

PolarPredictNews

Newsletter #07

July 2018



It was about -30°C when Tomash Petrovsky and his team from AARI deployed two EUMETNET buoys (Marlyn-Yug SVP-B drifter with a standard set of sensors) in April this year on 180 cm thick first-year ice close to the North Pole. While drifting across the central Arctic, the buoys will measure air temperature and pressure (photo: Tomash Petrovsky/AARI).

Dear Colleagues,

I am writing this editorial with the second Special Observing Period (SOP2) in the Arctic having started just a few days ago. Like for SOP1, we expect about 2,000 additional radiosondes to be launched from many land stations in the Arctic. Moreover, a large number of additional observations will be available from the interior of the Arctic through ships and additional buoys (see title photo). It is good to know that the modelling groups are prepared to use these data in observing system experiments.

There has been further progress in recent months as highlighted by this PolarPredictNews issue. For example, SIPN South just published its first post-season report. Congratulations to François Massonnet and his colleagues for making this happen! Furthermore, the second Polar Prediction School took place in April. Judged by the positive

feedback from students, the school was very successful; and we are looking forward to the next one in 2021, which will be an important element of the YOPP Consolidation Phase.

I would also like to welcome our new WMO consultant Jeff Wilson, who provides important support to the ICO and the PPP Steering Group. Furthermore, it is my pleasure to let you know that Riina Haavisto, an expert on environmental economics, joined the PPP-SERA team.

Last but not least, I would like to draw your attention to a new PolarPredictNews section entitled 'Featured Research Publications'. If you would like to have your publication featured in upcoming issues, please contact the ICO.

Happy reading,
Thomas Jung

The Year of Polar Prediction (YOPP) is a major international activity that has been initiated by World Meteorological Organization as a key component of the Polar Prediction Project (PPP). The overarching goal of YOPP is to significantly advance our environmental prediction capabilities for the polar regions and beyond. As an internationally coordinated period of intensive observing, modelling, prediction, verification, user-engagement, and education activities which involves various stakeholders, YOPP contributes to the knowledge base needed to manage the opportunities and risks that come with polar climate change.

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01 YOPP Communication | To ensure everyone involved with the Year of Polar Prediction is well-informed about ongoing activities and developments, the International Coordination Office provides information via various communication channels.

Website www.polarprediction.net

The PPP website forms the background of YOPP information as it compiles information of all PPP and YOPP activities, be it in the past, present, or, as far as possible, upcoming. On the website, you can find [YOPP documents](#) such as the [YOPP Implementation or the Modelling plans](#) along with newest relevant [science publications](#), current [news](#), and the [media review](#). Learn about the different [YOPP task teams](#) and [YOPP-endorsed projects](#) by viewing the [YOPP Explorer](#) or about enhanced routine observations during [Special Observing Periods](#) from the [YOPP Observation Layer](#). Or search through the [YOPP Media Kit](#) for [pictures](#), [infographics](#), and [videos](#).

PolarPredictNews

The YOPP newsletter, [PolarPredictNews](#), is currently issued every second month. It bears a collection of news items from the website together with additional

inside information from the YOPP community. A list of upcoming relevant events can be found at the end of the newsletter. New to this latest issue is the category on featured research publications (see [#16](#)). Make sure you send any YOPP-relevant information and publication to be included to PolarPredictNews at office@polarprediction.net.

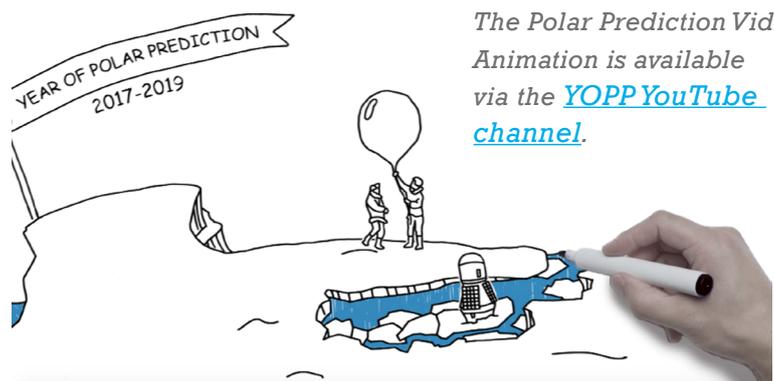
Mailinglists

Three mailing lists are currently used by the PPP community. To date, the **PPP mailing list** has more than 630 subscribers who like to be updated regularly about new YOPP activities but also additional developments, job announcements and other important information regarding polar weather and climate predictability and prediction. The list is maintained by CliC and PPP. Subscribers can send anything relevant – including, but not limited to, upcoming events, recent papers, questions, ideas, etc.

The **PPP-SERA community mailing list** is a mailing list to facilitate communication within the YOPP task team on Societal and Economic Research and Applications who study the needs for and the use of environmental forecast products by the diverse range of actors in polar regions and providers of environmental information during YOPP.

The **YOPP Southern Hemisphere (YOPP-SH) mailing list** informs those scientists, forecasters and forecast users who are particularly interested

The Polar Prediction Video Animation is available via the [YOPP YouTube channel](#).



in YOPP activities in the Southern Hemisphere. To subscribe/unsubscribe to any of these lists, please send an e-mail to office@polarprediction.net.

Polar Prediction Videos

YOPP maintains a [YouTube channel](#) where we upload our YOPP videos. The [Polar Prediction Video Animation](#) was jointly developed by ICO, WMO and AWI. It provides an easy-to-follow overview about the Year of Polar Prediction. Another video [‘What is YOPP?’](#) allows people involved with YOPP to tell the public why they are engaged with YOPP and why it is relevant to them.

Social Media

If you prefer less text but short precise information, we recommend following our twitter account [@PolarPrediction](#). In particular, during Special Observing Periods, we use social media to post pictures and information on extra observations (#YOPPextraobs) to keep our twitter followers informed on what is going on. For the Arctic Summer SOP, we’ll also be active on our instagram account [@polarprediction](#) to especially highlight the beautiful pictures our colleagues from polar met stations and vessels send in.

Polar Prediction Matters

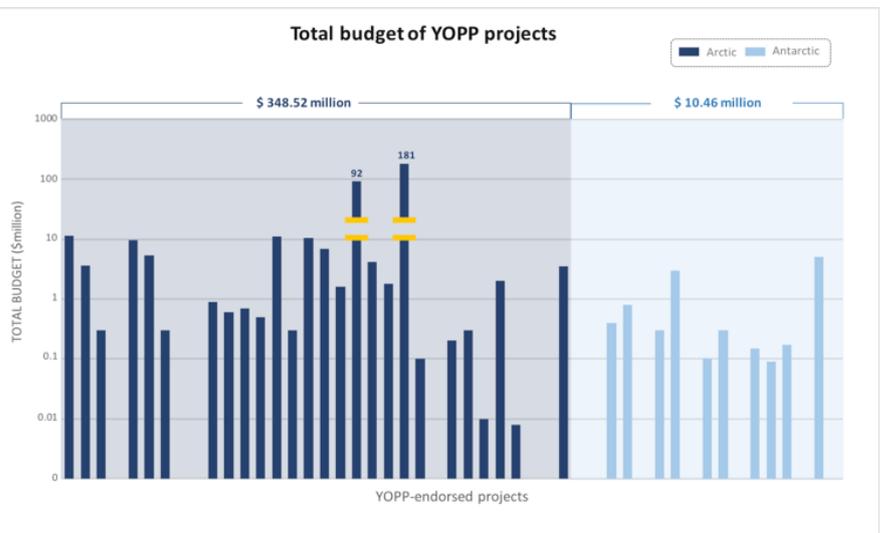
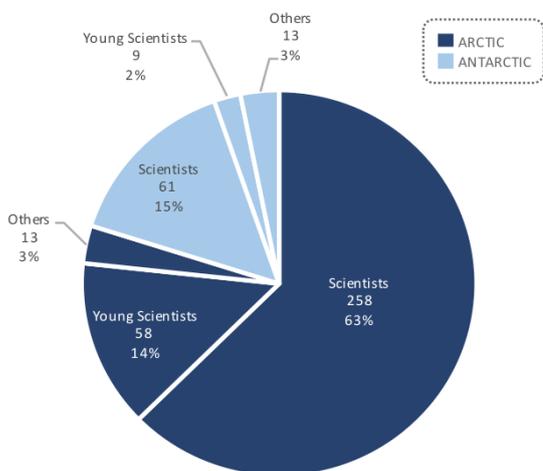
Another very important way to communicate, especially with users of polar forecast products, is the [Polar Prediction Matters](#) (PPM) dialogue platform. It is kindly hosted by the German Helmholtz Association’s blog website and the Alfred Wegener Institute. Monthly contributions by forecast users and operators in polar regions help to foster the dialogue between those that research, develop, and provide polar environmental forecasts and those that use (or could use) polar environmental forecasts to guide socio-economic decisions.

For any additional question or announcement you may want to spread to the PPP community, just contact the ICO via office@polarprediction.net.

02 Budget and Personnel of YOPP-Endorsed Projects | (by Juyeon Bae, WMO intern, and Kirstin Werner, YOPP International Coordination Office)

YOPP-endorsed projects embrace a total budget of ca \$ 360 Million and personnel of almost 2,000 people. Since the end of 2015, science projects, programmes and initiatives that contribute to the aims of the Year of Polar Prediction can request endorsement by YOPP. Project endorsement not only increases the visibility, networking and communication of

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Overview of YOPP-endorsed projects’ personnel and budget (source: WMO WWRP/International Coordination Office for Polar Prediction).

the research activities but also provides an international framework for research which in some cases even helps to leverage support and funding. At the same time, YOPP endorsement enables the International Coordination Office for Polar Prediction to coordinate the different activities during YOPP.

To date, there are 76 projects that have received project YOPP endorsement. Many of these projects carry out field campaigns during Arctic and Antarctic Special Observing Periods while others investigate how the extra observations obtained during the Special Observing Periods can improve predictive skills and forecasts of weather and sea ice in the polar regions.

In order to receive an overview of the total investment of YOPP-endorsed projects, the WMO WWRP that runs YOPP as one of their key projects together with the International Coordination Office surveyed YOPP-endorsed projects for their budget and personnel. The budget of YOPP-endorsed projects amounts to \$348,8 million in the Arctic and \$10.5 million in the Antarctic. In total, 1,649 and 336 scientists, young scientists but also technicians, students etc. are involved with YOPP-

endorsed projects in the Arctic and Antarctic, respectively. The Arctic projects MOSAiC and the Nansen LEGACY stand out here as they alone involve a budget and personnel of \$181 million and \$92 million as well as 500 and 130 scientists, respectively.

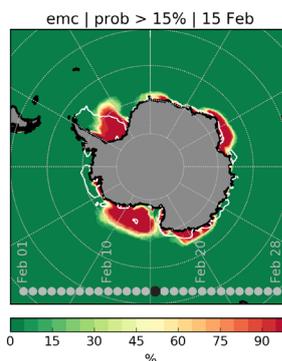
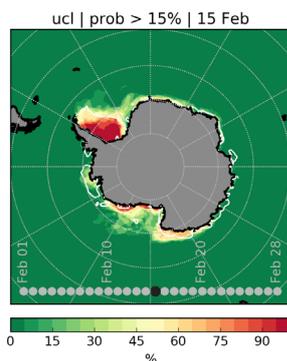
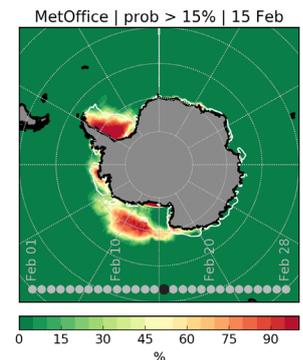
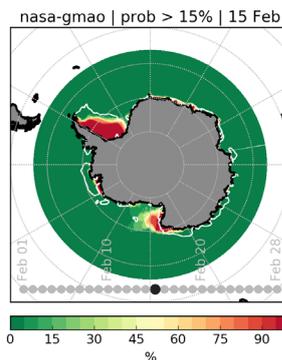
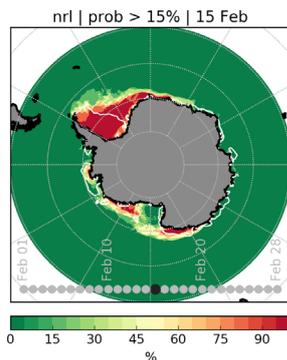
**03 SIPN South
Post-Season
Report | The Sea
Ice Prediction**

South Network (SIPN South) has just released a post-season report analyzing the ability of 13 systems to forecast summer Antarctic sea ice conditions.

The Sea Ice Prediction Network South (SIPN South) is an international project endorsed by the Year of Polar Prediction and a significant element of the YOPP in the Southern Hemisphere (YOPP-SH) effort. SIPN South aims at delivering an initial assessment of seasonal sea-ice forecasting capabilities around Antarctica. The final target is the prediction of sea ice conditions during the Year of Polar Prediction (YOPP) Special Observing Period of austral summer 2018-2019.

As a first major milestone of the project, 160 sea-ice forecasts for February 2018 were collected, analyzed and assessed against two observational references. This coordinated assessment is the first of its kind and should enable polar researchers to better understand the drivers of sea ice predictability in the Southern Ocean, as well as the origin(s) of systematic forecast errors. With 160 individual forecasts contributed, the polar community has shown great interest in the topic. The report, discussing February 2018

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Probability of sea-ice presence on the 15th of February 2018, according to five groups that contributed daily and spatial forecasts. The white lines are the observational sea-ice edge on that day (source: SIPN South).

conditions and how they were predicted, is now available from the SIPN South website: <http://acecrc.org.au/sipn-south/>

The forecast data are open to public in order to maximize their use within and outside the polar prediction community. The SIPN South leadership team currently prepares for their next milestone which will be the coordination of sea-ice forecasts for January-February 2019, that is, during the YOPP Special Observing Period for the Southern Hemisphere, scheduled from 16 November 2018 to 15 February 2019.

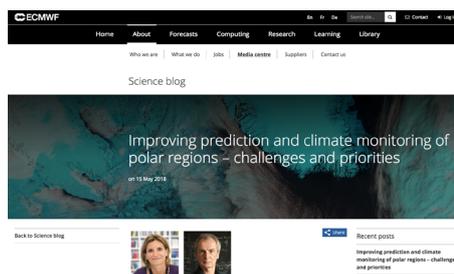
04 Looking North – New Polar Prediction Matters Entry on ‘Perspectives of European Arctic Users’ | Europeans from different shipping sectors provided insights to their daily operations in the Arctic and beyond at the recently held Open Session organized by the societal task team of YOPP. In the new article for the Polar Prediction Matters feedback platform, the authors Rick Thoman and Machiel Lamers report on the different perspectives presented by Europeans from different shipping sectors operating in Arctic waters. Stakeholders were invited by the authors and their colleagues from the Polar Prediction Project Societal and Economic Research and Applications (PPP_SERA) Task Team to the Open Session that was held on 18 April at the premises of the European Polar Board in The Hague, The Netherlands. How does a family-owned sailing venture make use of the currently available weather and ice information in Greenland waters? What does a ship master with long-year experience in Baltic sea-ice operations share about the reality of ice navigation? And how does modern bridge communication need to be re-organized to ensure safe decision-making? Observations and forecasts are just one piece of the puzzle as personal experience and non-environmental factors are playing additional important roles in polar maritime operations. See the new PPM contribution [here](#).



Traditional Bridge Organisation
One aspect mentioned in the new Polar Prediction Matters contribution is the traditional top-down hierarchies in bridge organization that need to be revisited (picture: Hans Hederström, CSMART).

05 ECMWF Science Blog Features Year of Polar Prediction | The new science blog of the European Centre for Medium-Range Weather Forecasts (ECMWF) outlines challenges and priorities to improve forecasting capabilities during the Year of Polar Prediction.

In the new article entitled ‘Improving prediction and climate monitoring of polar regions – challenges and priorities’, ECMWF colleagues Irina Sandu and Peter Bauer discuss the challenges of forecasting in the polar regions. The authors, who both play an active role in the PPP Steering Group, highlight the contributions and priorities for ECMWF to help making YOPP a success. Read the ECMWF Science Blog [here](#).



06 WMO WWRP Newsletter | A new edition of the quarterly newsletter issued by the World Meteorological Organization’s (WMO) World Weather Research Programme (WWRP) is now available online. As a guest editor, the Director of the Meteorological Research Division of Environmental and Climate Change Canada, Gilbert Brunet, identifies synergies and challenges of ‘The Future of Weather-Climate Prediction’. Amongst others, the April 2018 issue also spotlights the Year of Polar Prediction including a portrait of Thomas Jung, chair of the PPP Steering Group, as featured expert. See [here](#) for the WWRP newsletter.

07 YOPP Arctic Science Workshop – Call for Abstracts

| **The Call for Abstracts is now open for the YOPP Arctic Science Workshop to be held from 14 to 16 January in Helsinki, Finland.** The workshop is jointly organized by the Polar Prediction Project and its International Coordination Office (ICO), the International Arctic Science Committee (IASC), and the Finnish Meteorological Institute (FMI) who is hosting the meeting. It will bring together YOPP scientists to present and discuss the first results from the winter and summer Arctic Special Observing Periods in 2018, providing a vivid forum for exchange, networking, and interaction. Studies of coupled atmospheric, ocean, sea ice, and land processes will be addressed to share feedback on the latest Arctic observations, modelling and prediction efforts including their benefits to society on time scales from hours to seasonal. Amongst others, confirmed invited speakers are Elizabeth C. Hunke, Ian Renfrew and Gunilla Svensson.

Abstracts can be submitted until 3 September 2018 following the [link](#).

More information on the workshop can be found at the [workshop website](#) (see [Call for Abstracts](#) on page 15 this issue). Please direct any questions to the YOPP International Coordination Office office@polarprediction.net.

08 Polar Prediction School 2018 | **The second Polar Prediction School 2018 on weather and climate prediction in the polar regions took place from 17 - 27 April 2018 at Abisko Scientific Research Station in Sweden. It was organized by the EU Horizon 2020-funded [APPLICATE](#) project, in cooperation with the World Meteorological Organisation's Polar Prediction Project (PPP), the [Association of Polar Early Career Scientists \(APECS\)](#) and other partners.** This school, for early career scientists, included a combination of polar weather and climate lectures with practical exercises on



Time for group photo: Participants of the 2018 Polar Prediction School (photo: Fiona Tummon/APECS)

modelling and field meteorology as well as soft skill training. Each of these components forms a crucial pillar of the prediction problem as addressed during the Year of Polar Prediction; and the motivation for combining these was to provide participants with a complete overview of the components required to understand and predict polar weather. Amongst others, the young scientists launched radiosondes and held mini intense observational period. Videos summarizing the work of the students will be made available on the APECS and APPLICATE websites.

The Polar Prediction School 2018 has been attended by 29 early career researchers (focus on advanced graduate students, PhD students, and postdoctoral researchers) from around the world. An international set of 13 instructors taught the sessions. As during the first Polar Prediction School in 2016, classes were held at the Abisko Scientific Research Station in Sweden, where the instructional facilities are conveniently located in an environment well suited to Arctic observations. For more detailed information, please also see the [APECS](#) and the [APPLICATE](#) websites.

09 EGU Townhall Meeting – Exploiting Arctic Observations to Improve Weather and Climate Predictions: Next Steps and Priorities | *(by Rick Allard, Agnieszka Beszczynska-Möller, Luisa Cristini, Helge Goessling, Torben Koenigk, Irina Sandu, Kirstin Werner)* **A joint YOPP-APPLICATE Townhall Meeting took place during the European Geosciences Union**

General Assembly in Vienna. Invited speakers represented the Year of Polar Prediction (Helge Goessling, YOPP Coordination Office Director), the EU-funded APPLICATE project to study the Arctic's connection to mid-latitudes weather and climate (Irina Sandu, ECMWF) and close partners (Rick Allard, US Naval Research Lab; Agnieszka Beszczynska-Möller, IOPAN, Poland and INTAROS project; Torben Koenigk, Swedish Meteorological and Hydrological Institute). Speakers were invited to provide a brief response to the question: 'What are the main priorities and next steps to improve polar predictions in the Arctic, and how does your work contribute?'

From the perspective of the Arctic observational community, the **types, quantity and quality of the available data** were mentioned as being crucial to improve the understanding of key processes such as atmosphere-ocean-sea ice interactions in the Arctic. This will ensure better representation of these processes also in global and regional climate predictions from months to decades, as well as in longer-term projections.

From the operational perspective of Numerical Weather Predictions (NWP), improving **predictive skill on timescales from hours to seasons** in the Arctic and beyond has been named as one of the most pressing needs. It will also become increasingly important to **improve the quality of polar reanalysis**. High resolution global reanalysis such as ERA5 (with a global resolution of 30 km) constitute a great tool for climate monitoring of the Arctic. For this, three things need to be worked on: numerical models, data assimilation methods, and the effective use of observations in our NWP systems.

Transforming information obtained e.g., from satellites (radiances) into physical properties such as temperature or humidity used in models is more challenging in the Arctic than in other regions due to some polar-specific processes, e.g., the presence of clouds (and particularly mixed phase clouds), a shallow and often isothermal lower atmosphere, and the presence of snow and sea-ice covered surfaces. The quality of a forecast model highlighting the ultimate link between modelling and data assimilation will

thus be key for an **effective use of observational information in data assimilation**.

Further development of **data assimilation methodologies** in particular will be critical as currently knowledge is limited by how reliable estimates of model uncertainty and error are in polar areas. However, these estimates control how much weight is given to observations versus models in the assimilation process, and how to deal with systematic errors.

In addition, **new observing approaches and technologies** will be needed to meet future challenges in Arctic research, to adapt to the changing natural environment, and to fulfil different needs of the scientific community to guarantee year-round measurements of the different physical, biological, and biogeochemical parameters in the ocean, ice, and atmosphere.

In summary, YOPP presents a great opportunity for the science community to learn more about polar climate processes and to provide a wide range of additional observations, especially through the Special Observing Periods, which can be included in prediction models. Models, observations and data assimilation methodologies are all equally necessary to improve Arctic environmental prediction.

10 Polar Prediction Workshop 2018 | (by *Amélie Bouchat*) **Held in Montreal (Quebec, Canada) from 7 to 9 May 2018, the 5th Polar Prediction Workshop (PPW) brought together 75 participants from the academic, governmental, non-profit, and industry sectors to discuss research and operational activities related to Arctic sea-ice prediction.** While oral and poster presentations highlighted recent advances in Arctic prediction systems and their evaluation, the workshop also hosted its first end-user panel, providing a tribune for forecast end-users to present valuable feedback to the scientific community about their needs in terms of sea-ice products. Specifically, the need for ice pressure and ice motion information (on a weekly to daily time scale), as well as forecasting of beginning/end of open-water season for specific



Discussion during the Polar Prediction Workshop 2018 in Montréal, Canada (photo: Anna Brunette).

navigation routes were identified as pressing needs by the end-users.

Another major outcome of the Polar Prediction Workshop 2018 was a consensus forecast statement for the September 2018 sea-ice conditions. Based on a review of observed conditions for winter 2018, breakout groups were tasked with specifying the ice cover conditions in the marginal Arctic seas and drawing the September minimum ice-edge. The resulting consensus forecast agreed fairly well with early model forecast contributions also submitted at the workshop, with medium/high confidence for higher sea-ice cover in the Beaufort Sea and lower sea-ice cover in the Chukchi Sea. Breakout groups also identified higher sea-ice cover along the Eurasian coastline due to lower coastal divergence and positive ice thickness anomalies this spring, but uncertainty in the model forecasts for this region were high.

Supported by the Marine Environmental Observation Prediction and Response (MEOPAR) Network, the Canadian Ice Service, and the Climate and Cryosphere (CliC) project, results of the Polar Prediction Workshop 2018 activities were used as input for the Forecasting Regional Arctic sea ice from a Month to Season (FRAMS)

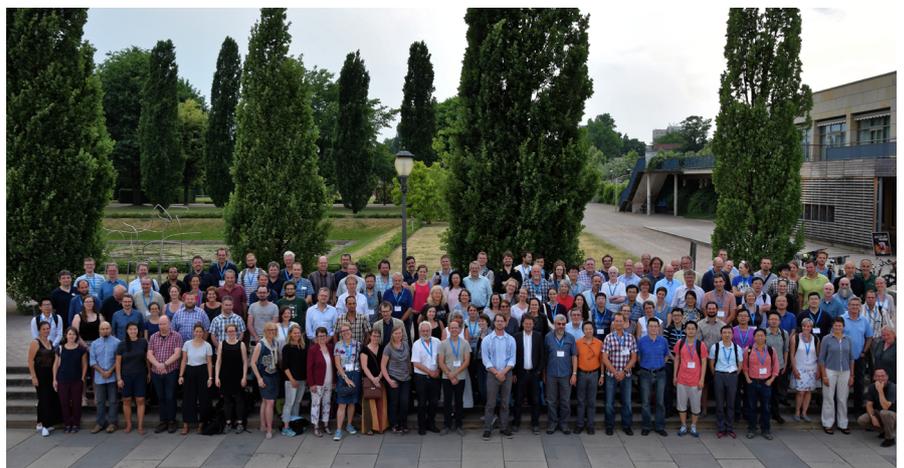
meeting and the first Pan-Arctic Regional Climate Outlook Forum (PARCOF-1) meeting, both held shortly after PPW.

The workshop presentations, documents, and videos are now available for reference at ppw2018.com.

11 MOSAiC Workshop – Paving the Way for Exciting Research | *(by Helge Goessling)* A 5-day workshop held 28 May to 1 June, 2018 in Potsdam, Germany, brought together close to 200 participants from various countries to advance the science around the MOSAiC Arctic ice drift campaign that is scheduled from September 2019 to September 2020.

The workshop made clear that the vastly challenging logistics and coordination have made major progress, paving the way for exciting research. Large parts of the workshop took place in breakout sessions organized by compartments (e.g., atmosphere, ice, snow, ocean), by cross-cutting science themes (e.g., ice formation, drift, deformation clouds, precipitation), or by other categories that will need enhanced coordination for a successful implementation of MOSAiC (including activities such as modelling, remote sensing, and aircraft campaigns). YOPP featured prominently as an important partner when it comes to:

(i) strengthening a pan-Arctic observation component, in particular during **the third Arctic**



Another group photo: Participants of the MOSAiC Workshop in Potsdam, Germany (photo: Benjamin Segger/Alfred Wegener Institute).

YOPP Special Observing Period, scheduled for **February/March 2020**, through extra radiosonde launches and meteorological buoys;

(ii) providing valuable modelling datasets, such as extra model output of operational forecast systems at the MOSAiC location by copying the concept of ‘**YOPP Supersites**’, and the **ECMWF YOPP Dataset** (confirmation of extension to include MOSAiC pending); and

(iii) helping to provide operational support by real-time meteorological forecasts as well as forecasts of the MOSAiC drift trajectory as part of the **YOPP Sea Ice Drift Forecast Experiment (SIDFEx)**.

A detailed workshop report will be made available through the [MOSAiC website](#).

12 PPP Meeting Reports | The meeting reports of the latest PPP Steering Group and PPP-SERA meetings are now available. The PPP Steering Group convenes once a year to discuss current developments, activities and plans for the Year of Polar Prediction’s successful implementation. From 13-15 March 2018, the group had been invited by the Icelandic Meteorological Office to hold their ninth meeting in Reykjavík, Iceland. Highlights of the current report involve the decision to hold a third Special Observing Period in the Arctic aligned with the MOSAiC drift experiment, agreement on priorities for the YOPP Consolidation Phase that will already start in about a year from now, YOPP data sharing, and coordination of activities at YOPP Supersites. Please find the full report [here](#).

The 4th meeting of the PPP Task Team on Societal and Economic Research and Applications (PPP-SERA) took place from 16-20 April at Wageningen University in The Netherlands. A report is now available summarizing the items discussed and progress made during the meeting. Amongst other endeavours, PPP-SERA plan to assess YOPP-endorsed projects that hold a stakeholder component. Following the concept of the Special Observing Periods (SOPs), they suggest holding two Special Services Periods (SSPs) during the

YOPP Consolidation Phase when investments will be made to stimulate researchers and operational centres to tailor environmental forecasting services closer to end-user needs, to exchange and promote key lessons from projects that focus on providing improved services delivery, and to learn how environmental forecasting services can be effectively improved in consultation with diverse groups of end-users. The PPP-SERA team is increasingly involving with doctoral researchers to support research focussing on the assessment of end-user needs. If prospective PhD students are interested in working on research needs identified in their [scoping document](#), PPP-SERA are looking forward to hearing from them. The PPP-SERA 2018 meeting report is now available from [here](#).

The report of the PPP-SERA Open Session that was held on 18 April at the premises of the European Polar Board in The Hague, The Netherlands ((see also #04) is also available [online](#).

13 YOPP Coordination Office Welcomes New WMO Consultant Jeff Wilson | Jeff Wilson joins the International Coordination Office for Polar Prediction as new WMO Consultant to support PPP and YOPP activities.

Prior to holding his position as Director of the WMO Education and Training Office for nearly nine years until 2016, Jeff Wilson worked as an educator, trainer and Principal of the Australian Bureau of Meteorology Training Centre for more than 27 years. In addition to his extensive experience in education and training, he worked as a forecaster with the Australian Bureau of Meteorology for five years including three summer seasons providing forecasting support for land, sea and air operations in Antarctica. Jeff Wilson started his career as a



New WMO Consultant Jeff Wilson in Support of YOPP (photo: private).

glaciologist with the Australian Antarctic Division analysing Antarctic ice cores for evidence of climate change and was awarded a Polar Medal for his work in Antarctica in 1977.

Jeff will provide his support to the International Coordination Office for Polar Prediction in particular in view of the upcoming YOPP Consolidation Phase from mid-2019 to 2022 when the legacy of YOPP data, science and publications will be prepared.

14 Expert on Environmental Economics joins PPP-SERA team | Environmental economist Riina Haavisto joins the PPP Societal and Economic Research and Applications (PPP-SERA) Task

Team. During the recent PPP-SERA annual meeting at Wageningen University, The Netherlands, a new face joined the PPP-SERA Task Team. Riina Haavisto has been working as an environmental economist at the Finnish Meteorological Institute, in Helsinki, Finland, since 2013. Her research focuses on projects related to weather and climate risk management as well as to climate change adaptation. Riina will support the PPP-SERA team in particular with her economic point of view when it comes to user engagement and the provider-user interface of WWIC (Weather, Water, Ice and Climate) information. In addition, she is looking into future needs of WWIC services and their value to different sectors in the northern hemisphere.



New to the PPP-SERA Task Team: Riina Haavisto from the Finnish Meteorological Institute/FMI (photo: Tero Pajukallio/Diaidea)

15 YOPP-endorsed! – Arctic Climate Across Scales | YOPP endorsement is available for projects, programmes and initiatives but also for institutions and operational centres that contribute to making the Year of Polar Prediction

successful. More than 76 projects, programmes and initiatives already received project endorsement from YOPP.

The **YOPP-endorsed project ‘Arctic Climate Across Scales’ (ACAS)** is led by the Swedish meteorologist Michael Tjernström. In August, Michael will join a cruise to north of Fram Strait on the Swedish research breaker Oden to run a semi-permanent atmospheric observatory for several weeks aboard.

Prof. Tjernström, what are you going to find out with the YOPP-endorsed ACAS campaign?

That’s the wonderful thing with science; you never know. So partly we’re expecting to be surprised. This is my fourth expedition to the Arctic and each time I’ve learned something new, something that I did not expect. But that’s also why taking detailed measurements in the Arctic more often is so important. The fact that we find new aspects of the Arctic atmosphere all the time tells us that we don’t know enough; that we’ve just been scratching the surface.

Then there’s also the technical aspect. We are in the build-up phase of the Oden atmospheric observatory, and have spent the last year designing some of the instrument systems. Now is the time to see what works and what doesn’t.

Which measurements will you carry out and how will they help achieving the project’s goals?

The project goals are quite wide. We want to close the gaps across the scales in order to improve computer models for weather and climate for the use in operational prediction and climate science. We believe there is a linkage all the way through from the large-scale atmospheric motions to cloud formation



PI of ACAS: The Swedish meteorologist Michael Tjernström (photo: Eva Dalin).

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and the energy budget at the sea-ice/ocean surface. To understand the smaller-scale we need in-situ observations that are detailed enough to study processes. But we also need a good handle on the larger-scale flow.

On this expedition, we will study the details of the energy flux at the surface using eddy-covariance and radiation observations, profiling the lower atmosphere in detail, looking at the turbulent boundary layer and the clouds with instruments on a tethered balloon and sondes in free-flying balloons, and surface based remote sensing such as radars and lidars.



Michael Tjernström launching a radiosonde balloon during the ACSE/SWERUS-C3 expedition in 2014, with Bennett Island in the background (photo: Jorien Vonk).

To do this, we collaborate with other atmospheric scientists. The collaborating projects will also measure things like aerosols and processes in the upper ocean. As a contribution to YOPP, routine meteorological observations, like surface observations and radiosoundings, will be available in real time on the GTS. In addition, we will improve the representation of the larger-scale atmosphere in operational models.

When, how long, and most importantly where to is the cruise going to take place?

We will depart from Longyearbyen on Svalbard at the beginning of August and set out north from Fram Strait into the pack ice. The intention is to be well within the ice; not close to the ice edge. How far north we'll have to go depends on how fast we can find a good-sized multiyear ice floe to ensure the observations on the ice. There is no particular point in going very far north; as soon as we find a good spot to set up camp we will anchor to that ice floe and drift with it for about five weeks. We hope to be able to capture the tail end of the melt season and into the local freeze up. On 25 September we'll be back again, in Tromsø.

What is the scientific scope of the Oden cruise, and how does ACAS fit into this larger scope of the cruise?

The expedition is mainly targeting processes that control the formation and lifetime of Arctic

boundar-layer clouds, and their effects on the surface energy balance. A number of different projects participate and we're lucky to share this objective with several other projects, so that we can test our vision for observations without yet having all our own instruments in place. ACAS itself is mainly interested in the boundary-layer physics and turbulence, and in the macro- and micro-scale of the clouds.

Who are you working with aboard (and back home later in the office) within the project, and where does the funds for the project come from?

The funding for ACAS itself comes from the Knut and Alice Wallenberg Foundation in Sweden, but there are many more projects on board with whom we collaborate, funded by the UK NERC and the Swedish VR science councils. Other projects on board are funded by AWI in Germany or NSF in the US; so its a major puzzle to fit everything together.

The observational strategy for ACAS is to develop an instrument package that can always be run on Oden, even when the expedition target is not the atmosphere. So the design strategy is to have the system run by either one person or by the ships logistics and IT crew. In that spirit, for ACAS there are only two people on board; myself and the ACAS instrument engineer John Prytherch. In total, there will be some forty scientists on

board, plus the crew and logistics, another maybe thirty people. But ACAS takes wide view on its membership. At the office, three PhD students and an instrument engineer are directly funded by ACAS but the core group consists of eight experienced scientists; the current email list contains some 25 names, as many more are part of the conversation.

Within ACAS, you envisage collaboration with the DLR, the German Aerospace Center. Can you tell more about DLR supporting ACAS?

DLR will provide detailed SAR imagery of the ice. This is important for three reasons. First, we want to identify the best area in which to scout for a good ice floe for our ice camp already beforehand. Second, the collaboration with DLR will facilitate finding the best path for the icebreaker to take us there, and, third, once there, they can monitor how the ice in the area changes during the active phase of the observations.

How does ACAS contribute to improving weather and sea-ice predictions in the Arctic?

In three ways: first, by directly sharing our more routine type observations with the global weather forecasting community, we will contribute to better forecasts there and then, which we will ourselves benefit from. Second, because these type of observations is so rare in the Arctic, modellers will have the possibility to go back and redo forecasts with and without this data to study the impact. Then finally, and most important for ACAS itself, is the use of our detailed observations in understanding the relevant physics to improve the model's parameterizations. Part of this is a collaboration with modelling efforts in Stockholm and at the ECMWF to test and evaluate different modelling efforts, among them a new fully coupled single-column model.

What should the polar prediction community remember about ACAS?

The urgent need for more observations in the central Arctic, especially of the vertical structure of the atmosphere. And how fascinating the Arctic and this kind of field work is - and how demanding.

16 Publications

Characteristics of a Convective-Scale Weather Forecasting System for the European Arctic |

Authors compare the convective-scale weather prediction system AROME Arctic with the coarser resolution global ECMWF forecasting systems. The regional forecast system AROME Arctic operated by Met Norway adds value in surface characteristics of wind and temperature. A major limitation for kilometer-scale atmospheric forecasting systems in the Arctic is the representation of sea ice and ocean surface characteristics. This challenge is illustrated by analysing currently available sea-ice and surface temperature products and discussing their shortcomings.

Müller, M., Batrak, Y., Kristiansen, J., Køltzow, M., Noer, G., Korosov, A., 2017: Characteristics of a convective-scale weather forecasting system for the European Arctic. *Monthly Weather Review*, 145 (12), 4771-4787. doi.org/10.1175/MWR-D-17-0194.1

Impact of Rheology on Probabilistic Forecasts of Sea Ice Trajectories: Application for Search and Rescue Operations in the Arctic |

This paper highlights the benefits of mechanical properties of sea ice in addition to wind information for sea-ice predictions, especially in winter time when sea ice mechanics are more intense. The sea ice model used for the study is neXtSIM, which is scheduled for operational forecasts in November 2019 and will be made available by the Copernicus Marine Services to the public, including search and rescue teams. Amongst other sea-ice forecast models, the novel neXtSIM will be assessed by the SIDFEx experiment as part of YOPP.

Rabatel, M., Rampal, P., Bertino, L., Jones, C.K.R.T., 2018: Impact of rheology on probabilistic forecasts of sea ice trajectories: application for search and rescue operations in the Arctic. *The Cryosphere*, 12, 935–953, 2018. doi.org/10.5194/tc-12-935-2018

Predictability of Arctic Sea Ice on Weather Time Scales | Simulations with a high-resolution sea ice-ocean model driven by atmospheric ensemble forecasts are used to determine the predictability of the Arctic sea-ice pack in winter. Understanding is limited in terms of the predictability of sea-ice deformation along so-called Linear Kinematic Features (LKFs) including sea-ice leads that are relevant for marine operations. Results show that the predictability of LKFs is almost completely lost after four to eight days, probably due to the low predictability of near surface wind divergence and vorticity.

Mohammadi-Aragh, M., Goessling, H., Losch, M., Hutter, N., Jung, T., 2018: Predictability of Arctic sea ice on weather time scales, *Scientific Reports*. [doi:10.1038/s41598-018-24660-0](https://doi.org/10.1038/s41598-018-24660-0)

An Assessment of Ten Ocean Reanalyses in the Polar Regions | The snow, sea ice, ocean transports and hydrography states of ten ocean and sea ice-reanalysis products (ORAs) from the Arctic and Antarctic were compared in the paper. As global and regional ocean and sea ice reanalysis products are increasingly used in polar research, knowing their main deficiencies is of high relevance. Results show that deviations of observations from the multi-ORA mean state were typically smaller than individual ORA anomalies.

Uotila, P., Goosse, H., Haines, H., Chevallier, M., Barthélemy, A., Bricaud, C., Carton, J., Fuçkar, N., Garric, G., Iovino, D., Kauker, F., Kerhonen, M., Lien, V.S., Marnela, M., Massonnet, F., Mignac, D., Peterson, K.A., Sadikni, R., Shi, L., Tietsche, S., Toyoda, T., Xie, J., Zhang, Zh., 2018: An Assessment of Ten Ocean Reanalyses in the Polar Regions. *Climate Dynamics*. <https://doi.org/10.1007/s00382-018-4242-z>

17 Upcoming Events

19 July 2018

Third YOPP in the Southern Hemisphere meeting (YOPP-SH#03) – In conjunction with 13th Antarctic Meteorology and Climate Workshop (16–18 July)
Madison, Wisconsin, USA

14-16 January 2019

Arctic YOPP Science Workshop – Jointly organized with IASC ([more info](#), see [Call for abstract](#) on page 15)
Finnish Meteorological Institute
Helsinki, Finland

2-5 April 2019

Workshop on Predictability, Dynamics and Applications Research using the TIGGE and S2S ensembles ([more info](#))
ECMWF
Reading, UK

22-30 May 2019

14 *Arctic Science Summit Week 2019*
/ Arkhangelsk, Russia
15

8-18 July 2019

International Union of Geodesy and Geophysics (IUGG) General Assembly ([more info](#))
Session: First Results from the Year of Polar Prediction
Montréal, Canada

4-6 September 2019

Arctic Futures 2050: Science and Policy for a Changing Arctic
Washington, DC

Any news or upcoming events to be announced to the community? Send an email to office@polarprediction.net.

The next issue of PolarPredictNews is expected to be out in September 2018.

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CALL FOR ABSTRACTS: *YOPP Arctic Science Workshop 2019*

14 to 16 January 2019
at **Finnish Meteorological Institute** in Helsinki, Finland

Jointly organized by the **Polar Prediction Project** and its International Coordination Office (ICO), the **International Arctic Science Committee** (IASC), and the **Finnish Meteorological Institute** (FMI).

The workshop will bring together YOPP scientists to discuss first results from the Arctic Special Observing Periods, providing a vivid forum for exchange and networking. We invite studies on coupled atmospheric, ocean, sea ice, and land processes in the context of **latest Arctic observations, modelling and prediction efforts** including their **benefits to society** on time scales **from hours to seasonal**.

Confirmed invited speakers:

Elizabeth C. Hunke, Jim Doyle, Machiel Lamers, John Marshall,
Pierre Rampal, Ian Renfrew, Greg C. Smith, Gunilla Svensson

Abstracts due by **3 September 2018**

<http://tiny.cc/ArcticYOPP2019>

Further information at workshop website: <https://bit.ly/2Hqla32>

Please direct any questions to the YOPP International Coordination Office:
office@polarprediction.net