

WORLD METEOROLOGICAL ORGANIZATION

**COMMISSION FOR ATMOSPHERIC SCIENCES (CAS)
WORLD WEATHER RESEARCH PROGRAMME (WWRP)**

WWRP POLAR PREDICTION PROJECT

**SECOND YOPP PLANNING MEETING
Focussing on Observations**

HELSINKI, FINLAND

8 April 2014



FINAL REPORT – 30 APRIL 2014



1. OPENING

1.1. Welcome from PPP-Steering Group Chair, Thomas Jung

The second planning meeting of the WWRP Polar Prediction Project (PPP) Year of Polar Prediction (YOPP), focussing on observations, was opened by the PPP Steering Group Chair, Thomas Jung, at 0900 on Tuesday 8 April 2014, at the Finnish Meteorological Institute (FMI) in Helsinki, Finland.

Thomas welcomed the participants. He thanked FMI for hosting the meeting, and for the excellent local arrangements. The assistance of Volker Rachold and the International Arctic Science Committee (IASC) for adding this meeting to the programme of the Arctic Science Summit Week was greatly appreciated. The meeting was made possible through various sources of funding support, in particular from Environment Canada and the Alfred Wegener Institute for Polar and Marine Research (AWI).

Gilbert Brunet, the chair of the WWRP Science Steering Committee SSC, added his welcome. He expressed satisfaction with the direction that PPP was taking, and looked forward to fruitful discussions. He was keen to ensure that the Working Groups under the new WWRP structure were involved and contributed to the Year of Polar Prediction.

1.2. Purpose of the Meeting

Thomas recalled that the main purpose of the meeting was to gain feedback on the observational aspects of the current draft YOPP Implementation Plan, and to work towards more detailed and concrete contributions to the observational components.

He provided background on the development of the YOPP Implementation Plan, which originated from a chapter in the PPP Implementation Plan. It had been expanded on following YPM-1 in Reading, England in June 2013, and PPP SG-4 in Boulder, Colorado, in October 2013. The Plan was now out for external consultation, with comments requested by the end of April 2014.

1.3. Introductions

The participants each introduced themselves.

The full list of participants in the meeting is given as Annex 1 to this report.

2. ORGANIZATION OF THE MEETING

The meeting agenda was adopted, and is given as Annex 2 to this report. Working arrangements were agreed for the session.

3. CURRENT DRAFT OF YOPP PLAN

3.1. Overview of Current Draft YOPP Plan

Thomas Jung gave a presentation on the current draft of the YOPP Implementation Plan. His presentation, along with those presented under Agenda Item 4, is available via <http://polarprediction.net>.

For this meeting, the focus was on the observational component, whose purpose and elements could be summarised as:

- Purpose
 - Comprehensive observation “snapshot”
 - Improved initial conditions
 - Model development
 - Forecast verification
- Elements
 - Mobile systems (buoys, ships, etc.)
 - Extra observations from existing sites
 - Supersites → model grid box (e.g., MOSAiC)
 - Satellite snapshots
 - Special campaigns (aircraft etc.)
 - User relevant data → verification
 - Data availability (GTS, data sharing)

According to the plan, the main activities during the **Preparation Phase** (2013 to mid-2017) are:

- Promote and coordinate additional observations
 - Plan and promote additional routine observations (EUCOS)
 - Promote satellite observations (PSTG)
 - Promote observations from supersites
 - Engage forecast users in actively taking measurements
 - Promote fields campaigns
 - Ensure that YOPP observations make it in near-real time into the WMO Information System
 - Ensure PPP needs are reflected in WMO’s Rolling Review of Requirements
- Coordinate with major international field campaigns
 - MOSAiC
- Establish YOPP data centre
- Preparatory research

- Data denial experiments using observations from previous campaigns
- Use of data assimilation „tools“ such as analysis uncertainty, analysis increments and adjoint sensitivities
- Verification
 - Define observational requirements for forecast verification during YOPP
- Workshops

Planned activities for the **YOPP Phase** (mid-2017 to mid-2019) are:

- Take measurements following what has been developed during the preparation phase
- Elements
 - Comprehensive reference stations (SIOS, ...)
 - Field campaigns (MOSAIC, EM-bird, ...)
 - Extra observations (buoys, ships, planes, ...)
 - Satellite data (CryoSat2, AVHRR, ...)
- Data availability
 - Availability on the WMO Information System
 - Availability to modellers and verification experts

And planned activities for the **Consolidation Phase** (mid-2019 to 2022) are:

- Ensure proper archiving, availability, documentation and traceability (DOIs) of additional observations
- Forecasting system development
 - Observing system design
 - Model development
 - Improvements of satellite retrievals
- Workshops and Publications

Thomas explained that funding sources would be both in kind and external:

- In kind
 - International Coordination Office (ICO)
 - PPP Trust Fund
 - “Virtual” modelling component? – in kind from main centres
 - EUCOS?
 - Research institutions?
 - Anything else?
- External funding
 - PPP can promote YOPP-related research
 - PPP can write letters of support for relevant proposals
 - PPP can bring people together

3.2. General Discussion

The following points were agreed:

- The EarthCARE satellite is due for launch in 2016, so will be providing data during YOPP
- It is indeed very important to ensure that research data gets into the WMO Information System in near real time. Even if it is not available in time for operational data assimilation, it can be used to characterise the errors. There had been examples during IPY where data was only released after it had been used for PhD theses; this should be avoided.
- There could be more emphasis on ocean modelling for YOPP, particularly for the longer predictions periods out to seasons
- Argo buoys deployed in polar oceans may have value, provided that issues (e.g., navigation) in the presence of sea ice can be overcome
- There will be a meeting of the International Arctic Buoy Programme (IABP) in Bremerhaven, Germany in May which would be a good opportunity to discuss IABP involvement in YOPP
- Sea ice prediction is important, and PPP/YOPP needs to be well linked into workshops and other activities
- There is a need for a PPP Steering Group member to focus on satellite requirements
- It will be important to ensure clear satellite requirements via the Polar Satellite Task Group (PSTG) whose next meeting is in September 2014; Pablo Clemente-Colón is a member of PSTG

ACTIONS

2YPM-01	Pablo Clemente-Colón	Put PPP/YOPP on the agenda of the IABP meeting in May 2014
2YPM-02	Thomas Jung	Designate a PPP SG member to focus on ocean modelling issues
2YPM-03	Thomas Jung	Designate a PPP SG member to focus on satellite requirements, and to take part in the PSTG-4 meeting in September 2014
2YPM-04	Pablo Clemente-Colón	Put YOPP on the agenda for PSTG-4 meeting in September 2014
2YPM-05	Thomas Jung and Greg Smith	Greg (as leader of the PPP Sea Ice Prediction flagship activity) to ensure that PPP and YOPP are well linked into the various sea ice prediction/modelling workshops
2YPM-06	Thomas Jung	Contact Andrew Charlton from SNAP over the importance of stratospheric processes for linkages to middle-latitudes

4. PARTNER PRESENTATIONS AND CONTRIBUTIONS

For each of these items there was generally a presentation covering the activities and possible contributions to YOPP, followed by discussion. Presentations are available at <http://polarprediction.net>.

4.1. Global Cryosphere Watch (GCW) / CryoNet – Kari Luojus

Kari Luojus provided an overview of GCW and CryoNet, which both have a strong emphasis on long-term monitoring. Further details are in the presentation and at the website <http://www.globalcryospherewatch.org>.

CryoNet is a tiered network of surface observations, which builds on existing networks, and includes Baseline Sites, Reference Sites, and Integrated Sites.

There is a GCW Data Portal under construction at <http://gcw.met.no>, which is populated with metadata harvested from a number of contributing data centres, but data remain in the original location and are served through the interfaces supported by the originating data centre. The Portal will provide the ability to exchange cryosphere data, metadata, information and analyses among a distributed network of providers and users in support of informed decision-making.

Karl suggested that this model – of providing pointers to and access to data – could also be suitable for YOPP.

In discussion it was noted that the CryoNet stations were all land-based, and did not include measurements of sea ice. It was also pointed out that GCW was somewhat modelled on GAW, as well as BSRN; but GAW measurements can be representative of a relatively large area because the atmosphere is relatively well mixed, while GCW measurements are very much spot values.

The main contribution of GCW to YOPP was seen as a single point of entry to cryospheric observations; additional observations during the YOPP phase were unlikely. However, it was noted that not all stations provided data in near real time. The GCW data would likely be important for validation of remote sensing of cryospheric observations (e.g., Siberian snow cover, which is believed important for polar-midlatitude influences).

4.2. (a) Svalbard Integrated Arctic Earth Observation System (SIOS); and (b) CNR (Italian National Research Council) and InRiM (The Italian National Metrological Institute) – Vito Vitale

Vito Vitale spoke first about SIOS. Further details are in the presentation, and the website at <http://www.sios-svalbard.org>. The goal of SIOS is to establish an Arctic Earth Observing System in and around Svalbard that integrates the studies of geophysical, chemical and biological processes from all research and monitoring platforms. It is primarily aimed at monitoring on the decadal scale.

The system includes both an observing component and a new “Knowledge Centre” which is being developed from 2017-2019 at a cost of some 2-3m Euros per year. Observations from SIOS will clearly be an important component of Arctic observing in general, and YOPP in particular, especially because of the spatial array characteristics rather than just a single site and the strong vertical extent.

Vito also spoke about a possible contribution to YOPP by CNR-InRIM – the Climate Change Tower Integrated Project (CCT- IP). Details are at <http://www.isac.cnr.it/~radiclim/CCTower/>. The Amundsen-Nobile Climate Change Tower, is located at Ny-Ålesund with a height of 32 m, has the possibility to host and operate many instruments, and permits deep investigation of the energy budget in the surface layer, PBL dynamics and exchange fluxes (heat, momentum, chemicals) at the atmosphere-land interface.

Vito stressed the importance of Metrology (standardisation of measurements). A project MeteoMet established a cooperation channel between Metrology and GRUAN (the GCOS Reference Upper Air Network), supporting GRUAN to adopt a robust metrological approach since its inception. In June 2014 there will be the first metrology activities in Ny-Ålesund, addressed at calibrating various sensors.

CNR-InRIM also supports observations in Antarctica, including 18 AWS along Victoria Land; twice daily radiosondes at NZS October-February; and daily radiosondes at Concordia year round.

The meeting noted that there was to be a SIOS Steering Board Meeting in Bremerhaven soon, which could be an opportunity to promote YOPP.

ACTIONS

2YPM-07	Thomas Jung and Vito Vitale	Ensure that the SIOS 20 th Steering Board Meeting in Bremerhaven on 24-25 April discusses YOPP and possible support –Thomas could speak at this.
2YPM-08	Vito Vitale	Explore the possibility of additional AWS in Svalbard (Arctic) or Victoria Land (Antarctic) during YOPP.

4.3. International Arctic Systems for Observing the Atmosphere (IASOA) – Sandy Starkweather

Sandy presented on this – there are further details in her presentation and at <http://www.esrl.noaa.gov/psd/iasoa/>. IASOA grew out of the IPY in recognition that the ten international flagship observatories had many similar observing assets and science goals. It recognises that observatories around the Arctic have similar capacities, objectives and expertise that could be synthesised for improving the pan-Arctic vision. The idea is to do things that can't be dealt with at just single points.

The IAOSA Vision is “Bringing IAOSA datasets and experts together in a sustained science collaboration to develop a pan-Arctic understanding of both how and why the Arctic is changing”.

In 2013 IAOSA developed a Working Group structure, which will include a Regional Prediction Working Group. The meeting felt it was important to ensure that this takes advantage of the existing expertise in national meteorological services, as well as activities under WMO’s World Weather Research Programme, and that it is well linked with regional prediction aspects of the Polar Prediction Project.

Clearly, observations from the IAOSA observatories – perhaps with special YOPP products – would form a key component of Arctic observations for PPP and YOPP. In return, as an international collaborative effort, the existence of YOPP could help support strategic growth in observational capacity of the IAOSA observatories. It was also recognized that there would be great value in making available, for the area around each observatory, targeted YOPP datasets of both model output and satellite products.

The IAOSA website includes a data access portal (<http://www.esrl.noaa.gov/psd/iasoa/dataataglance>) which, similarly to the GCW portal, provides not only data discovery but also data access from the original source. This could form a template for how an overall YOPP data access portal could work.

ACTIONS

2YPM-09	Neil Gordon	Add IAOSA as a key partner in the YOPP Plan
2YPM-10	Sandy Starkweather	As new IAOSA Working Groups are established, have them consider how their activities can contribute to YOPP
2YPM-11	Thomas Jung	Nominate a person on the PPP SG to take the lead on regional prediction
2YPM-12	Thomas Jung	Ensure that the IAOSA Working Group on Regional Prediction is invited to participate in any PPP/YOPP Workshops on regional prediction
2YPM-13	Neil Gordon	Add to the YOPP Plan a requirement to make available, for the area around each IAOSA observatory, and other major static or drifting observing sites, targeted YOPP datasets of both model output and satellite products
2YPM-14	Neil Gordon	Add reference to the IAOSA Data Access Portal in the YOPP Plan

4.4. ICE-ARC – Elaina Ford

Elaina Ford gave a presentation on “Ice, Climate, and Economics – Arctic Research on Change” (ICE-ARC) – further details are in her presentation and online at <http://www.ice-arc.eu> . ICE-ARC will look into the current and future changes in Arctic sea ice – both from changing atmospheric and oceanic conditions. The project will also investigate, in a robust way, the consequences of these changes both on the economics of the area, and social aspects such as on indigenous peoples.

The project has funding of €11.5M over 2014-2017. There are work packages on Observations, Modelling, Social Impacts, and Economic Impacts. As an EU project, open data is an explicit policy. International partnerships are also important, and there is some funding set aside for this to collaborate and share information, ideas and data. This could potentially apply to YOPP.

As part of the Observations Work Package there will be extra instruments provided for IAOOS (Ice-Atmosphere-Arctic Ocean Observing System).

ACTIONS

2YPM-15	Thomas Jung	Explore whether any funding is available to support from ICE-ARC under international partnerships to support YOPP
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4.5. International Ice Charting Working Group (IICWG) – Pablo Clemente-Colón

Pablo Clemente-Colón gave a presentation on IICWG – further details are available in his presentation, and online about IICWG at <https://nsidc.org/noaa/iicwg/>.

The IICWG is an ad-hoc, self-funded Working group formed by national ice services to coordinate the operational provision of sea ice and iceberg information globally. Pablo explained its functions and some of its achievements.

The meeting agreed that the IICWG is clearly a key partner for YOPP in terms of sea ice observations and prediction. The IICWG co-chairs are apparently keen on such a partnership. Pablo also expressed the view that it would be good to leverage on YOPP to bring together all sea ice modellers. However, this wasn't simple, given the various interests involved.

In terms of sea ice predictions, Pablo pointed out useful findings from meetings such as the NOAA Sea Ice Forecasting Workshop, held in Anchorage, Alaska, 19-21 September, 2011 – see http://www.arctic.noaa.gov/docs/NOAA_Sea_Ice_Forecasting_Workshop_Summary.pdf .

There is also an important upcoming “NOAA Science Challenge Workshop - Predicting Arctic Weather, Climate and Related Impacts” which is scheduled for May 13-15, 2014 in Boulder, CO – see <http://www.esrl.noaa.gov/psd/events/2014/arctic-predictions-science/>. Members of the PPP Steering Group will be taking part; as this has become a meeting with international and interagency participation rather than just NOAA.

The next meeting of the IICWG will be held October 20-24, 2014 in Punta Arenas, Chile. One of their aims is to use this meeting, and YOPP, to increase Southern Hemisphere participation in YOPP.

Pablo also provided an advance, informal, copy of detailed comments by IICWG on the draft YOPP Plan. A summary of those comments is:

- Better linkages/integration between the modelling/research , observational, and operational community required
- Enhanced YOPP observations should provide data in near real-time to attract the operational community
- Seek early engagement of operational services in YOPP activities including summer schools, workshops, and synthesis preparation
- Actively promote forecasting centres to undertake sea ice verification
- Identify what IICWG coordination is required or expected in support of YOPP
- Leverage YOPP to develop IICWG Southern Hemisphere participation
- Improved sea ice automation may not be based solely on SAR but on a combination with non-SAR observations
- Promote assimilation of analysis into models

ACTIONS

2YPM-16	Neil Gordon	Take detailed IICWG comments into account in revision of YOPP Plan
2YPM-17	Pablo Clemente-Colón	Ensure that YOPP is discussed at the IICWG meeting in October 2014
2YPM-18	Greg Smith and IICWG Co-chairs	Discuss ongoing coordination on sea ice prediction for PPP and YOPP

4.6. MOSAiC – Matt Shupe

Matt Shupe gave just a brief presentation on MOSAiC, as it is already quite well documented in the draft YOPP Plan. Further details on MOSAiC can be found online at <http://www.mosaicobservatory.org>.

He summarised what MOSAiC could do for YOPP as:

- Provide an Observational “test bed” with:
 - 1) Detailed column observations >>
Process understanding
 - 2) Take Spatial measurements >>
Gridbox representation

- Archive of observational products

In terms of what YOPP could do for MOSAiC:

- Coordinated work towards building community support
- Draw for other enhanced observations
- Developing a model community that is eager to use obs
- Preparatory & Operational model support
- Archival of enhanced modelling products
- Data sets appropriate for model forcing
- Being the conduit for linking MOSAiC to large-scale

These items were generally agreed. It was also noted that funding agencies were very interested in tangible evidence of working closely together.

Matt made it very clear that MOSAiC was working to a hard deadline of boreal autumn of 2018. Discussions were well advanced about possible use of *R/V Polarstern*, but a final decision was not likely until 2015.

2YPM-19	Matt Shupe	Finalise MOSAiC plans, arrange funding, and secure a vessel for boreal autumn 2018.
2YPM-20	Thomas Jung and Matt Shupe	Ensure joint promotion of YOPP and MOSAiC

4.7. Met Office UK – Chawn Harlow

Chawn Harlow gave a presentation about the Met Office’ plans for YOPP, starting with why they were interested in the Arctic – because of:

- Models that cover the Arctic

- Global NWP model
- GloSEA seasonal forecast model
- Climate model
- Assimilation of satellite data into NWP model
 - Large amount of data available due to the polar orbits of many met satellites
 - Majority rejected due to uncertainties in surface temperature and emissivity and cloud cover
- Climate studies interested in polar and cold region processes
 - Permafrost and associated greenhouse gas
 - Sea ice modelling and extent analysis

This was seen as an excellent example of interests, which could be incorporated in the YOPP Plan.

After describing past Arctic campaigns, he focussed on two prime potential Met Office UK contributions to YOPP.

One is the Facility for Airborne Atmospheric Measurements (FAAM). This aircraft could be used for one or two FAAM campaigns including dropsondes; surface temperature and emissivity retrievals; surface energy balance measurements; cloud microphysical and remote sensing studies; and aircraft *in situ* measurements of T, Q, aerosol size distributions, CH₄ (if desired). Fairbanks and Kiruna are the two options for the base of operations – each has pros and cons. There are dependencies on funding and collaborators, naturally.

The second contribution would be to undertake limited area model runs, and LES simulations.

In discussion it was suggested that there should be two FAAM campaigns – one from Fairbanks, and the other from Svalbard (which better aligns with MOSAiC). The timing of the campaigns would be around late March/early April when there is sunlight. The Fairbanks campaign could be aligned with a high level NASA campaign from Kiruna (they had one in 2008). It was noted that for proper planning, decisions needed to be made no earlier than two years prior to the campaigns.

2YPM-21	Neil Gordon	Incorporate Met Office UK Arctic interests in the YOPP plan as an example, provided this is ok with the Met Office
2YPM-22	Neil Gordon	Incorporate potential UK Met Office contributions to YOPP in an “Activity Contribution Table” to be included in the YOPP Plan

2YPM-23	Chawn Harlow	Continue with plans for Met Office UK contribution, liaising with the YOPP Planning Group.
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4.8. British Antarctic Survey (BAS) – Tom Bracegirdle

Tom Bracegirdle gave a presentation on BAS current activities, possible contributions and broader Southern Hemisphere initiatives. Further information about BAS research can be found online at http://www.antarctica.ac.uk/bas_research/index.php.

Possible contributions include gathering additional observations through field programmes and develop improved representation. The Meteorological Airborne Science Instrumentation (MASIN) aircraft facility is a key resource. Upcoming campaigns and proposals are:

- MAC (Microphysics of Antarctic Clouds).
 - 2014-2015: BAS.
- ACRE (Antarctic Clouds and Radiation Experiment).
 - 2017-2018: Australian Antarctic Division – in collaboration with BAS.
 - Will involve cloud and radiation measurements at Macquarie Island (54S) and Davis (69S).
 - Macquarie: one year from March 2016
 - Davis: one year from November 2017 or 2018
 - BAS Twin Otter cloud measurements at Davis in DJF 2017/18 or 2018/19.
- SOCRATES (Southern Ocean Clouds, Radiation and Aerosol Transport Experimental Studies).
 - Tentative time frame of the summer of 2016/17 or 2017/18: Monash University (Christian Jakob).

One very interesting system mentioned was the Aircraft-Deployable Ice Observation System (ADIOS). See <ftp://ftp.bas.ac.uk/photo/ADIOS/ADIOS%20poster.pdf>.

Tom recommended that the Executive Summary of the draft YOPP Plan should highlight polar clouds and polar winds. He also noted that in terms of polar predictability, especially on longer time scales, it was important to know about the tropical influences on polar regions.

Overall, his presentation concluded that:

- BAS is in a good position to contribute to the YOPP.
 - Strong technical capability in atmospheric and oceanic observations and modelling.
 - Opportunity to utilise links and influence in the Southern Hemisphere polar research community.
 - Increasing involvement in Arctic research.
- There are a number of relevant collaborative activities being proposed.
 - These might feed most obviously into seasonal forecasting, but also relevant to shorter-term predictability.

In discussion, the BAS proposals were welcomed, and seen as generally well aligned with the timing of YOPP.

Having been intrigued by the potential of ADIOS, the meeting recommended that YOPP should be promoted as providing a framework for testing new activities, and should explicitly solicit research, development and employment of innovative systems.

The question was raised: “What are the *observational* needs for better understanding linkages between high and mid latitudes?” In that regard, the fact that there was less multi-year thick ice in the Arctic for placing observational platforms on made it more difficult to get good spatial coverage.

ACTIONS

2YPM-24	Neil Gordon	Incorporate potential BAS contributions to YOPP in an “Activity Contribution Table” to be included in the YOPP Plan
2YPM-25	Neil Gordon	Update the Executive Summary of the YOPP Plan to highlight polar clouds and polar winds
2YPM-26	Neil Gordon	Include reference in the YOPP Plan that YOPP should be promoted as providing a framework for testing new activities, and should explicitly solicit research, development and employment of innovative systems.

4.9. Met Norway – Thor Erik Nordeng

Thor Erik Nordeng gave a presentation on Met Norway’s forecasting and monitoring for the Arctic.

He presented modelling results that showed that the accuracy and skill (with respect to climatological variability) in MSLP predictions on the coast of Norway decreased to the north. The observing system was believed to be the main contributor.

In terms of observational coverage, he noted that overall there is a lack of both wind and temperature information in the lower troposphere in the remote ocean and ice areas in the Arctic. In particular, there is:

- a gap in pressure observations over parts of the sea ice and ocean areas
- almost no coverage of near-surface wind observations over sea ice
- a lack of conventional upper air data, but this is compensated by data from satellite sounding instruments
- difficulty in using data from temperature sounding sensors in the lower troposphere because the signal will then have a surface contribution which is generally not well modelled

Conclusions from a data-denial experiment on the impact of radiosondes in the Arctic, using the HARMONIE 11 km model, were:

- The Arctic radiosonde stations are more valuable than those on the Scandinavian mainland, both for the forecast of surface conditions and in general for the atmosphere as a whole
- Doubling of the number of radiosonde launches from two to four daily at the two Arctic stations: Significant positive impact, although not quite double impact from twice daily

Thor-Erik also provided information on Met Norway's experimental Arctic HARMONIE (AROME) convection-permitting 2.5 km model, including assimilation, and their high resolution EPS system for probabilistic forecasting of potentially severe weather from 12 to 48 h.

He summarised possible Met Norway contributions to YOPP as:

- data from Arctic stations
- operational model results
- experimental model integrations (data assimilation, physical parameterization,) for atmosphere, ocean and ice with high resolutions

In discussion, there was much interest in the results of the data denial experiments, which were in effect preparatory research for YOPP, and a request for the ICO for Polar Prediction to be kept updated on such research and its findings.

ACTIONS

2YPM-27	Neil Gordon	Incorporate potential Met Norway contributions to
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		YOPP in an “Activity Contribution Table” to be included in the YOPP Plan
2YPM-28	Thor-Erik Nordeng along with all others	Keep ICO for Polar Prediction updated on such YOPP preparatory research and its findings

4.10. Arctic and Antarctic Research Institute (AARI), St Petersburg, Russia – Alexander Makshtas

Alexander Makshtas gave a presentation on the Arctic Observational network, with a focus on the Russian contributions. He provided details on activities of:

- Russian Drifting Stations
- Hydrometeorological Observatory Tiksi
- Research station “Ice Base Cape Baranov”
- Russian scientific Center at Spitsbergen

as well as on the network of meteorological stations in the Northern Yacutia.

For YOPP, he suggested:

- Data from SHEBA and “North Pole” Russian drifting stations are important for model experiments as a part of the YOPP Preparation Phase, for MOSAiC and future “North Pole” station planning
- An international program of atmospheric observations, executed by Roshydromet (Russia), NOAA (USA) and FMI (Finland) at the Tiksi Hydro-meteorological observatory and possible extended programs at “Ice Base Cape Baranov” in concert with Polar Observatories at Summit, Ny-Ålesund, Eureka, Alert and Barrow (www.iasoa.org) offer YOPP a comprehensive data set on the polar atmospheric and underlying surface in a “picket fence” configuration surrounding the Arctic Ocean.
- The existing network of polar stations and resulting surface and upper air meteorological observations will be essential for YOPP experimental design. Additional financial and instrument support is very important for relevant data quality and value. (For example 4 radiosonde launches per day versus the usual 1–2 at Russian polar stations). Additional soundings require additional personnel and sondes.
- Must consider the state of permafrost, fast ice, glaciers, hydrological studies (important for flooding), and atmospheric chemistry in the framework of YOPP

- Important to develop standard protocols and data formats of data similar to the procedures followed by previous WMO global experiments (For example: GARP Global Experiment)

These suggestions were generally supported. It was appreciated that additional funding would be needed for additional radiosonde soundings, and that the case for this could be supported by results of data denial experiments. The chances for Russian funding for this would be enhanced if there were some kind of joint experiment with other countries such as Japan and Germany.

Alexander said that while conventional data (e.g., radiosonde soundings) are available in real time, not enough resource has yet been devoted to processing other data so it is not available easily or quickly. It was agreed that having the data would be good as part of the preparatory phase of YOPP.

ACTIONS

2YPM-29	Neil Gordon	Incorporate potential Russian contributions to YOPP in an “Activity Contribution Table” to be included in the YOPP Plan
2YPM-30	Neil Gordon	Ensure the YOPP plan reflects the ideas expressed in the suggestions from Alexander Makshtas

4.11. National Institute of Polar Research (NiPR), Japan – Jun Inoue

Jun Inoue gave a presentation on activities of NiPR, and in particular on the Arctic Research Collaboration for Radiosonde Observing System Experiment (ARCROSE). The Japanese *R/V Mirai* is used for this research. It is an ice-strengthened vessel, and has a Doppler radar and auto balloon launcher. As many as 8 radiosondes per day can be launched, with all observations sent onto WMO’s GTS.

Japan’s contribution to YOPP can include:

- Frequent radiosonde observations from ships & land stations
 - Using *R/V Mirai* & *R/V Polarstern*, Ny-Alesund, etc.
 - Aimed at improvements of NWP and reanalyses
- Data assimilation (DA) using the Earth Simulator
 - Observing System Experiment (OSE)
 - Aimed at evaluating the effect of intensive observations, and proposing a future observing network

Jun referred to research from 2009 showing the positive impact of IABP drifting buoys (see http://iabp.apl.washington.edu/pdfs/InoueEtal2009_ImpactOfBuoyOnPressureFields.pdf)

and 2013 work showing that the impact of intensive Arctic radiosonde observations reached mid-latitudes (see <http://onlinelibrary.wiley.com/doi/10.1002/grl.50207/abstract>). Other research (Yamazaki et al) demonstrating the local impact on intensive radiosondes will be published this year.

Jun will be the cruise leader for the 2014 *R/V Mirai* cruise, which will include being located at a stationary point in the Arctic Ocean from 6-25 September. He noted that in some ways ARCROSE2014 was similar to plans for YOPP, with many additional radiosonde soundings surrounding and in the Arctic Ocean.

He urged strong endorsement from the community (WMO, IASC, etc.) to reserve ship time for *R/V Mirai* to be contributed to YOPP. At the moment, plans were in place for a mainly physical oceanography Arctic cruise in 2017, but there were no plans for 2018 or 2019. Ship time for YOPP would need to be secured by April 2015.

In discussion, it was noted that this presentation, along with others, had shown that there was already useful work going on that would contribute to the research needed for the YOPP Preparatory Phase, and it would be good to take note of it.

ACTIONS

2YPM-31	All Presenters	Send slides on research that could count as contributing to “YOPP Preparatory Research” (see draft YOPP Plan) to Thomas Jung for appropriate use in presentations on PPP and YOPP
2YPM-32	Neil Gordon	Incorporate potential Japanese contributions to YOPP in an “Activity Contribution Table” to be included in the YOPP Plan
2YPM-33	Thomas Jung	Ensure that there is appropriate endorsement of proposed Japanese activities to support a bid for use of <i>R/V Mirai</i> for YOPP
2YPM-34	Jun Inoue	Secure <i>R/V Mirai</i> for YOPP

4.12. NOAA – Chris Fairall

Chris Fairall showed a preliminary agenda for “NOAA Science Challenge Workshop - Predicting Arctic Weather, Climate and Related Impacts” which is scheduled for May 13-15, 2014 in Boulder, CO – see <http://www.esrl.noaa.gov/psd/events/2014/arctic-predictions-science/>. Members of the PPP Steering Group will be taking part; as this has become a meeting with international and interagency participation rather than just NOAA.

He indicated that he hoped that the meeting would result in some initiatives which link very strongly with YOPP.

NOAA aircraft assets that could be relevant are two Orion P3 aircraft (dropsonde and Doppler radar) and a dropsonde launching platform. There is a process within NOAA that needs to be followed to request these platforms for field programmes. This may or may not try to target the MOSAiC drifting station. Another possibility is a UAV programme – the Global Hawk which could fly from California to the North Pole and back, dropping sondes along the way. Other aircraft that could contribute come under NASA, the US Navy, and the National Science Foundation.

In discussion it was stressed that in polar regions the observing system is so poor that a few extra observations can make a big difference. In that regard one of the best “bang for buck” might be moving from two to four radiosonde soundings per day, since the fixed station cost is already covered and the main additional variable cost is in additional radiosondes. It would also be important to ensure that as much as possible automated aircraft data (AMDAR) was obtained over polar regions. Overall responsibility for this in WMO lies with the Expert Team on Aircraft-Based Observing Systems ([ET-ABO](#)).

ACTIONS

2YPM-35	Chris Fairall	Lead efforts within the USA to contribute aircraft to coordinated YOPP Intensive Observing Periods
2YPM-36	Neil Gordon	Incorporate potential USA contributions to YOPP in an “Activity Contribution Table” to be included in the YOPP Plan
2YPM-37	Neil Gordon	Ensure that the YOPP Plan makes the point strongly that in polar regions the observing system is so poor that a few extra observations can make a big difference.
2YPM-38	Neil Gordon	Particularly note in the YOPP Plan the potential advantages of four versus two radiosonde soundings per day (could refer to Met Norway research findings)
2YPM-39	Neil Gordon	Contact the WMO CBS Expert Team on Automated Aircraft Observations (ET-ABO) to ask about plans for additional AMDAR coverage over polar regions

5. GENERAL DISCUSSION

The following matters were raised during general discussion:

Activity Contribution Table

The meeting decided that it would be important to record what contributions were being offered for YOPP and what the level of commitment was at this stage. This was best as an Annex to the YOPP Plan so that it could be separately and regularly updated. This table could start with committed observational and modelling infrastructure.

ACTIONS

2YPM-40	Neil Gordon	Include a new Annex in the YOPP Plan with an "Activity Contribution Table" and populate it with committed observational and modelling infrastructure, as well as other likely contributions as detailed from earlier presentations
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Modelling Drivers for Observations

It was noted that the YOPP plan included different priority areas for modelling, and suggested it might be useful to have some kind of mapping from modelling priorities to observational needs (e.g., we need to do a better job on modelling clouds; can we map from that to what is needed in the way of observations.)

ACTIONS

2YPM-41	PPP Steering Group	Introduce a mapping from modelling priorities to observational needs
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Partners

It was agreed that there generally needed to be more focus on satellite matters, and that it would be a good idea to have one person from the Steering Group focussing on this.

Jenny Baeseman, Director of the Project CliC Office offered support for the project – e.g., in facilitating enhanced sea ice observations

Funding

Various opportunities for funding were discussed. In the UK, the main opportunity was via NERC, and this was probably best in collaboration between universities and the Met Office. In

the US, the US Interagency Arctic Funding Committee represented an opportunity. It has a milestone driven research plan. Milestones will be updated this boreal fall, so YOPP should be included.

ACTIONS

2YPM-42	Sandy Starkweather	Ensure that YOPP is put on table for discussion in relation to US Interagency Arctic Funding Committee, and to include YOPP relevant milestones.
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YOPP Data Portal

It was general agreed that the best approach for YOPP data would be a hybrid – primarily a portal providing discovery and access to data archives which were held by those producing the data, but also hosting archival data where absolutely necessary. Archival data was more likely to be model data.

The YOPP Plan and milestones already referred to the establishment of a YOPP data archiving group. This might be better named a YOPP Data Group. Issues it needed to address included:

- Data policy
- What observational data should be covered (including buoys, moving platforms, and field experiments)
- What satellite products should be covered
- What modelling data should be covered (global models, regional models, fields, tendencies)
- What subsets of modelling data and satellite products could be provided around supersites and drifting stations
- What formats should be used (and would there be any reformatting of data)
- What data are needed for verification purposes
- How will the data portal work
- Summarising experiences and learning from others including IPY, YOTC, TIGGE, UCAR, S2S, GCW, IASC, IASOA, and from data portals set up by other disciplines such as Antarctic biology (see <http://data.biodiversity.aq>)
- Obtaining commitments from modelling centre over maintaining their own data archives

- Establishing a role of data curator

ACTIONS

2YPM-43	Thomas Jung	Establish the YOPP Data Group
2YPM-44	Neil Gordon	Ensure that the YOPP Plan includes provision of subsets of model data and satellite products around supersites and drifting stations
2YPM-45	Thomas Jung	Contact UCAR to see if they can assist with a data portal (Chris Fairall to provide contacts)

6. WRAP-UP AND CLOSING

Thomas Jung first expressed satisfaction that PPP and YOPP were becoming very visible and well known, as demonstrated by being mentioned many other times during other meetings at the Arctic Science Summit Week in Helsinki. It had also been good to see all the activities going on. Funding agencies want concerted efforts, and YOPP and PPP provide a focus and impetus to support this.

He summarized what he saw as the main conclusions from the meeting:

- We need to Identify focal regions
- Coordination with other activities is key (as just one example - sea ice prediction – just one)
- Lower-high latitude linkages are important, but not part of YOPP – complementary to YOPP
- YOPP Preparatory Research is underway – there were some nice examples from Norway and Japan, and it would be good to know of others
- YOPP could promote testbeds for innovative observing systems such as ADIOS from BAS
- Need to reconsider whether we have enough emphasis in the subsurface oceans (perhaps through more involvement with efforts such as FAMOS)
- A hybrid approach to a data portal/archive seems best – there is a need to set up a YOPP Data Group to address many related issues

- GCW – what about sea ice? Perhaps that's the link with CliC?
- Regional modeling – we need someone on the Steering Group to take responsibility for this (need to determine in the next couple of weeks), avoid duplication of efforts
- We need tables in the Implementation Plan of commitments and interest expressed in contributing to YOPP – we can show progress as this table is filled out
- We need more emphasis on satellite data – best through a conversation with PSTG and being clear about what YOPP needs are
- YOPP will be pushed on the US Interagency Arctic Research Policy Committee
- We need to ensure that observational priorities follow and support modeling priorities

In terms of the next steps, Thomas expected a draft of this meeting report to be sent out for comment by Easter. This would then be finalised by the end of April. Relevant information from this meeting, plus from external consultation, would be used to revise the YOPP Implementation Plan. This would be considered by a meeting of the PPP Steering Group in association with the World Weather Open Science Conference in Montréal, Canada, in August 2014 (which also has a special session on polar prediction). There was also planned to be a third YOPP Planning Meeting, focussing on modelling.

In closing, he once again thanked those who had been involved in organising, hosting and funding the meeting, and all those present for their valuable contributions.

The meeting closed at 1722 on 8 April 2014.

ANNEX 1: LIST OF PARTICIPANTS

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ANNEX 2: PROVISIONAL AGENDA

1. OPENING [0900 - 0920]

1.1 Welcome from PPP-Steering Group Chair, Thomas Jung

1.2 Purpose of the Meeting

... to gain feedback on the observational aspects of the current draft YOPP Implementation Plan, and to work towards more detailed and concrete contributions to the observational components

1.3 Introductions

2. ORGANIZATION OF THE MEETING [0920 - 0925]

2.1 Adoption of the Agenda

2.2 Working Arrangements

3. CURRENT DRAFT YOPP PLAN [0925 - 1010]

3.1 Overview of Current Draft YOPP Plan [0925-0950]

3.2 General Discussion [0950-1010]

4. PARTNER PRESENTATIONS AND CONTRIBUTIONS [1010 - 1530]

This item on the Agenda will consist of a series of approximately 20-minute slots for individual initiatives and organizations. For each slot, there should be:

- about a five minute presentation on the relevant activities of the initiative/organization
- about a five minute presentation on possible contributions to YOPP, including what is needed from PPP/YOPP to ensure this happens (e.g., what funding, planning, coordination, partnering with others, may be needed)
- about ten minutes of discussion.

4.1 Global Cryosphere Watch (GCW) / CryoNet – Kari Luojus [1010-1030]

Coffee Break [1030 - 1100]

4.2 (a) Svalbard Integrated Arctic Earth Observation System (SIOS); and (b) CNR (Italian National Research Council) and InRiM (The Italian National Metrological Institute) – Vito Vitale [1100-1125]

4.3 IASOA – Sandy Starkweather [1125-1135]

4.4 ICE-ARC – Elaina Ford [1135-1145]

4.5 International Ice Charting Working Group (IICWG) – Pablo Clemente-Colón [1145-1205]

4.6 MOSAiC – Matt Shupe [1205 -1230]

Lunch [1230 - 1330]

4.7 Met Office UK – Chawn Harlow [1330-1350]

4.8 British Antarctic Survey (BAS) – Tom Bracegirdle [1350-1410]

4.9 Met Norway – Thor Erik Nordeng [1410-1430]

4.10 Arctic and Antarctic Research Institute, St Petersburg, Russia – Alexander Makshtas [1430-1450]

4.11 National Institute of Polar Research, Japan – Jun Inoue [1450-1510]

4.12 NOAA – Chris Fairall [1510-1530]

Coffee Break [1530 - 1600]

5. GENERAL DISCUSSION [1600 - 1700]

6. WRAP-UP AND CLOSING [1700-1730]

- Wrap-up
- Next steps
- Closure