft resolutions to be debated by EC-66 in June 2014 and concluded at the Cg-17 and subsequent EC-67 in 2015. In doing so, the Panel reflected on a number of aspects such as;

- Implementation of GCW including its governance, the establishment of a core GCW network called CryoNet with a set of initial stations and mainstreaming GCW into the core WMO activities.
- High mountain areas and their relevance to GCW;
- Strategic issues related to climate (e.g. Polar Regional Climate Centres (PRCC) network and interaction with the Intergovernmental Board on Climate Services (IBCS/ Global Framework for Climate Services (GFCS));
- Antarctica and how we inform and influence the rest of WMO about the unique requirements of Antarctica to ensure they are accommodated in WIGOS and WIS;
- Building synergy with bodies such as the Arctic Council and Antarctic Treaty Consultative Meeting and their mechanisms;
- Strengthening the interface between services and the GIPPS (including WWRP - PPP and WCRP – PCPI) on matters such as Search and Rescue and transportation;

3. Review of Past Activities and the Development of Future Plans

A series of presentations followed on Panel achievements, including decisions of WMO and other relevant bodies on the activities of the Panel's Task Teams. Each of the five main teams (Antarctic, Observations, Research, Services and Third Pole/High Mountain Regions) provided

a brief summary of accomplishments and future considerations, including potential recommendations of EC-PORS to EC 66, Cg-17 and EC 67.

Three break-out groups based on the Framework structure - (i) Observations (GCW / Third Pole / Polar Space Task Group), (ii) Research and (iii) Services – met on the second day to recommend activities for consideration by the Panel for forward planning. Those engaged with the Antarctic Task Team and the Services Framework Team circulated through the groups.

3.1 Observations

Árni Snorrason, the chair of the Observations Task Team, provided an overview of activities related to the Polar Space Task Group, GCW, Arctic-HYCOS, SatCom, WIGOS and other activities. The Panel noted the need to;

- Advocate for expanded AMDAR coverage in polar regions;
- Express concern about diminishing GAW networks;
- Ensure WMO contributes to SAON network inventories; and
- Engage Technical Commission in activities (e.g. CHy for Arctic-HYCOS, CIMO for GCW requirements)

3.1.1 Polar Space Task Group (PSTG)

Mark Drinkwater, the chair of PSTG, attended by WebEx to provide an overview of the outcomes of the Third meeting of the PSTG including the status of its Strategic Implementation Plan, the Synthetic Aperture Radar (SAR) Coordination Group and reporting relationship to CEOS and CGMS. A strong spirit of inter-agency cooperation exists. He highlighted the evolution in satellite based services and forthcoming satellite missions related to snow thickness measurements, sea-ice drift products, melt flux products and ice sheet mass balance intercomparison to name a few.

CryoSat has now entered its 3rd consecutive cycle. He noted that sea ice dynamics has significant influence on ice mass and we now have combined products of sea-ice drift for both poles. By determining melt fluxes, we are able to derive ice shelf calving. Copernicus (previously GMES) Cryoland Service, a pan European service, went live on December 1, 2013 (see; <http://www.cryoland.eu>), and Anistiamo is focused on the eastern passage near Novaya Zemlya.

He supplied an overview of existing and planned missions; the NASA/JAXA Global Precipitation Measurement mission (GPM) will be launched in February, 2014 (note: it was launched February 27 as planned) carrying a dual frequency radar and microwave radiometer. Sentinel 1A is the first launch of a pair of C-band SAR satellites with launch expected near the end of March or early April 2014 and Soil Moisture Active/Passive (SMAP) mission is currently planned for launch in October 2014 to map soil moisture and freeze/thaw states. The panel noted that these data will be very useful for water cycle studies. All data are provided “free and open”.

PSTG is developing a community white paper and reviewing their contributions to the GCOS Essential Climate Variables (ECVs). One activity of importance to the GTN-P is to determine what can be derived for permafrost from space (including snow cover extent, SWE, digital terrain mapping and Arctic coastal erosion).

There is a need for feedback from the surface observation communities on the use of in-situ data for calibration and validation of satellite-derived data. Although satellite data is invaluable for many applications, it is important to make the case that satellites cannot do everything. For

the European Copernicus missions there is clear recognition by the European Commission that validation is a responsibility of the national users.

Co-chair David Grimes provided an overview of the Polar Communication and Weather (PCW) satellite mission led by Canada targeting fifteen minute refresh times from 50 – 90 degrees north. In the tundra orbit they could last 10 – 20 years. The Request for Interest (RFI) to industry is closed and the mission is well advanced. The recommendation should be put forward by the end of the year with launch likely 2019 or a bit later. There is potential to have continuous coverage of both north and south with three satellites.

Action; EC PORS needs to be proactive in defining PSTG initiatives and will provide input to the community white paper to assist space agencies in responding to specific and well-thought user requirements. Panel teams will reflect on how to harmonize PSTG strategies with a GCW and GIPPS focus.

Action; Panel will consider how to capture consolidated space observation needs of networks such as GCW, SAON or SOOS and, more broadly, provide advocacy to sustain surface-based ground-truthing for calibration and validation. The Panel will provide its views on critical needs and strategic priorities to forthcoming PSTG-4 meeting, Greenbelt MD, USA, 29-30 September 2014.

3.1.2 Global Cryosphere Watch

Jeff Key, the chair of the GCW Team, provided: an outline of the GCW Implementation Plan; the proposal for the establishment of the GCW core network – CryoNet, including the selection criteria and a process for inclusion of candidate stations into CryoNet; a proposal for engagements with partners; the proposal of the GCW working structure and the terms of reference of GCW Teams; proposed membership of the GCW Steering Group (GSG); and planned activities and steps to be taken to mainstream the GCW in WMO, including potential recommendations of EC-PORS to Cg-17.

The first meeting of the GCW Steering Group (GSG) was held in Reykjavik, Iceland from 23 to 24 January 2014. The GSG proposed the GCW working structure to be composed of the GCW GSG and six Teams as follows (those with an asterisk have been activated):

- The GCW CryoNet Team (*)
- The GCW Infrastructure and Practices Team
- The GCW Requirements and Capabilities Team (*)
- The GCW Products Team (*)
- The GCW Portal and Website Team (*)
- The GCW Outreach Team

The GSG has developed Terms of Reference of all Teams, including the GSG, and prepared GCW Partnership criteria for consideration by the Panel. There are strong partnerships developing such as the contribution to the GCW Snow Watch activities from the European Space Agency (ESA) through the Satellite Snow Products Intercomparison and Evaluation Exercise (SnowPEX) project, complementing the existing GlobSnow activity. GCW is seen as a key contributor to two of WMO's highest priorities – GFCS and WIGOS.

GCW is developing a core network of surface observations called "CryoNet", which builds on existing networks; it will operate on agreed measurement guidelines and best practices established for CryoNet sites. The GCW is refining observational requirements for the WMO Rolling Review of Requirements based on those developed in the IGOS-P Cryosphere Theme Report (CryoOS) which is a basis for GCW observing. Its contribution to WMO's space-based

capabilities database is coordinated with the PSTG. GCW is assessing snow cover products through the GCW Snow Watch project and creating unique products, e.g., the SWE Tracker, in collaboration with partners. Engaging in historical data rescue (e.g., snow depth) and building a snow and ice glossary are supplemented by the development of international training and outreach materials and co-sponsoring workshops.

Using the GFCS partners agreement as the basis, GCW International Partners criteria suggest that any international organization, professional union, association or data centre that is actively involved in cryosphere activities, that has a willingness to contribute tangibly to the implementation of the WMO GCW initiative, and that is active internationally in structure and membership, is invited and encouraged to become an “International Partner” of GCW.

A formal statement of intent to be a GCW International Partner should be sent to the WMO GCW Secretariat for consideration by the WMO GCW Steering Group. The statement should address how the organization will contribute to GCW implementation and to GCW Team activities. Requests are reviewed and endorsed formally. In accepting Partner status, special attention will be given to the following criteria:

- a) Extensive global networks of members or partners or a high global presence or visibility, through regional or country offices, on measurement, research, product generation, or data archival and distribution activities; and
- b) Specific expertise with a strong emphasis on cryosphere issues in their organizational mandate.

The Partner organization should appoint one focal point and one alternate as principal contact persons for GCW. The full contact information of the focal point and the alternate should be provided to the WMO GCW Secretariat (mondras@wmo.int). The focal point (or alternate of the Partner) is eligible to participate in GCW Steering Group meetings.

EC-PORS will continue providing guidance on the GCW working structure, membership, TORs and the overall strategy, including the development of CryoNet and its initial stations. Officially, however, there will be no CryoNet sites until after Congress 17 which is expected to approve CryoNet for implementation. EC-PORS will seek to ensure the GCW project office is staffed and appropriately funded. A process for formal engagement with partners and the issue of co-sponsorship has to mature. EC-PORS must ensure is that there is a clear governance process in place and that there are defined technical requirements. The GSG suggest the way forward is to have a GCW Project Officer in the WMO Secretariat with an estimated budget of CHF 1.4 million for the 2016-2019 financial period; CHF 600k from the regular budget and CHF 800k from extra-budgetary donations to the EC-PORS Trust Fund.

GCW is already providing initial up-to-date information on the state of the cryosphere through its website at <http://globalcryospherewatch.org/>. News items captured from 25 or more news sites including journals, project information, observational requirements, and a glossary are available. It also includes a calendar that is an integration of calendars related to cryosphere, Arctic, CliC, etc. The GCW Data Portal (<http://gcw.met.no>) is pre-operational. It is interoperable with a number of major data centres, and engaged in discussions with others.

Actions; The Panel agreed to the proposed GCW working structure, the TOR and the membership of the GCW Steering Group. It approved the process for the establishment of CryoNet, including its initial sites and criteria for inclusion of the candidate sites into CryoNet, and approved the GCW partnership criteria (See annex). The Panel will also:

- Advocate on the importance of Regular Budget funding for the core GCW functions;

- Further define WMO coordination office, governance role, selection of GCW team members and international partnership criteria;
- Finalize the draft GCW Resolution as an information document to EC-66 including the GCW Implementation Plan requested by EC-64.

3.1.3 WIGOS/WIS and other WMO activities relevant to PORS

Wenjian Zhang provided information on the current status of WIGOS Implementation including the development of WIGOS regulatory material with an emphasis on the GCW observing component. The WIGOS Framework Implementation Plan (WIP) defines the necessary activities to establish an operational WIGOS by the end of 2015. As a component of WIGOS, the standard and recommended practices and procedures for the observing component of GCW are to be drafted and included in the WIGOS regulatory material, namely WIGOS sections in the WMO Technical Regulations and the WIGOS Manual, (see: <http://www.wmo.int/pages/prog/www/wigos/TT-WRM.html>). It was recognized this requires important contributions from GCW partners and that these will evolve as GCW matures.

Links to operational Global Information System Centres (GISCs) for searching WIS can be found at www.wmo.int/gisacs. WMO Regions are now preparing Regional WIS Implementation Plans however no progress has been made to prepare a WIS Implementation Plan specifically for Polar Regions. EC-PORS has a role to play in ensuring that institutions offering data or other services for the cryosphere to the WMO community as National Centres (NCs) or Data Collection or Production Centres (DCPCs) be aware of existing portals such as has been developed for GCW. The Panel will take into consideration the identification of a rapporteur or focal point for such matters.

Action; Giancarlo Pedrini, a Panel member, is a member of the ICT-WIGOS but this task requires a significant effort. The Panel agreed to define a modality for more holistic engagement into WIGOS planning to ensure Polar issues are coordinated with WIGOS. It was decided to establish a Task Team within EC-PORS to deal with regulatory material, metadata and requirements. Jeff Key will collaborate with the ICG-WIGOS Task Team on Regulatory Material in the development of sections related to GCW observing component.

3.1.4 SatCom

Johan Stander provided a brief on the set of recommendations and actions emanating from the *ad hoc* international Forum of users of satellite data telecommunication systems (SatCom Forum) held in Paris from October 3-4, 2013. It is expected that this Forum would be formally established after CBS-Ext. (2014) considers a coordination mechanism and its TOR. The Forum is meant to provide an international mechanism covering the wide user base that exists within the co-sponsoring Organizations. The goal is to address remote data communication requirements – including tariff negotiations as needed – for automatic environment observing systems using satellite data telecommunication systems in remote areas (including buoys, ship-based observing systems, sea level observing stations, Automatic Weather Stations, Polar Observations, profiling floats, and animal tracking).

The Forum would provide guidance on how to make the best arrangements for the purchase of airtime. In recent years, with the advent of new satellite data telecommunication systems that better address user requirements in a cost effective way, the Argos system is no longer in a *de*

facto monopolistic situation for the collection and location of drifting buoy data. The SatCom meeting will be linked with the DBCP/ARGOS JTA meeting – next one in China.

Activities have been initiated by JCOMM to evaluate the use of other systems such as Iridium. JCOMM launched a Pilot Project for the WMO Integrated Global Observing System (WIGOS) to investigate alternatives.

Action; The Panel to review the recommendations on the SatCom Forum by CBS-Ext. (2014) in Asuncion, Paraguay, September 2014. JCOMM-5 is invited to co-sponsor the SatCom Forum and endorse its Terms of Reference if needed in 2017.

3.2 Research; Global Integrated Polar Prediction System (GIPPS)

3.2.1 Polar Prediction Project (PPP)

Neil Gordon, a past member of the Panel and the consultant to the Polar Prediction Project, presented on behalf of Thomas Jung who was unable to attend due to illness. He provided an overview of the WWRP – Polar Prediction Project (PPP) Implementation and Science Plans and the organization of the Year of Polar Prediction (YOPP) centred on 2018. Related documents are available at <http://polarprediction.net>. PPP is the hours to seasonal research component of the Global Integrated Polar Prediction System (GIPPS).

The International Coordination Office for Polar Prediction (ICO) is based at the Alfred Wegener Institute (AWI), Helmholtz Centre for Polar and Marine Research, and is led by Thomas Jung with Neil Gordon supporting as a consultant; and Stefanie Klebe (AWI) providing administrative support. The rationale for PPP is clear; the poles are an integral part of the Earth system and it is expected that, in the Arctic, over \$100 billion in investment is expected in the coming decade. Research areas include: (i) service oriented (SERA); (ii) forecasting systems, and (iii) underpinning research. Improving observation and modelling of sea-ice is critical to improved polar prediction.

There are concentrated efforts within PPP on sea ice prediction (which has a big impact on atmospheric predictions), the linkage between polar and lower-latitude regions and an emphasis on improved availability of polar observations and therefore significant interest in the success of SAON and AntON.

The draft YOPP Implementation Plan has been released for external review and comment. Observational aspects were to be discussed at a one day planning meeting during the Arctic Science Summit Week in Helsinki in early April.

3.2.2 WCRP Polar Climate Predictability Initiative (PCPI)

PCPI is the GIPPS research component for time scales from seasons upwards. The PCPI has developed over the last two years, and will be a component of the “The Cryosphere in a Changing Climate” Grand Challenge of WCRP (although the scope of the PCPI extends well beyond the cryosphere). The two co-leads of the GIPPS - PCPI are Cecilia Bitz (Clic) and Ted Shepherd (SPARC). PCPI is planning research on six initiatives.

1. Improve knowledge and understanding of past polar climate variations (up to 100 years);
2. Assess reanalyses in polar regions (joint with PPP);
3. Improve understanding of polar climate predictability on seasonal to decadal timescales (joint with PPP);

4. Assess performance of CMIP5 models in polar regions;
5. Model error (joint with PPP); and
6. Improve understanding of how jetstreams and non-zonal circulations couple to the rest of the system in the Southern Hemisphere.

This planning work is progressing well despite lack of dedicated ICO support.

Action; The Panel noted the need for a very strong focus on moving research into applications so as to realize the dividends quickly with the GIPPS thinking informing the services white paper. Both PPP and PCPI should also inform the PSTG to provide advice on what types of future missions would benefit GIPPS objectives.

It is important to engage with the Arctic Council, which has a task force for business forum. The EU's Horizon 2020 is another avenue to explore noting the need for a defined "research lifecycle" (i.e. what is the purpose and who are the stakeholders who are already engaged).

The Panel agreed to;

- Provide feedback on the YOPP plan and more generally on PPP plans and activities;
- Strengthen coordination between PPP and PCPI, and the role of the ICO with other organizations;
- Convey the global benefits of GIPPS (i.e., not only for the Polar Regions) to Congress and promote GIPPS with Member states, funding agencies and the private sector to secure trust fund contributions, and seek GIPPS funding from the regular WMO budget; and
- Reference PCPI to Executive Council but remove references in draft resolutions until such time as the PCPI is more firmly established.

3.2.3 IPCC Fifth Assessment Report (AR 5)

James Renwick provided an overview of the findings in AR 5 with implications on the Cryosphere. It was noted that the WG reports continue to be very large; some commented that only those who wrote it will ever read it in its entirety. The report noted a decrease in sea ice in Arctic with increases in Antarctica, near ubiquitous glacier ice loss and major ice sheets losing mass. He noted that the cut-off for AR5 papers was about a year ago and some good papers have been published since then; for example some recent studies showing a link between poles and lower latitude weather were not available prior to publication. A recent paper from the US National Academy of Sciences entitled 'Abrupt Impacts of Climate Change – Avoiding Surprises' has some important perspectives. The WCRP Grand Challenge on Cryosphere will intensify its research on permafrost; IPA has launched several large scale projects in Europe, Scandinavia, Canada and the USA. The Panel noted that;

- AntON is essential to consolidate monitoring;
- Expanded satellite glacier / ice thickness, sea-ice thickness measurement is essential to improve our understanding and therefore improve predictability through GIPPS; and
- The WCRP is planning a workshop in September on lessons learned from AR5.

3.3. Services

The presentation by Aimee Devaris highlighted the survey that was conducted under the auspices of the 7th Framework Programme of the European Commission, entitled “Sea Ice Downstream Services for Arctic and Antarctic Users and Stakeholders (SIDARUS),” to define user requirements for sea ice services. The team noted that there are a lot of different sets of priorities and drivers and the team is finding it difficult to knit the pieces together while ensuring the work remains current and relevant. It was noted that it is difficult to contain such a broad topic as, in the view of many, forecasts, observations and all the web-based information and decision tools are considered services.

In the Antarctic, there are common service needs (sea ice, cloud, aviation), but it is clear we must take a regional versus national focus and define a mechanism that allows for a level of cooperation amongst the players in a region. Examples exist such as Regional Specialized Meteorological Centres (RSMCs) and the same issues relate to the establishment of Polar Regional Climate Centres networks and the Regional Climate Outlook Forums.

Action: The Arctic Marine Shipping Assessment (AMSA) and national northern strategies have promulgated a fairly clear set of actions and priorities. Outstanding tasks include liaison with indigenous groups, policy makers (e.g. Arctic Council) and with the ATT and the 3rd pole (e.g. RA II Asia). There is need to strengthen the link with COMNAP for which James Renwick volunteered to assist and to activities related to the 3rd pole on water resource management. Other areas include: (i) working with JCOMM in their approach to the Arctic and southern ocean and (ii) better provision of climate services. The ICARP III planning meeting in Helsinki is considered an opportunity to explore the regional dimension of services.

3.4 Antarctic activities

Jon Shanklin provided a resume of the ATT meeting held the previous day. Experience with AntON suggests that it is very useful to have a comprehensive list of stations, but it does also require a dedicated monitoring centre to pick up when stations drop out and to give feedback on any issues that arise. WIS/WIGOS could help with regular RTH monitoring of the reception of data. He noted a drop in the number of stations reporting, but there are several reasons for this (e.g. change of transmission mechanism). The future workplan includes;

- Continue to maintain the list of the Antarctic Observing Network (AntON);
- Encourage more ships to report weather observations;
- Improve telecommunications routing information and secure a successful transition to BUFR and to make others outside our community aware of the transition;
- Contribute to WMO regulatory material within WIGOS;
- Work with other organizations (e.g. SCAR, IAATO) to increase data availability; and
- Encourage Member states to deposit their metadata.

3.5 Third Pole and other High Mountain Regions

Xiao Cunde highlighted that there are observation, research and service components in this initiative. The high Asian cryosphere is complex, important and diverse. It was noted that forty five percent of the world's population dwell in or near this region and eight large rivers originate there.

International science programs, such as the Third Pole Environment (TPE) are considered a good mechanism to focus on a theme of 'water-ice-air-ecosystem-human' interaction. There appears to be a solid suite of services available however gaps in seasonal prediction, prediction of water availability, disaster risk reduction (e.g. floods) and information for land-use strategies remain longer term goals.

Action; With respect to the high Asian cryosphere, there is need to fully tabulate the observing network in this vast region. PORS agreed that the Regional Climate Centre in Beijing would be one appropriate platform to deliver the needed services. Also, the International Centre for Integrated Mountain Development (ICIMOD), located in Nepal, would be another potential partner platform to help with the coordinated efforts. It was suggested that perhaps the next workshop would take place in the Andes.

4. Partnerships

4.1 International Polar Partnership Initiative (IPPI)

The International Polar Partnership Initiative (IPPI) is the evolution of the International Polar Initiative (IPI) presented to EC-65. The IPPI Concept document evolved from a meeting held in Paris, February 10 – 11, 2014 of the the interagency Steering Group on a Long-Term Cooperative International Polar Initiative. The Panel noted the Concept document need to better highlight tangible benefits and outcomes expected from the IPPI beyond existing partnership mechanisms. EC-PORS stressed the need for distinguishable activities that are inexpensive to implement, clearly address WMO objectives and considers benefits to national programmes.

The Panel noted that there are synergies between IPPI and efforts underway in the Arctic Council to advance adaptation tools for northern communities including information portals. For example, there are strong linkages with AMAPs' Adaptation Actions for a Changing Arctic (AACCA). The Panel stressed the need for distinguishable activities and tangible outcomes that are inexpensive to implement and clearly address WMO objectives. The IPPI should also consider how it would benefit national programmes. The Panel noted that GCW and GIPPS remain tangible contributions by WMO to an IPPI. EC-PORS suggested that WMO could consider involvement after addressing the concerns noted above.

Action; The Panel agreed that Johan Stander (Observations Team and JCOMM co-president), Aimee Devaris (chair of Services Team), and James Renwick (representing Research Team and a member of the WCRP Joint Scientific Committee) will review the IPPI Concept from the view point of WMO polar and related global interests and to submit their comments to David Grimes by March 15 who will then submit their consolidated comments to the Steering Group via V. Ryabinin on 22 March 2014.

After the discussions in Helsinki during the Arctic Science Summit Week, the further updated IPPI Concept document will be presented to the EC-66 and to the other

Partners, including IOC, which will have its Executive Council on 30 June – 3 July 2014. The final Concept proposal will take into account suggestions of key stakeholders including WMO. The proposal may be submitted for consideration of the 17th World Meteorological Congress, 28th Session of IOC Assembly, ICARP III and several other high-level meetings.

4.2 Partner Organizations

Discussions ensued on a number of relationships that have developed over the last four years. Action items are noted as follows;

4.2.1 Association of Arctic Expedition Cruise Operators (AECO)

AECO organizes an annual conference on Polar cruise issues in Oslo in October. EC-PORS / WMO are suggested to present at this conference. An area of interest is the Voluntary Observing Ship Scheme. It was suggested that Helge Tangen would attend.

4.2.2 Arctic Council

WMO was not successful in 2013 in achieving observer status. The Ministerial in 2015 is the next decision point; it was strongly suggested that we continue to seek observer status for WMO with the Arctic Council.

4.2.3 Arctic Monitoring and Assessment Programme (AMAP)

The Panel will continue to strengthen linkages with several AMAP initiatives, including SAON (with IASC), AACA (Adaptation Actions for a Changing Arctic) and SWIPA.

4.2.4 Antarctic Treaty Consultative Meeting (ATCM)

ATCMXXXVII will take place in Brasilia, 28 April to 7 May 2014. Miroslav Ondráš will be Head of Delegation and Steve Pendlebury (consultant and former EC-PORS member) will act as his alternate. EC PORS will designate a current Panel member to fill the “Antarctic practitioner” role subsequent to ATCMXXXVII. The member will be identified before the next ATCM meeting.

4.2.5 International Arctic Science Committee (IASC)

Volker Rachold provided an overview of the IASC including the structure of its working groups and main pursuits. There are strong linkages to GIPPS and large interest in the YOPP, particularly in understanding the link between polar and low latitude climates. Over the course of 2014 a number of organizations will chart a roadmap to integrate Arctic research. The Panel agreed there is need for EC-PORS to have good representation at the Arctic Science Summit Week, the AOS (advocating for SAON which is now in the implementation phase) and the International Conference on Arctic Research Planning (ICARP III) see: <http://icarp.arcticportal.org/>. The WMO is not listed currently as one of the participants in the ICARP III planning. The Panel suggested that PORS or WWRP – PPP be involved.

4.2.6 International Association of Antarctic Tour Operators (IAATO)

Ship observations from cruise ships are of significant value. It was suggested that Permanent Representatives of WMO Members that have flagged ships could write to them to request them to consider being identified as part of the VOS. Johan Stander agreed to follow-up through his JCOMM links.

4.2.7 International Ice Charting Working Group (IICWG)

Helge Tangen provided an overview of the IICWG and their achievements such as the harmonization of ice-charts, data exchange formats, lobbying of satellite providers for ice

monitoring, ice logistics portal, Arctic METAREAs and coordination of service provision, ice analyst workshops, and an ice objects catalog for electronic navigation charts. The EC-PORS research and observations communities will strengthen interaction with the IICWG Applied Science and Research Standing Committee. Their focus will be on long range (seasonal) ice forecasts and modelling. The main issues are ice information products for Electronic Navigation Chart Systems, availability of ice information in Antarctic, ice info requirements of the IMO Mandatory Polar Code, joint ice chart production and measurement of sea ice thickness.

The Panel agreed to investigate the possibility of obtaining EC-PORS or other funding for an analyst to produce some experimental seasonal ice forecast products to help in the discussion with users. It was also suggested that the co-chairs or Secretary General could communicate with interested Permanent Representatives of WMO to encourage investment in this area. The Panel may also consider making this a priority in the Budget for Panel activities within the Compendium of activities for voluntary contributions. Bruce Angle will raise the issues during the JCOMM Expert Team on Sea-Ice meeting in Ottawa. Helge Tangen will follow up with the IICWG co-chairs.

4.2.8 International Permafrost Association (IPA)

Hans Hubberten provided an overview of the IPA, a description of the Global Terrestrial Network – Permafrost (GTN-P) and the Strategy and Implementation Plans endorsed by GCOS. They are engaged in ICARP III planning, developed the UNEP report 2012 on state of permafrost, and have started to prepare for the next International Conference on Permafrost scheduled for June 2016 in Potsdam.

4.2.9 Sea ice in GCW CryoNet and Interactions with the Sea-Ice Community

Alex Klepikov noted the push for standards (terminology, best practices & guides, requirements, formats for exchange) and improved data dissemination (systems, portals for routine access to data). The impetus for action stems from strong user community interaction with the International Ice Charting Working Group and GCW CryoNet Team with complementary work by the JCOMM Expert Team on Sea-ice (ETSI), which will meet March 25 – 28 in Ottawa at the Canadian Ice Service.

ETSI and IICWG are seeking closer linkages with the scientific community (e.g. IASC, SCAR, WCRP). Immediate plans are to review WMO Technical Documents (i.e. SIGRID-3 version 3 - WMO/TD-No.1214, Sea ice nomenclature, vol. I, II, III -WMO-No. 259, update to Sea ice services in the World - WMO-No. 574 and to review coding tables related to sea ice in WMO Manual on Codes (WMO–No.306) and to further develop a Manual for sea-ice observers and to incorporate WMO Polar Initiative activities in their work (e.g. EC-PORS, GCW, Cryonet, etc). The 15th Meeting of the International Ice Charting Working Group, planned for October 20-24 October 2014, Punta-Arenas, Chile, will review standards and further address sea ice issues in the Antarctic.

4.2.10 Arctic Science Summit Week (ASSW) and the International Conference on Arctic Research Planning (ICARP III)

The 3rd International Conference on Arctic Research Planning (ICARP III) will be held as part of the ASSW 2015 in Toyama (Japan) on 23-30 April 2015 and includes the final event of the 3rd International Conference on Arctic Research Planning (ICARP III) see; <http://www.assw2015.org>. This will also be IASC's 25th Anniversary Symposium. ICARP III will provide an opportunity to further the development of cross-cutting, inter- and trans-disciplinary initiatives.

The Panel noted the need for WMO to be engaged in ICARP III planning; there will be a meeting held during the ASSW II in Helsinki in April 2014. Existing SCAR and IASC scientific groups would be requested to consider potential bipolar activities where feasible. The first workshop will possibly be held in the second half of 2015 and review the outcome of IASC's ICARP III and SCAR's Horizon Scan.

Volker Rachold and Thomas Jung will be present but will be occupied with their other duties. The Panel requested that Johanna Ikävalko consider representing its interests.

4.2.11 CIMO Solid Precipitation InterComparison Experiment (SPICE)

The IOC seeks to secure financial resources to support ongoing data analysis and specifically to acquire the services of a data analyst to work under the guidance of the SPICE Data Analysis Team. It is estimated that a total of two person-years is required to complement the existing project team resources, for the completion of the data analysis and report writing. We might consider factoring this into the GFCS FastStart suite of projects.

5. EC-PORS Response to the GFCS, Advice to the Intergovernmental Board on Climate Services (IBCS) and Advancing Polar Region Climate Centres and Outlook Forums

Climate observations in Polar Regions are often for research purposes and are therefore not sustained. User engagement has been a fundamental weakness in the climate services process. The Canadian FastStart contribution of 6.1 million was highlighted a portion of which has been identified for projects relevant to PORS priorities (e.g. Polar Regional Climate Centres network and Polar Regional Outlook Forums) for the Arctic and Third Pole. EC-PORS noted two projects:

Climate Service for the Arctic Polar Region, including:

- Support to Global Cryosphere Watch (GCW);
- Research support on polar weather prediction and climate predictability;
- Establish a Polar Regional Climate Centers network and carry out Regional Climate Outlook Forums.
- Climate Services in South Asia/Third Pole Region (Himalaya and Tibetan Plateau region), including:
 - Stakeholder Engagement and Outreach Activities;
 - Strengthening of the Regional Climate Centre (RCC) and development of services in the context of the GFCS and its emphasis on a user (client) interface;
 - Extending the effectiveness, frequency and coverage of the Regional Climate Outlook Forums (RCOFs) and onward engagement at the national level. Increase dissemination of RCOF outputs, through National Climate Forums and national entities such as National Meteorological and Hydrological Services (NMHSs), to national level target socio-economic sectors, relevant agencies and organizations through improved format, frequency and quality of the services, using standard format and user agreed type of content, thresholds and dissemination mechanisms etc.;
 - Capacity Development activities at the national levels; and
 - Stakeholder Engagement and Development.

For the Antarctic, SCAR does have a working group doing, for example, model intercomparisons but not necessarily providing services. Having an Antarctic centre is likely not possible. BAS does provide probability forecasts for up to six months ahead but not for

operational use and mostly for the peninsula. <http://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/gpc-outlooks>. Probability maps are available at <http://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/gpc-outlooks/glob-seas-prob>. Dr. Falkner will investigate what climate service capability is being developed in SCAR and report back.

The Panel agreed there is a need to better interface with WMO programmes and Constituent Bodies, the ICO for the GIPPS - PPP and the GCW Steering Group to help prepare specific proposals with tangible and time-bound goals. EC-PORS will also consider its relationship with the IBCS to facilitate future collaboration for the benefit of their common stakeholders. The Panel agreed we need to arrive at Congress with some foundational actions completed.

Action; To develop a vision on how EC-PORS sees climate services provision in Polar Regions and the 3rd Pole aligned to the WMO RCC framework which defines the role, functions, connections with WMO and other machinery. This may be best managed in the context of the Services White Paper in advancing the PRCC / PCOF concepts. Aimee Devaris will lead a process with assistance from Árni Snorrason (chair of Observations Team), Dr. Kelly Falkner and the Research Team to describe the architecture.

6. Preparing the Path Forward to Cg-17; Resolutions and Documentation

Miro Ondráš provided an overview of what steps need to be taken to prepare reports to EC-66 (18 – 26 June 2014), Congress 17 (25 May –12 June 2015) and EC-67 (June 15 – 17, 2015). The objective is to influence the Strategic and Operational Plans, interface with the Regional Associations & Technical Commissions and prepare resolutions to renew the PORS mandate and to get guidance on the future step in WMO Polar Activities (see items under section 8).

7. Other activities and presentations

Peter Lennox, CEO MetService of New Zealand, and his staff provided a tour of MetService Headquarters including briefs on public communications and forecast operations.

7.1 Presentations;

1. *Korean Government Arctic Policy and activities in Polar Regions by the Korea Polar Research Institute (KOPRI)*; Dr. Sang-Jong Park;

New Zealand Research Activities, covering:

2. *Sea ice near an ice shelf*; Pat Langhorne, University of Otago Physics department;
3. *Storm-induced sea ice breakup and the implications for ice extent*; Mike Williams, NIWA;
4. *Snow on the Ross Ice Shelf: comparison of reanalyses and AWS observations*; Lana Cohen, Antarctic Research Centre, Victoria University of Wellington
5. Available at; http://prezi.com/cnx3xmrcw3d/?utm_campaign=share&utm_medium=copy
6. *Antarctic Forecasting – A Practitioner’s View*; Matt Ruglys, Royal NZ Navy Joint METOC;
7. *Message from the Poles: Communicating Polar Research*; Erick Brenstrum, senior forecaster, MetService, NZ.

8. Review of the Mandate, Structure and Modalities of EC-PORS (Co-chairs)

8.1 Terms of Reference

The Terms of Reference of the Panel were updated to better reflect current activities including activities related to high mountain regions.

8.2 Structure of EC-PORS

Minor adjustment was agreed to make sure EC-PORS activities are coordinated with WIGOS/WIS.

Action; Establish a Task Team to deal with regulatory material, metadata and observational requirements.

8.3 Panel membership, Team leads and Co-chairs

Scott Carpentier (Australia) and S. J. Park (Korea) were identified as additional members of the Panel. The Panel agreed on the revised assignment of members to various Teams.

Action; The Panel will invite Charles Fierz (GCW GSG member and Chair, IACS) to participate as a member of the Panel.

8.4 Funding of Panel sub-groups and activities; Engaging Funding Agencies

The current balance of the EC–PORS Trust Fund is quite healthy but there are a limited number of contributors as is the case for the GIPPS – Polar Prediction Project.

Dr. Pedrini presented on, “Improving the operational lifespan of surface-based environmental automatic monitoring systems” emphasizing the need to negotiate ongoing technical support for the first ten years with donors to help assure sustainability.

Action; The Panel identified a need to have an overall awareness of the various money flows and how they are targeted to GIPPS, EC PORS or GCW. There are a number of donors and it would be best to coordinate our investments and activities.

8.5 Working mechanisms with WMO Constituent bodies and programmes

Action; EC-PORS noted the need to interface with the development of technical regulations being re-drafted for WIGOS (e.g. removing regional aspects from the Manuals on GDPFS and GTS), particularly in the context of the Antarctic.

Action; The Panel agreed that strengthening the GFCS Interface is important to advance our work. Panel members should advocate with their representatives to the IBCS and its Management Committee on the definition and role of the Polar Regional Climate Centres - network and Polar Regional Outlook Forums.

Action; It was noted that the annual meeting of the Presidents of Technical Commissions (PTC) provides a forum for EC-PORS to ensure effective communication and tasking of responsibilities. High level coordination is also needed between the Observation, Research and Services activities to properly address the GFCS.

8.6 Report to EC-66 (18 – 26 June 2014)

Action; Dr. Barry Goodison will prepare the necessary report to EC-66 in consultation with the co-chairs.

8.7 Identify major issues for guidance from Executive Council or Congress

The Panel noted the following issues that should be further developed and brought to the attention of EC or Congress

- Scalable, detailed Strategic Plan on GIPPS to EC-66 or Cg-17
- GCW Implementation Plan to Cg-17
- IPPI Concept Paper to EC-66 & Cg-17
- Update of the Services White Paper to Cg-17

8.8 Drafting of Resolutions for Cg-17 and EC-67 (2015)

Panel agreed on the text of the draft Resolutions to be submitted to Cg-17 (see Annex):

1. Resolution on the Manual on GOS, Vol. II, The Antarctic (Annex 7)
Note; Decision pending proposed structure of the Manual on GOS
2. Resolution on AntON (Annex 8)
Note; This will remain a living document
3. Resolution on GIPPS (Annex 9)
4. Resolution on WMO Polar and High Mountain Activities (Annex 10)
5. Resolution on IPPI (Annex 11)
6. Resolution on GCW (Annex 12)

Resolutions to be submitted to EC-67:

1. Resolution on PORS (Annex 13)
Note; Panel re-establishment of its TOR and membership.

Action; All drafted resolutions will be submitted to EC-66 for information as annexes to a draft text of the working document on WMO Polar Activities.

9. Future Work Programme, intersessional arrangements; the Path forward

9.1 Continuing engagement of Partner organizations

Action; For future meetings, EC-PORS will take steps to invite targeted, external partners that relate to key activities under discussion. Forward planning will be required.

9.2 Summary of Proposed tasks, actions and responsibilities

The Panel recognized a series of follow-up actions as identified in sections of this report.

10. Future Meetings of EC-PORS and its Constituent Bodies

There are two offers for the next meeting in the northern hemisphere; one in Reykjavik, Iceland and a second offer for Oslo or Tromso, Norway. There is also an offer to meet in Potsdam, Germany at a future date.

It was agreed that the next meeting will take place in Iceland> It was suggested that the Panel may consider the last week of January 2015 as an option as this would match well to the 2015 meeting of the Presidents of Technical Commissions in Geneva.

EC-PORS also discussed the frequency of meetings and will consider meeting every 18 months versus holding an annual meeting. EC-PORS co-chairs will assess whether the Panel will meet before Congress or after EC-67, the latter would enable to follow-up immediately on the guidance from Cg-17.

Closing of the session

Deep appreciation was conveyed to our hosts in New Zealand noting the cooperative ethos of the group. The Co-chairs thanked all members for their contributions and for the fine spirit of the group which ensured a very productive meeting. A special thank you was extended to James Renwick and to MetService of New Zealand who made sure all our interactions with stakeholders and partners went well. Peter Lennox thanked all for attending and enjoyed the Panel's visit to MetService. James Renwick was thrilled to see the EC-PORS panel members in Wellington and thanked James Lunny, Mike Williams (NIWA) and to the VUW school manager Monica Hanson for making things work.