

**Space Task Group (STG) of the IPY Sub-committee
on Observations
Fifth session
30 Nov. - 2 Dec. 2009, WMO, Geneva, Switzerland**

1. Opening and Approval of Agenda

Eduard Sarukhanian welcomed representatives of ASI, CSA, DLR, ESA, IPY JC, and WCRP on behalf of WMO, and transmitted apologies from Jeff Key (NOAA), Eric Thouvenot (CNES), Kenneth Holmlund (Eumetsat) who for financial and personal reasons were not able to participate. Missing were also representatives of CMA, INPE, NASA, Roshydromet. The plan was to rendezvous with K. Jezek (KJ) by teleconference on day 2, to discuss the document "Scientific Requirements Interface" prepared for the meeting.

Barbara Ryan, Director WMO Space Office welcomed participants on behalf of W. Zhang, Director WMO Department on Observations and Telecommunications and her own. She pointed out that some key meetings including ET-EGOS (WMO Expert Team on Evolution of GOS) were being held at this time to evaluate the status of the space based and in-situ observing networks. These were pertinent to the STG5 meeting discussion and germane to the future of the polar observing system.

Mark Drinkwater welcomed the participants to the 5th STG meeting (see list of participants). He pointed out the significance of the meeting for assessing the legacy of the IPY and in particular for discussing the future of the IPY Space Task Group. The background to this discussion will be presentations about the WCRP perspectives in the context of scientific priorities for the future, the International Polar Decade (IPD), and the Global Cryosphere Watch (GCW). Meanwhile discussions shall also focus around the Oslo IPY Science Conference in June 2010 as a focal point for conclusion of IPY STG activities.

The STG approved the proposed Agenda, though the summary report drafting was not needed at this time. MD proposed that Item 3 be taken after the Agency reports in order to assess progress towards some of the product objectives.

2. Review of IPY status (Eduard Sarukhanian)

ES presented a summary review of the IPY scientific advances and observational achievements (see **Presentation 1**). These included extension of surface-based meteorological networks in polar regions through establishment or modernization of new stations and by the intensive deployment of automatic weather stations and upper-air systems; development of new integrated observing systems in Arctic and Southern Oceans based on the wide use of modern technologies such as gliders, ice-tethered profilers, marine animals equipped with sensors, Argo floats; creation of an impressive array of new satellite data and products as result of the coordinated approach adopted by the Space Agencies; and implementation of new initiatives in hydrological cycle and cryosphere studies during the IPY period.

Recognizing that success of IPY had inspired many nations to continue projects beyond IPY "official" period, WMO and ICSU have agreed to announce formal closure of IPY on 12 June 2010 at IPY Oslo Science Conference (OSC), Norway. Meanwhile, given the phasing of national funding some large scale IPY projects shall continue their field experiments in the Arctic and Antarctic in 2009 and first half of 2010.

The STG members acknowledged the proposal to use the Oslo Conference as a focal point for concluding STG activities and for showing results. FB, however, pointed out that delays in initiating ASI IPY Projects would mean that it is likely too premature for them to present scientific results from COSMO-SkyMed (CSK) at OSC. The 20 January abstract submission date for OSC will likely be too early for the Projects using data via the ASI Announcement of Opportunity projects. ES noted that it may be possible for ASI to participate anyway with a summary of the valuable results coming from the COSMO-SkyMed (see ASI status presentation).

To document a history and some of the achievements of the IPY Joint Committee for IPY (JC) has decided to prepare a report titled "Understanding Earth's Polar Challenges: The International Polar Year 2007-2008" and to present it to IPY Oslo Science Conference. First draft is to be prepared by 20 December 2009. KJ and MD had coordinated preparation of a short article summarizing the work of the STG that has served as valuable input to the Report preparation. MD asked the members of the STG if they were in agreement to use some of the text and in particular illustrations and content from the publication being prepared. The STG expressed no concern with use of the figures, since this did not preclude their use in a peer reviewed publication later.

3. Review of Status of Actions from previous meetings

The Status of Actions from previous meetings was reviewed and discussed by the STG and the status reported in Appendix II. Most actions were closed, except for a few ongoing items.

4. Report on IPY STG 3rd SAR Coordination Workshop (Yves Crevier)

YC presented the path followed by the SAR Coordination group in Planning, Acquisition coordination, and Science product development activities (See **Presentation 2**). These elements had been used as the basis of SAR Coordination meetings that took place at CSA in Montreal Canada, in DLR Oberpfaffenhofen Germany, and at ESA-ESRIN in Frascati, Rome. The output of these meetings was that various tables have been prepared indicating the Agency commitments towards producing a suite of scientific products from the acquired SAR data. YC proposed that it may be possible to consider a multi-agency flyer for OSC containing a summary of the products being produced.

YC noted the impact which the IPY STG's SAR Coordination group has had at GEO level, as the group is now used as a model for coordination of the Forest Carbon Tracking (FCT) initiative being discussed at COP-15, and also the CEOS Hazards group who also use InSAR data.

The STG sincerely thanked Yves Crevier for his efforts in chairing the SAR Coordination Group, and for channeling his positive energy into this effort. The STG encouraged that the Coordination Group write down the lessons learned from the IPY SAR Coordinating

efforts as a means of documenting the essential elements for such a group to be able to make tangible progress.

Action STG5 – A1 to STG SAR Coordination Group participants to write down key lessons learned from the IPY acquisition coordinating effort – illustrated by some specific scientific examples of results of this effort.

It was also recognized that there should be a summary presentation in OSC summarizing the kinds of effort required to get the Space Agencies around a table – with key examples outlining the benefits of such coordination.

4 a. Progress towards product commitments

The Chair had requested that progress towards Agency portfolio and high level product commitments will be covered specifically in the Space Agency reports.

4 b. ESA G-POD Processing of Antarctic Mosaics

See info under ESA Status report.

5. Agency Reports

5 a. Individual Agency Status Updates

ASI Status Report (Fabrizio Battazza)

FB presented the results stemming from the ASI portfolio and actions in response to Action items stemming from Coordination Group (See **Presentation 3**). He recalled the data exploitation projects and main actors in use of COSMO-SkyMed (CSK). Currently 3 satellites are operational with a fourth satellite about to be launched in 2010.

Meanwhile via the ASI approved AO, 167 projects to be activated over an interval of 2 years. Of these 27 will be funded by ASI. Over 16,000 scenes to be exploited in these projects. IPY CSK acquisitions were made in foreground and background mission planning. For Foreground mission, 7 Projects focused on IPY topics plus 3 projects acquiring on Alps, Iceland and Lapland. In background mission other acquisitions are possible for CSK to meet the GIIPSY requirements. The STG noted that super-sites may be the answer.

Action STG5 - A2 to GIIPSY to define (and send to FB) imaging geometry for of additional background acquisitions of super-sites etc in Antarctica and Greenland to match the GIIPSY requirements.

During IPY CSK has been monitoring specific sites for “punctual” imaging of special events in Huge region (HR) and Wide Region (WR). Examples were shown from Wilkins ice shelf, Drygalski ice tongue and Terra Nova Bay polynya, and also of Perito Moreno glacier velocity changes over time in spotlight mode.

DLR Status update Manfred Gottwald)

MG presented two parts of a DLR update (see **Presentations 4a and 4b**).

In the first part from Dana Floriciou (DF) he indicated the present updates for the acquisition planning (Presentation 4). MG also noted the explicit DLR updates to the table prepared at the SAR Coordination meeting.

Action STG5- A3 to GIIPSY to prepare a proposal for Greenland InSAR coast region acquisition request from T-SAR-X.

Left-looking acquisition planning which had been made by DF allows different ice streams/glacier basins to be acquired – in particular in trans-Antarctic mountains. MG showed the example from Nimrod glacier. Acquisitions for Beardmore glacier are currently ongoing. Greenland ice stream mapping via project by I. Joughin, and Antarctic peninsula mapping, including ice shelves by project by M. Braun. Background acquisitions ongoing in Transantarctic mountains.

The second presentation by MG responded to the previous action item **STG4 - A2** to indicate links to atmospheric products. He indicated the specific atmospheric datasets available through the DLR, OSI-SAF and ESA interfaces. He listed the suite of atmospheric sensors from which products available, and showed some atmospheric applications stemming from the data – such as ozone monitoring using GOME, GOME-2, Sciamachy.

MG noted that presenting polar atmosphere chemistry results may require more attention since their content differs from e.g. high resolution radar data. While the latter are usually easy to ‘read’ for the interested observer, the atmospheric domain results (often with low spatial resolution) appear to be less ‘sexy’. Therefore it is important at conferences as e.g. Oslo to think about how the atmosphere chemistry is presented (e.g. link tropospheric BrO and frost flowers images; ozone hole, although somewhat self explanatory, may gain from PSC photos).

CSA Status update (Yves Crevier)

YC outlined CSA status of IPY portfolio (**Presentation 5**). He noted that Canadians have a very strong sensitivity to climate change and impact of Arctic changes. Canadian government has this very high on agenda, together with sovereignty and security issues. CSA summarized their portfolio – including over 25,000 Radarsat scenes. In addition there were 40-50,000 scenes acquired over last 15 years since Radarsat 1.

He noted the success in mapping Antarctica in HH, HV together with extended and high beams (all left looking). These data are complemented by 3 consecutive cycles of interferometric coverage which started in Feb 2009. The data focus on the pole hole, and together with the ESA data are anticipated to enable the interferometric derivation of pole to coast velocity maps.

For the Arctic sea ice contiguous basin coverage has been acquired in winter and spring from Radarsat-2 to complement the Envisat ASAR data.

Greenland interferometric coverage was with Radarsat-1, with a downloading agreement with K-SAT (Svalbard). Greenland coverage was not possible with Radarsat-2 due to the predominance of Wideswath HH-pol mode. I. Joughin (Univ. Washington) interferometric data into pole-to-coast velocity maps as part of a NASA funded Measures project.

YC summarized the response to the Tables discussed at the STG SAR Coordination meeting, and summarized the successes and principal contributions. The principal limitation with respect to what was planned was the original plan to obtain 3 day snapshots. This has not been possible during IPY due to operational constraints.

The STG noted its appreciation for the significant contribution of MDA and in particular Gordon Rigby for the effort made to accomplish the mission planning required slew the satellite from right to left looking mode on each consecutive orbit. MDA are encouraged to present in OSC what it takes to perform such a set of acquisition campaigns as have been achieved during IPY.

ESA Status update (Mark Drinkwater)

MD presented the ESA IPY portfolio status (**Presentation 6**), illustrating progress towards producing the Arctic sea ice snapshots, Antarctic mosaics (see note on G-POD below), and MERIS optical data from Arctic. He showed results of the cross-interferometry tandem campaigns.

MD presented the ESA GRID Processing on Demand user interface as a means of producing ice sheet or other large mosaics automatically at the data source (See here: [ESA Grid PoD - Antarctic Mosaics](#)). The advantage is that the GRID offers a parallel computing environment to process large volumes of data directly on data in the ESA archive, without pushing and pulling the large product volumes to users by internet or in the form of DVD's or other media. MD noted that Jorge del Rio Vera will be succeeded by Emmanuel Mathot/Jordi Farres.

5 b. Status of New Missions (e.g. CryoSat-2; IceSat-2; Arktika; PCW)

YC presented the current status of PCW (currently known as PolarSat) and its scientific and communications objectives (**Presentation 7**). The satellite would provide communications at latitude north of 50deg. N.

YC noted the Canadian Phase A of what was the Polar Communications and Weather satellite (PCW). The mission has been re-baptised with the name "PolarSat". He identified the product and services objectives of the mission which are being used as drivers for the current ongoing Phase A activity (runs through June 2010). The plan is to go for a Phase B/C/D/ in February 2011 - with projected launch of first satellite in August 2016. The Canadian government is seeking partnerships on instruments and launches, and even consideration of public private partnerships (PPP).

MD presented the status of GOCE, SMOS and CryoSat-2, and noted the principal synergies between GOCE and Cryosat-2 for derivation of ice thickness, ocean dynamic topography and thus under-ice Arctic Ocean circulation (**Presentation 6**). He also pointed out the forthcoming GMES Sentinel missions relevant to polar observations in the future. Sentinel-1 will provide continuity to Envisat ASAR observations, whilst Sentinel-3 will provide continuity to CryoSat-2 SAR altimetry, using its SRAL instrument; AATSR is succeeded by the SLSTR instrument, and MERIS is succeeded by the OLCI instrument.

6. Reports on Recent IPY Portfolio developments

6 a. USGS Arctic Mosaic Status

It was noted that it had not been possible to reach USGS prior to the meeting to find whether a suitable teleconference would be possible. At the previous STG4 meeting, B.Ryan had noted that the 2nd GeoNorth meeting forum was a forum in which the value of an Arctic LIMA-like product would be discussed. It was suggested by the STG that she follow up with USGS about status of Arctic LIMA-like product, and to report back to the STG.

Action STG5 – A4 the STG Chair requested that B. Ryan follow up with USGS about status of preparation of an Arctic LIMA-like product.

6 b. SPIRIT DEM overview

In the absence of ET, MD noted that he was aware that the CNES funded SPIRIT Project had now ended, and that SPIRIT had invited a representative of GIIPSY to present the project at a SPIRIT Workshop being organised in Toulouse, France on 29-30 April 2010. The aim of the workshop is to discuss completed and/or on-going glaciological research based on SPIRIT data and share experiences using these data. Apart from the glaciological talks, time will be also allocated for presentations by the French Space Agency (CNES, who designed the SPOT5 satellite and funded the SPIRIT project), Spot Image (who manages the satellite) and the French Mapping Agency (IGN, who derived the DEMs from the stereo-images). This a unique opportunity to bring together the international glaciological community with CNES, Spot Image and IGN in order to discuss future acquisitions using the SPOT5-HRS sensor on polar regions and forthcoming very high resolution satellites such as Pleiades (<http://smc.cnes.fr/PLEIADES/index.htm>).

6 c. Eumetsat new operational Arctic ice drift product

MD pointed out that a new pre-operational sea-ice drift product is being operationally distributed in demonstration product mode. This is the first time that such a product has been made available by an operational Agency.

The product algorithm theoretical basis documents, and product manuals are available online together with browse examples of the product from the Ocean and Sea Ice Satellite Application Facility here; <http://saf.met.no/p/ice/index.html>.

7. IPY Archival Status (Oystein Godoy)

OG gave the STG an update on progress regarding Data Management (**Presentation 8**) The various interoperability standards complicate data exchange, and various catalogues in US and Europe using these different standards make it difficult to integrate the holdings.

One of the key objectives of IPY and also the main challenge is to establish integrated search for data (through metadata) for all IPY data, regardless of discipline or data owner. IPY relies on a minimum metadata specification based upon the NASA Global Change Master Directory (GCMD) Directory Interchange Format (DIF). However, the IPY metadata specification is yet not supported by all data management centres and many use other standards for metadata (e.g. CF, ISO19115,..). Experience gained after 1 year

of test exchanges reveals that standards may be interpreted differently and that efforts are required to harmonise implementations and run time operation.

Currently GCMD is harvesting metadata from the Norwegian DOKIPY Norwegian IPY multi-site database (distributed system between 3 centres in Norway) once weekly. Due to the funding situation this database currently contains physical sciences data, though ultimately the system could be adapted to human sciences. Similarly GCMD harvest metadata from other IPY databases like e.g. NSIDC. NSIDC has also created a XML validation for IPY metadata.

The Catalogue Services Web (CSW) utilising ISO19115 metadata is used within the INSPIRE framework. This is what Eumetsat catalogue supports as the machine interface to their catalogue. METNO is examining the possibility to integrate this with the IPY catalogue through additional funding.

As GCMD DIF was adopted for IPY a mapping between DIF ISO19115 is required. This work is being continued within EU FP7 projects where INSPIRE compatibility is sought and in relation to MyOcean.

OG reported that an IPY Data Management meeting had been recently held in Ottawa from 29 Sept 29 – 1 Oct, 2009. The lessons learned from IPY are that funding for data managements systems came too late and ambitions were initially too great. Also in order for the scientists to buy in they must first see the benefits via pilot projects. It is important to try to utilize the existing frameworks, and that the systems should be global and not regional in focus. One major outcome of the meeting is that there will be a “State of Polar Data Report” together with recommendations for various groups (e.g. for sponsors, data managers, data providers etc).

OG noted that a demonstration Project is currently underway based on OAI-PMH/GCMD DIF to link together NSIDC, Polar Data Catalogue, BAS, DOCIPY, CADIS, DAMOCLES, GCMD.

BG noted that the lessons learned from IPY Data Management have pointed to the fact that any International Polar Decade must be accompanied by effective preparation of the Data Management. The demonstration project above is critical to demonstrate the benefits of linking together the holdings of these systems and to show the benefit of being able to discover datasets.

DAMOCLES held recently an end symposium in Brussels from 10-12 November, 2009 which involved also the US SEARCH community. OG had attended this meeting. A specific session was dedicated to operational forecasting and arctic reanalysis. Several presentations pointed out the need for data, and highlighted observational gaps. An increasing recognition of the need for data management was observed during the meeting compared to earlier meetings, as well as the need to collect data relevant to data assimilation by the modelers. Similarly this helped to recognize the need to coordinate experimental and operational data streams in the Polar regions.

Concerning Remote sensing datasets there has been useful dialogue with CEOS WGISS since last meeting. With respect to metadata exchange Eumetsat has established a metadata exchange system.

With respect to GTS data, the IPY data management has focused on cataloguing WMO distributed data from SYNOP, TEMP, DRIBU, etc. This effort relies on transformation or addition of proper metadata. Not all data can be put openly online but will be archived offline to ensure IPY legacy.

ECMWF data have been handled through a rolling online archive. For METNO data products include Arctic HIRLAM NWP, the Arctic Ocean Model (Norwegian) fields and SYNOP data. Similarly Eumetsat OSI-SAF products and IPY THORPEX data have been included. METNO continues to work to establish an Arctic Data Centre through WIS with specific focus on metadata and data discovery.

TM asked if Data Management subgroup had managed to establish appropriate links to Space agencies. OG noted that CEOS forum would help facilitate adoption of standards to help link together with respective data archives. Meanwhile, some agencies try to bring the users to the independent Agency archives, and we are still some way from unifying many of the data archives.

OG notes that there shall be a demonstration that shows the benefits of linking the archives together. It is time to go to implementation of a system with an interface.

Action STG5 – A5 for OG to continue with preparing demonstration to illustrate to Space Agencies the benefits of open interfaces to their IPY catalogues.

Recommendation STG5 – R1 - STG recommends that Eumetsat in collaboration with OG consider holding a workshop in 2010/11 to discuss how to approach the management of the IPY satellite data legacy.

8. Space and the Arctic Workshop - Summary Report (Tillmann Mohr)

TM debriefed the STG on the “Space and the Arctic” Workshop organized by EC, ESA and Swedish in Stockholm on 20-21 October, 2010. (See: **Presentation 9**). This and all the session presentations appear online on a Workshop Website hosted by ESA, here: <http://earth.esa.int/workshops/spaceandthearctic09/Presentations.html>). There were approx. 200-250 participants, with EO, transport, and other thematic subjects dealt with. The EC’s Director Marine General Reinhard Priebe (DG-MARE) chaired the meeting. ESA delegation included Volker Liebig (Director EO), and Eumetsat delegation included E. Koenemann.

There were three primary sessions: Climate change and Arctic; Transport and Security; and Sustainable Exploitation issues were discussed at the meeting. There were summaries and conclusions out of the sessions at the meeting, and there is intent to convene a meeting early in 2010 to discuss specific actions stemming from the Workshop.

9. WMO Panel of Experts on Polar Observations, Research & Services (PORS)

9 a. Global Cryosphere Watch (Barry Goodison)

BG presented the status of preparation of the Global Cryosphere Watch (**Presentation 10**). Blending IGOS Cryosphere Theme (here: <http://geo-cryosphere.org/igos-cryos.html>) into GCW means that GCW presentation now includes Jeff Key (NOAA STG member)

as a co-presenter. The Global Cryosphere Watch is regarded as one of the IPY legacies of IPY and WCRP CliC. The mission of GCW is to fully implement and realize the CryOS vision outlined in the IGOS document. It has to link to WCRP CliC activities to be successful in delivering on products with which to stimulate assessment of changes in the cryosphere, and also to deliver data with which to better predict the future state of the cryosphere via Earth System Models. GCW should be an authoritative source of data and derived products.

CryoNet should use existing reference station networks, like Antarctic AWS stations, or Arctic atmospheric reference network stations, and to adopt standard suites of measurements. CEOP are beginning to document the sites and the data sets. BG noted that an important connection to retain to the GCW community of practice is a group with a mandate similar to that of the Space Task Group.

BG highlighted the next steps to preparing a scoping document and to develop demonstration projects. For Antarctica there is an important gap and there needs to be a plan prepared for the way forward. The PORS has been given the mandate to progress GCW to the point where a proposal can be made to the WMO Congress in 2011. GCW was strongly endorsed by PORS. The Panel appointed a number of PORS members to help define the way forward. These include Jeff Key, Karl Erb, Arni Snorrasson, and Hans Hubberten.

(Item 9 b. International Polar Decade was discussed after item 10)

10. Scientific Requirements for STG

10 a. Scientific Requirements Interface - telephone conference with Ken Jezek (Day 2, 17:00hrs)

KJ outlined his ideas about the critical need to retain an active scientific interface, via something that resembled GIIPSY during IPY (see supporting Document 10c). GIIPSY had fulfilled an important role in linking the science community and Space Task Group. GIIPSY was successful in identifying a doable list of high-level, consolidated science objectives. These had been distilled and consolidated from the range of science drivers for space data needs during IPY. KJ expressed that a similar body to STG would be required with links to science groups or bodies such as ISMASS, Sea Ice Working Group, IPA, etc.

KJ recognized that the body must reach into the science community of each discipline. It must be able to identify the key science and observational requirements for each discipline. It shall work to establish a set of observational priorities on the basis of the requirements – but this shall help to make most efficient use of the space infrastructure. This information is required to drive a group like STG towards acquisition planning, processing and distribution progress.

TM noted that as concerns the cryosphere, he believes one can rely on IGOS Cryo Theme Team report as a source of the key observational requirements. However, other domains are not covered such as polar atmosphere. VR noted that he believed that WCRP SPARC is in the future a more all encompassing source of requirements for polar atmospheric issues. VR highlighted that there would be more interest in troposphere in the future.

The STG discussed the interest in an STG-like body that interfaced with GCOS, WCRP CliC, GCW, PORS, and GTOS. VR noted a clear need and desire for such a body.

YC noted that the relationship between GIIPSY and STG is unique. He identified that there is a need for a formal body like STG which is recognized, but which has an interface to a group like GIIPSY to focus the requirements. ES noted that PORS is one mechanism to link STG like group to the community of practice.

KJ highlighted that what needs to be preserved is the kind of bond between GIIPSY and STG. GIIPSY provided an ensemble of requirements to the Agency, which fed into the STG discussion about setting priorities.

TM proposed that one could take GIIPSY and note the legacy of GIIPSY as an IPY Project. If a body or Project like GIIPSY was considered of value in serving requirements to space agencies then the STG shall consider how to translate this into what similar group would be required for a Polar Decade. Maybe a GIIPSY-like Project is something that could be considered to be proposed as part of IPD.

Action STG5 – A6 to KJ to develop a list of functional requirements and capabilities would help to distinguish what sets aside GIIPSY to be discussed by GIIPSY and WCRP.

VR noted that we should clearly identify what shall be possible using the satellites already planned over the next 15 years.

Action STG – A7 on MD and JK (as STG PORS representatives) and VR to put together White Paper identifying satellite infrastructure elements and consequences for what sustained observation time-series shall exist, and what resulting services could be delivered in the future. A contribution from VR shall be on essential wiring diagram illustrating the important interfaces linking to the bodies preparing IPD.

BR highlighted that what appeared to work was that there was a recognized need, as well as a clear mandate for a group like STG. However, what had been accomplished had clearly also relied on the energy and commitment of specific people.

MG noted the challenge would be to put together an interested community of practice for the Polar regions atmosphere element of a GIIPSY like Project. This is because few people are intrinsically interested in Polar regions, rather global atmospheric processes. Though he identified specific interests in Polar Stratospheric Clouds, Noctilucent Clouds (i.e. mesospheric clouds), and ozone hole, he believed it may be difficult to engage these users in a similar manner to the polar cryospheric community.

10 b. WCRP perspectives in polar research (Vladimir Ryabinin)

VR presented the WCRP perspectives (see **Presentation 11**). For the intermediate and long term planning (2010-2015) WCRP focused on implementing strategic framework COPES (Coordinated Observations and Prediction for the Earth System). The central element to WCRP is Prediction, and to understand climate variability, predictability and forecasting. Reanalyses, long-term predictions, and regional predictions are of key interest in this framework. A question which focuses the efforts is to what extent decadal

variability is predictable. Indices such as the Meridional Overturning Circulation are used to evaluate whether models can reproduce the observed variability. Model inter-comparisons indicate that there is strong predictability in the north Atlantic sub-polar gyre region and other key polar ocean regions such as the Weddell Sea. Polar Climate predictability is a key theme and thus there will be a Workshop on polar climate predictability in October 2010 in Scandinavia. VR noted that there would also be a WCRP Science Conference in 2011 to review aspects of WCRP projects.

VR pointed out some of the specific CliC initiatives, including such components as impact on freshwater balance of Arctic, or Carbon and Permafrost, and the modulating role of the permafrost. Snow, Water Ice and Permafrost in the Arctic (SWIPA) shall make an assessment of the state of these elements. Regional climate modeling was also identified as a new focus area within the CliC activities.

MD noted that there must be some feedback from the modelers about consistency or inconsistency in satellite data parameters that are used in climate and forecasting models. This is an active interface approach to WCRP activities that should be considered in the context of a future STG-like group.

VR summarized by saying that it was clear that we need cryospheric models embedded in Earth System models to make accurate global predictions. These models require satellite cryospheric data sets with error bars for effective data assimilation. The International Polar Decade should therefore have an embedded element treating studies of real predictability using real observations of polar regions made by polar observing systems.

Suggestions by VR on behalf of WCRP were that we need to consider how change the philosophy in terms of polar product development. Instead of single sensor products we need synthesized products. For example, significant benefits may accrue from having melt pond information generated from multi-satellite datasets (Vis+IR+high res. SAR+passive microwave) in order to improve sounder data and thus 3d atmosphere in NWP models during spring.

9 b. International Polar Decade (Eduard Sarukhanian)

ES Presented the International Polar Decade (IPD) and the preparation for this post-IPY initiative (see **Presentation 12**). Noting the sensitivity of climate to changes in the Polar regions, the idea of a decade is strongly linked to the goal of decadal prediction, and improvement of climate forecasting. The recent Third World Climate Conference had concluded there shall be a global framework for climate services. However, unfortunately there was nothing specific about the need for cryospheric observations, or indeed polar satellite observations. The link between WCC-3 conclusions and the need for IPD will need to be made elsewhere.

The IPD initiative was presented at several events (see Presentation 12) and received a positive response which led to a commitment by WMO Executive Council at the June 2009 meeting EC-LXI to an International Polar Decade. There are various background document sources that feed into the intent of IPD, including the IPY JC Statement "The State of Polar Research" (supporting document) and other WCRP documents.

IPY has showed the feasibility of addressing key environmental and societal issues in the Polar regions. The "State of Polar Research" document distributed at the meeting summarized the key outcomes and benefits of IPY. Furthermore, it clearly states that there is a pressing need for further polar research – and proposes a more sustained polar research effort. The IPD observing structure is currently foreseen to include the following potential contributing elements: Sustaining Arctic Observing Networks (SAON), Integrated Arctic Observing Systems (iAOOS), the Southern Ocean Observing System (SOOS), The Global Cryosphere Watch (GCW), Polar Satellite Constellation (PSC), Polar Climate Outlook Forum (PCOF), and THORPEX IPY project. IPD can be considered as an umbrella under which these IPY legacy initiatives would be developed.

ES pointed out the potential IPD stakeholders to define the scientific basis of IPD, its observing system capability and organizational structure. WMO, ICSU, UNEP, UNESCO (i.e. its IOC) have strong scientific interest and some of them run comprehensive observing networks in Polar Regions. Arctic Council (AC) and Antarctic Treaty (AT) bodies must be engaged to provide political linkage since they recognize the need for long-term sustained polar research.

VR noted that the above organizations are those which should endorse the concept of IPD. Meanwhile, though the Space Agencies may be seen as a supporting element of the necessary observing system infrastructure, they are not really seen as an endorsing element of IPD. MD pointed out that it will be necessary to convince the space agencies that they shall endorse the IPD effort.

The EC-PORS group shall take some key role in preparation of documents in support of IPD. Notably MD and JK represent the Space Agency interests on the PORS group, and should help to prepare IPD with the STG member inputs. PORS-1 had unfortunately been somewhat inconclusive in expressing concrete views on the next steps, or for preparing for a possible workshop. Meanwhile, it was highlighted that there is a need now to prepare documents for the June 2010 Executive Council EC-LXII meeting.

TM noted that CGMS agencies will undoubtedly support the IPD effort. What is necessary is a concrete proposal for a mechanism like GIIPSY that would help to facilitate the research link to the R&D Agencies.

YC noted that he was uncomfortable having a discussion about the politics of who shall and how to justify IPD. YC noted that there is reason enough to try to task the satellites to address issues of IPD interest. However, he recognized that this implied a change in methodology from obtaining punctual snapshots against which to gauge climate change, to a more careful planning of sustained observations and resultant products that support the ideals of IPD.

FB was in agreement with YC. The IPD is undoubtedly of interest. FB noted that the effort of each Space Agency in a decade should be more demanding respect to the two years of IPY, then the framework for IPD, together with the objectives and guidelines, should be clearer to the STG members at present to evaluate a possible contribution of each Space Agency.

VR noted that the proposal for IPD should outline two phases, one to establish principal, and a second phase to establish and properly consolidate the implementation approach.

BR noted that she and Wenjian Zhang had a chance to speak to D. Grimes (Chair PORS) at the recent GEO Plenary. She believes that the PORS does recognize the critical importance of STG. Furthermore the Chair of PORS very much supported what the STG had accomplished. But he had expressed that perhaps the PORS-1 meeting had been so busy that it was not possible to properly structure future thoughts on what to do with the necessary evolution of the STG.

VR noted that a reinvented GIIPSY would have to link to the climate prediction framework for the IPD. MD noted that GIIPSY is not sufficiently inclusive to engender a discussion, for instance, with the atmospheric community. VR noted that WCRP can help with engaging the other necessary communities, e.g. via SPARC or GEWEX.

Action STG5 - A8 – from STG to GIIPSY and WCRP to engage town hall meetings or appropriate discussion helping to frame a proposal for about how to develop an appropriate requirements interface to a future STG and IPD initiative.

VR proposed to engage GIIPSY in a WCRP CliC discussion by a GIIPSY rep. to attend the forthcoming SSG meeting in Valdivia, Chile. The proposed CliC SSG meeting would give the change to engage WCRP in discussion. Since polar predictability should be one basis for engaging a GIIPSY like group, this was at least a concrete step to scoping out the basis for such an approach, and successor group.

YC recommended that we look also to GOFC-GOLD and similar such offices as a means of establishing a working capability to coordinate GIIPSY like inputs. He noted that this was something that Space Agencies are currently financing as a means of collecting requirements from the community.

11. Future of Space Task Group

MD introduced the issues in connection with the end of tenure of the present STG, and pointed towards important questions concerning the potential future establishment of an STG-like group for IPD.

The STG discussed at length the issue of the end of STG Tenure and the relationship with the proposed June 2010 OSC date. ES noted that ideally the sunset date can be considered the Oslo meeting, though a transition period until end 2010 may help with preparing the way for IPD. The STG members and secretariat agreed that the STG shall officially be terminated, with a transition period foreseen between June and end 2010. However, importantly, a letter of thanks shall be sent to heads of space agencies prior to OSC, outlining the clear benefits of Agency involvement in IPY. Such a letter should point towards future involvement in IPD.

Action STG5-A9 – from STG to JC (TM/ES) to ensure WMO/ICSU send letter of thanks in May 2010 closing activities of present STG, but highlighting IPD need to engage the Agencies in sustained future activities – and to encourage participation in OSC.

MD noted that any new STG should ideally be given a fresh mandate and should re-engage Agency members with a clear objective tuned towards the needs of the IPD and GCW. Meanwhile, the discussion had clearly identified that it needs to be requirements driven exercise. Potential links were identified to the IGOS Cryosphere Theme requirements, GCOS ECV's, GEO SBA's, and potentially also GMES/EU Policy and

Service requirements (e.g. PolarView service continuity). Today WCRP do not place requirements on Space Agencies, though clearly a link was needed on the basis of the modeling framework of COPEs, and to ensure an active link to CliC.

It was identified that a future group would need to bridge CEOS and CGMS and to federate the R&D and Operational Agencies in some common goals. Moreover, this would help to consolidate the Global Observing System vision – which recognizes the importance of specific R&D satellite data streams in the GOS context.

Meanwhile, the CryOS goal embodies a space infrastructure element (called Polar Satellite Constellation) that shall contribute to meeting GEOSS goals. It was also noted that the future constellation should help to address GCW product and service related needs, which are necessarily broader than “polar” mandate of PORS

MD suggested that it may be possible to make a proposal to establish a CEOS Polar Virtual Constellation (PVC). This may be considered as one way to interface with CEOS at a level on a par with other virtual constellations. YC noted that the Ocean Colour Radiance Virtual Constellation (OCR-VC) has at its heart the International Ocean Colour Working Group (IOCCG) which is ostensibly a science coordination group. This model was identified as one potential way to maintain a science interface to the R&D agencies for a potential polar constellation. MD noted that such a PVC could at least fulfil this role. STG believes that the proposal for a Polar Virtual Constellation could be made to help fulfill the need to engage CEOS agencies. However TM noted that this should perhaps be separated from the need for an STG like group in the future.

To conclude the discussion it was decided to proceed with the Actions noted at this meeting, and to prepare for a discussion and decision on the way forwards at a final STG meeting in Oslo. The proposal was made by the Secretariat and JC representatives to have a last official STG meeting in Oslo to discuss future Agenda of an STG like group. STG members agreed that Oslo provides a good location to have a last meeting which could focus on the future STG configuration in connection with IPD.

12. STG Communications

12 a. EOS Publication of STG Results

STG proposed that the 4 figs for the short EOS publication should be balanced amongst SAR, optical and atmosphere - and should include: current Fig. 2. Recovery Glacier (SAR), Fig. 5 Hofnajokull (Optical DEM), Fig. 6 Atmos Dynamics (upper level wind), and Fig. 7a atmos chemistry Eumetsat. MG noted that we must quickly adapt text accordingly.

YC raised the issue that what we are currently missing is a SAR figure illustrating the synoptic view available from SAR ice sheet mosaics. It was proposed to see if KJ or Katy Farness could combine the Recovery example with an IPY ice sheet mosaic image from L-band or C-band (e.g. JAXA browse mosaic).

STG also agreed that we should have a publication in another journal. MG proposed Environmental Earth Sciences (Springer Journal). BAMS was noted as a potential.

Action STG5 - A10 - for STG to provide proposals to KJ for candidate Journal for a longer peer reviewed STG publication.

The STG noted the need to balance examples from different Agencies in a longer publication.

12 b. IPY Open Science Conference, 8-12 June 2010

STG members agreed to commit to attending the Oslo meeting, and to encourage their investigators to submit abstracts in Theme 5.5 "Space for the Polar Regions". MD noted that ESA has put out an announcement to its AO investigators yesterday, together with an advertisement here: <http://earth.esa.int/workshops/>

Meanwhile, STG members are also encouraged to submit abstracts to the session T5.5, outlining their extensive efforts to deliver scientifically useful data to the IPY investigators. A series of highlight presentations could be foreseen, provided that the STG members submit abstracts by the 20 January deadline. Information about the Conference Session is available here; <http://www.ipy-osc.no/article/2009/1258985707.07>

It was discussed to have a formal exhibit of STG member Agency results in Oslo 2010. The idea would be to have a formal wall exhibit or poster wall exhibit comprising key highlights and scientific results from each of the Agencies. This could include poster sized exhibit examples in the form of 1m x1m glossy poster examples. STG members agreed to send examples from each respective space Agency.

The possibility of an STG booth is of interest to ESA, though it was likely difficult to foresee a joint booth, due to the fact that corporate communications financing is required. This almost precludes a joint exhibit; unless Agencies each organized a booth and then they were collocated with one another.

Action STG5-A11 on MD to circulate specifications and details for the proposed exhibit Posters and exhibition space and to organize a teleconference to coordinate inputs for Oslo in second week of January 2010 (i.e. before Abstract deadline).

13. Review of Action Items from the Meeting

Action list consolidated in afternoon on Day 3 after meeting officially closed.

Next Meeting: STG agreed to hold next and final meeting collocated at the IPY Oslo Science Conference during the week of 7-12 June 2010.

STG5 Action Items and Recommendations - Overview

STG5 – A1 - STG SAR Coordination Group participants to write down key lessons learned from the IPY acquisition coordinating effort – illustrated by some specific scientific examples of results of this effort.

STG5 - A2 – from STG to GIIPSY to define (and send to FB) imaging geometry for of additional background acquisitions of super-sites etc in Antarctica and Greenland to match the GIIPSY requirements.

STG5 - A3 – from STG to GIIPSY to prepare a proposal for Greenland InSAR coast region acquisition request from T-SAR-X.

STG5 – A4 - STG Chair to request B. Ryan follow up with USGS about status of preparation of an Arctic LIMA-like product.

STG5 – A5 - OG to continue with preparing demonstration to illustrate to Space Agencies the benefits of open interfaces to their IPY catalogues.

STG5 – A6 - KJ to develop a list of functional requirements and capabilities would help to distinguish what sets aside GIIPSY to be discussed by GIIPSY and WCRP.

STG5 – A7 - MD and JK (as STG PORS representatives) and VR to put together White Paper identifying satellite infrastructure elements and consequences for what sustained observation time-series shall exist, and what resulting services could be delivered in the future. A contribution from VR shall be on essential wiring diagram illustrating the important interfaces linking to the bodies preparing IPD.

STG5 - A8 – from STG to GIIPSY and WCRP to engage town hall meetings or appropriate discussion helping to frame a proposal for about how to develop an appropriate requirements interface to a future STG and IPD initiative.

STG5 - A9 – from STG to JC (TM/ES) to ensure WMO/ICSU send letter of thanks in May 2010 closing activities of present STG, but highlighting IPD need to engage the Agencies in sustained future activities – and to encourage participation in OSC.

STG5 - A10 - STG to provide proposals to KJ for candidate Journal for a longer peer reviewed STG publication.

STG5 - A11 – MD to circulate specifications and details for the proposed exhibit Posters and exhibition space, and to organize a teleconference to coordinate inputs for Oslo in second week of January 2010 (i.e. before Abstract deadline).

Recommendation STG5 – R1 - STG recommends that Eumetsat in collaboration with OG consider holding a workshop in 2010/11 to discuss how to approach the management of the IPY satellite data legacy.

List of Presentations

Presentation 1 – Review of IPY status - E. Sarukhanian

Presentation 2 – Y. Crevier presented summary of STG SAR Coordination Group activities

Presentation 3 – F. Battazza presentation of ASI IPY contribution

Presentation 4 – M. Gottwald presented DLR contribution in two parts:

4a - D. Floriciou on T-SAR-X IPY contribution

4b – Atmos. Chemistry data product links

Presentation 5 – Y. Crevier presentation on CSA contribution status

Presentation 6 – M. Drinkwater presentation on behalf of H. Laur (ESA)

Presentation 7 – Y. Crevier presentation of Polar Communications and Weather mission

Presentation 8 – O. Godoy presentation of IPY Data Management

Presentation 9 – T. Mohr summary of “Space and the Arctic” Workshop

Presentation 10 – B. Goodison presentation of Global Cryosphere Watch

Presentation 11 – V. Ryabinin – WCRP Perspectives on polar research

Presentation 12 – E. Sarukhanian – International Polar Decade

Presentation 13 – M. Drinkwater presentation on Future of STG

**Space Task Group (STG) of the IPY Sub-committee on Observations
Fourth session
3-4 Feb. 2009, WMO, Geneva, Switzerland**

STG4 Action Items - Overview

STG4 - A1 - ASI and DLR to further coordinate T-SARX and C-SK data acquisitions over supersites. F. Battazza (ASI) to fill in Summary table from SAR Coordination meeting, on the 4 science objectives, in connection with the C-SK AO investigations. **CLOSED** for ASI. **CLOSED** KJ and DF looking into TSAR-X quad pol acquisitions over supersites.

****Note related new action to supply T-SAR acquisition plan for Greenland InSAR.**

STG4 - A2 - KJ and MG to ensure the Atmospheric Chemistry dataset URL Web links (see MG presentation) are uploaded to GIIPSY web site, under DLR portfolio. **CLOSED** - MG delivered list of links to include on GIIPSY web site

STG4 - A3 – JK to assemble the Antarctic HRPT record information contributed by the stations and see whether it is feasible to produce and archive an historical 1km AVHRR composite product prior to MODIS. **Action Ongoing**

STG4 - A4 - YC to contact USGS – J. Mullins to coordinate Canadian contribution to products over the Canadian Northern territories. ****B.Ryan to follow up with USGS about status of Arctic LIMA-like product, and to report on output from 2nd GeoNorth meeting.**
Action ONGOING for YC to check with CCRS about potential contribution

STG4 - A5 - STG members to refine and elaborate details on the list of higher level products identified in document 7 (Data Processing Strategy) in order to fulfill the high level product goals. **CLOSED – in Context of SAR Coordination Group Activities**

STG4 -A6 - OG and STG members to establish concrete action plans for how Space Agencies can best move forwards in consolidating how IPY Data Portfolio's will be made available/visible, discoverable and accessible with pilot project demonstrations by 2010.
Action ONGOING - waiting to see benefits of demonstration projects.

STG4 - A7 – YC to contact Ellsworth LeDrew to encourage development of a link between ArcticNet (<http://www.arcticnet.ulaval.ca>) and OG efforts to access IPY databases.
Action CLOSED - Now realise benefits of demonstration project via link to ArcticNet metadata.

STG4 - A8 - STG members to formulate ideas for presentation at the IGOS-P Workshop to be collocated with GEO plenary. **CLOSED**

STG4 - A9 - YC, KJ to plan and facilitate next SAR coordination meeting based on the benefits of first coordination exercises for purpose of preparation for next phase of product generation. **CLOSED**

STG4 - A10 - STG members to deliver their best results on 1 page with extended figure captions. **CLOSED – examples provided for EOS paper. **New action for Oslo examples**

STG4 - 11 - DC to coordinate with STG the idea of glossy IPY brochure via IPO illustrating the power of satellite in polar science. **CLOSED**
SUperceded by new Action to provide input to JC report.

STG4 Recommendations - Overview

STG4 – R1 – USGS to make efforts to secure funding for a circumpolar Arctic product similar to LIMA.

STG4 - R2 - STG to consider what the Global Cryosphere Watch can do in a coordinated manner for Antarctica. **Followed up in GCW discussion**

STG4 - R3 – JAXA to formulate a plan how to exploit the archives of PRISM and AVNIR-2 in the context of meeting the high-level IPY Objectives.

STG4 - R4 - JC to send a letter by April 2009 to Norwegian Space Centre, Norwegian IPY Committee and KSAT by April 2009 to highlight the importance of the archival data in Tromso. **Superceded by effort of CSA and NASA to repatriate critical data for seamless InSAR coverage of Greenland.**

Letter sent to NSC by JC(?), but no formal response (?). MD also contacted NSC regarding their support to liberating further R1 data and repatriating the data to Canada, or processing of the data by K-SAT. YC suggested to focus any future effort with NSC on repatriation of eastern Arctic sea ice data.

3rd STG SAR Coordination Meeting 23-24 June, 2009, ESA-ESRIN, Frascati, Italy

Action Item Summary

ACTION STG-C3 A1: Follow up on Action STG-C2 A2. Mark Drinkwater to speak to Guru Dahle Strom about Option 1 (Norwegian government and KSAT to contribute the processing of the RADARSAT-1 data to IPY). **CLOSED – Repatriation of data in Progress**

ACTION STG-C3 A2: CSA to pursue funding for the repatriation and processing of the Greenland interferometric data. CSA could ask NASA (Craig Dobson) if he can fund the repatriation and processing. **CLOSED – plan for data delivery to I. Joughin by 15 January, 2010.**

ACTION STG-C3 A3: M.D. with input from K.J. to prepare draft high level letter from STG to JAXA justifying 3 cycles of acquisitions for interferometric applications. Seek input from C. Dobson, because this letter needs to be coordinated with the discussions between NASA and JAXA.

ONGOING discussions between NASA and JAXA . ** Ask Ken during teleconf.

ACTION STG-C3 A4: The space agencies should look at punctual events (e.g. Larsen B break-up, Wilkins Ice Shelf) and prepare visuals for the Oslo meeting.

→ ESA are already working in generating mosaics of Wilkins and Arctic/Antarctica using the G-POD infrastructure with Matthias Braun and the British Antarctic Survey. MD also prepared a list of candidate image examples from MERIS, ASAR, etc. MG and FB responded with examples of acquisitions from T-SARX and C-SK at STG5.

ACTION STG-C3 A5: Yves Crevier to contact the science leader of IICWG and request a chance to show this data at the October meeting and get agreement on products.

Dean Flett attended IICWG and presentation made on behalf of STG

ACTION STG-C3 A6: The scientists should agree on the detailed product specifications.

Ongoing issue to be resolved between scientists and Agencies.

ACTION STG-C3 A7: The space agencies should specify what they can offer by filling in the table. The deadline is July 15. Filling in the table will show:

1. if the data is acquired
2. what we can generate in terms of input product (what the ground segment can generate – processing to Level 1B)
3. the capacity to generate output products Internally or funding available for contracting-out)
4. distribution
5. availability of input data to scientists
6. integration role.

Column D of the table (labeled ‘Capacity to generate’) can be used to record constraints.

CLOSED – YC presented tables at STG5

ACTION STG-C3 A8: A teleconference is needed to discuss outreach and sustainability, likely in September.

→ idea postponed until after STG5 meeting in October

CLOSED – based on Agenda items at STG5

**Space Task Group (STG)
of the IPY Sub-Committee on Observations**

Fifth Session

(30 Nov. - 2 Dec. 2009, WMO, Geneva, Switzerland)

List of Participants

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ICSU/WMO JOINT COMMITTEE FOR IPY

STG 5/Inf. 1
(27.11.2009)

SUB-COMMITTEE ON OBSERVATIONS
SPACE TASK GROUP

FIFTH SESSION

GENEVA, SWITZERLAND, 30 NOVEMBER – 2 DECEMBER 2009
Original: ENGLISH

List of documents

Document No	Title	Submitted
Doc 1	Provisional Agenda	M. Drinkwater
Doc 2	IPY Space Task Group Synthetic Aperture Radar (SAR) 3 rd Coordination Meeting Minutes	Y. Crevier
Doc 3	Draft EOS Paper	K. Jezek
Doc 9a	WMO EC Panel of Experts on Polar Observations, Research and Services - Summary	E. Sarukhanian
Doc 9b	International Polar Decade Initiative	E. Sarukhanian
Doc 10c	Scientific Requirements Interface	K. Jezek
Doc 12	Oslo Open Science Conference 2 nd Circular http://ipy.no/filearchive/osc_2nd_circular_enkelts_ny.pdf	
Appendix I	List of Presentations	
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