YOPP
YEAR OF
POLAR
PREDICTION

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of the Polar Prediction Project

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PolarPredictNews

Newsletter #12

Sept. 2019

On 20 September 2019, the MOSAiC expedition starts from Tromsø, Norway. The German research icebreaker Polarstern will be the central MOSAiC observatory frozen into and drifting with the sea ice for an entire year. More than six hundred people from 17 nations will be working aboard and from the surrounding ice floe at polar night and day during six different cruise legs (photo: Stefan Hendricks, Alfred Wegener Institute).

Dear Colleagues,

After years of planning, finally, RV Polarstern is leaving Tromsø on 20 September 2019 to accomplish MOSAiC – the biggest Arctic expedition ever. While drifting for one year through the central Arctic, novel measurements will be taken that will provide the basis for bringing weather and climate models in terms of their ability to represent critical processes in the high north to the next level.

It is with great pleasure, that I look back at years of excellent collaboration with the MOSAiC planning team. In fact, from the outset it was clear that YOPP and MOSAiC would be an excellent fit. MOSAiC was first mentioned at the PPP Steering Group meeting at ECMWF in 2012 ("*invite MOSAiC representatives to the first YOPP planning workshop*"). One year later, MOSAiC was presented by Matt Shupe, and subsequently it had been mentioned 22 times in the report of the Boulder meeting (e.g., "*The grid box approach was seen as being very important, and should be highlighted in any letter of support from PPP for MOSAiC.*"). MOSAiC has been high on the agenda during the planning of YOPP ever since. We even postponed the YOPP Core Phase by one year, to ensure best possible alignment between the two initiatives.

I wish the MOSAiC team the best of luck for their endeavor. Be assured that we will contribute to using your unique observations to help advancing predictive capacity in the Arctic and beyond.

Happy reading,
Thomas Jung

The Year of Polar Prediction (YOPP) is a major international activity that has been initiated by the 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.

YOPP
YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

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Content

01 Off You Go, Polarstern! | **On 20 September 2019, the German research icebreaker Polarstern will depart from Tromsø, Norway, to spend an entire year drifting through the Arctic Ocean, trapped in sea ice. A total of six hundred people from 19 countries will participate in the expedition. The data gathered during six cruise legs, covering full polar night and polar day conditions and everything in between, will be used by numerous researchers to take climate and ecosystem research to a next level.**

The Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) will be the first year-round expedition into the central Arctic exploring its climate system. It is the largest Arctic expedition following the concept of Fridtjof Nansen's Fram expedition in 1893. The project with a total budget exceeding 120 Million Euro has been designed by an international consortium of leading polar research institutions, under the umbrella of the International Arctic Science Committee (IASC), led by the German Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI), the Russian Arctic and Antarctic Research Institute (AARI) and the University of Colorado, Cooperative Institute for Research in Environmental Sciences (CIRES), United States. RV Polarstern will serve as the central observatory, drifting with the sea ice across the central Arctic towards Fram Strait for a year. A distributed regional network of observational sites will be set up on the sea ice in an area of up to ~50 km distance from RV Polarstern. The ship and the surrounding network will drift with the natural ice drift across the polar cap towards the Atlantic, while the sea ice thickens during winter.

Link between MOSAiC and YOPP

A strong link between MOSAiC and YOPP has existed right from the beginning of MOSAiC's planning. "*Both projects strive to better understand the Arctic climate system*", explains expedition leader Markus Rex in his interview with PolarPredictNews (see *#16*). "*MOSAiC has always been considered one of the key projects contributing to the Year of Polar Prediction*", says PPP Steering Group chair Thomas Jung. MOSAiC is thus also one of the first projects which received endorsement by the Year of Polar Prediction in late 2015, as it 'supports YOPP by the evaluation of near-real-time observational data in a long-term context'. Ever since, MOSAiC planning has involved YOPP as an important partner.

MOSAiC – A YOPP Supersite

The MOSAiC central observatory and the surrounding distributed network of instruments will serve as a YOPP Supersite. Together with other YOPP Supersites, MOSAiC observational data will be used within the YOPPSiteMIP project led by PPP Steering Group members Gunilla Svensson from Stockholm University and Taneil Uttal from the U.S. National Oceanic and Atmospheric Administration. Measurement procedures will be standardized

YOPP YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

AWI PPP WORLD METEOROLOGICAL ORGANIZATION

International Coordination Office (ICO)
of the Polar Prediction Project

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for all observational YOPP Supersites including MOSAiC in order to compare instrumental observations with model data output at high frequency. This will enable multimodel and multisite verification and process evaluation until the end of the Polar Prediction Project in 2022, and beyond.
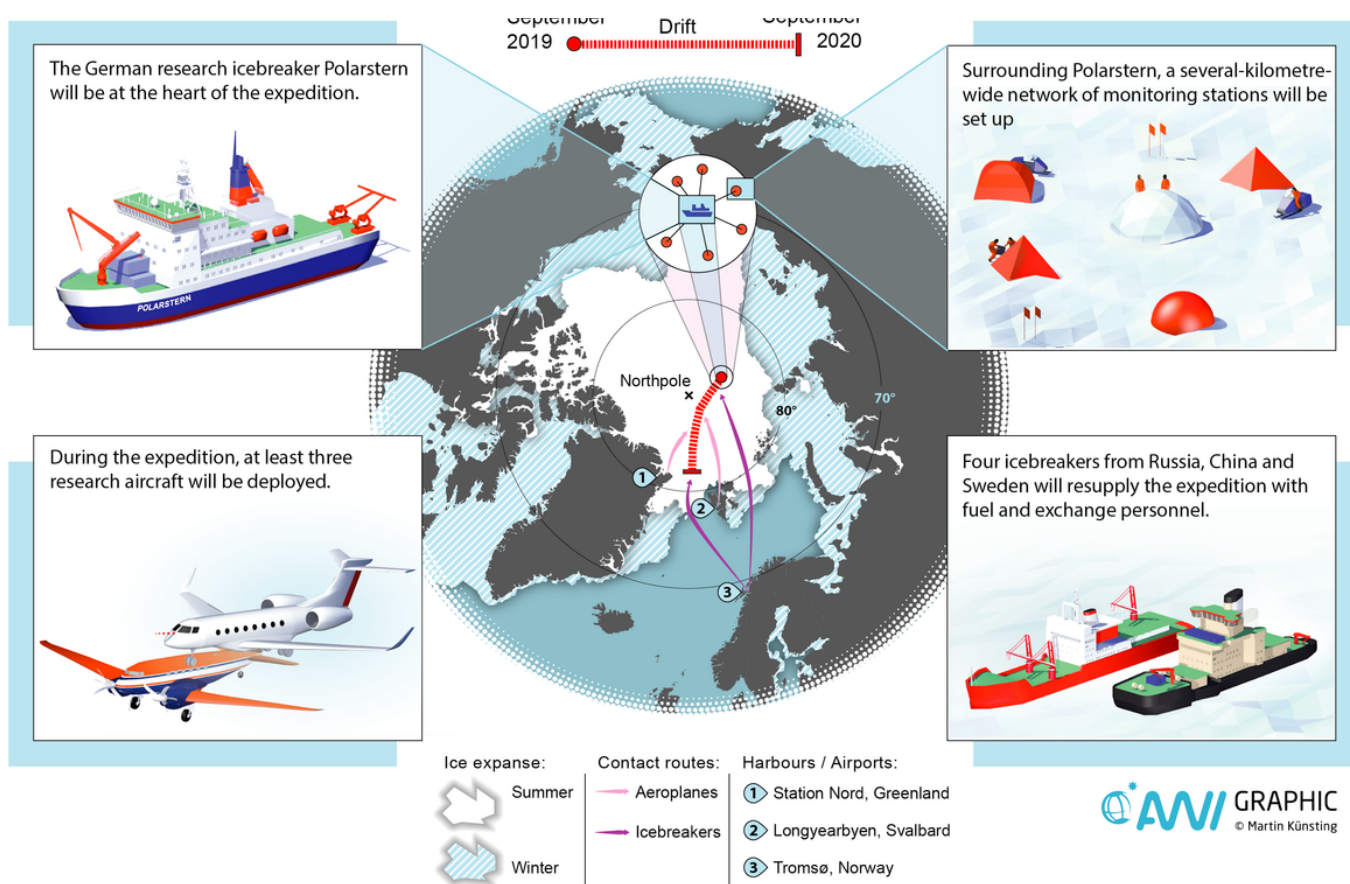
Third Arctic Special Observing Period

A third Arctic Special Observing Period is planned during MOSAiC, tentatively scheduled from December 2019 through April 2020. This third Arctic SOP-NH3 will have a focus on improving observational coverage during episodes of strong interactions between the Arctic and mid-latitudes. These are i) warm air intrusions being associated with the mid-latitudes driving Arctic weather and climate and ii) cold-air outbreaks which are episodes when the Arctic has strong influence on mid-latitude weather.

This third SOP in the Arctic will thus be different from the previous SOPs as additional radiosonde launches and other measurements will only focus on key regions. The most prominent third SOP region is of course the central Arctic Ocean with RV Polarstern and the surrounding distributed instrument network.

Sea-Ice Drift Forecast Experiment

Another major link between YOPP and MOSAiC has been established by the implementation of the Sea-Ice Drift Forecast Experiment (SIDFEx). A central component of this YOPP activity is the provision of near-real-time ice drift forecasts for the MOSAiC site from several operational forecast centers. The forecasts will be made available on the ship and on a land-based server, openly accessible through an interactive online tool at *https://sidfex.polarprediction.net*. The forecasts are meant to support the ordering of satellite

The German research icebreaker Polarstern will be at the heart of the expedition.

Surrounding Polarstern, a several-kilometre-wide network of monitoring stations will be set up

During the expedition, at least three research aircraft will be deployed.

Four icebreakers from Russia, China and Sweden will resupply the expedition with fuel and exchange personnel.

September 2019 — Drift — September 2020

Northpole

Ice expanse: Summer / Winter
Contact routes: Aeroplanes / Icebreakers
Harbours / Airports: ① Station Nord, Greenland ② Longyearbyen, Svalbard ③ Tromsø, Norway

AWI GRAPHIC © Martin Künsting

MOSAiC will be the first year-round expedition into the central Arctic. Laden with scientific instruments, the German research icebreaker RV Polarstern will start its drift from close to the North Pole this coming winter 2019/2020. Not only the science behind MOSAiC is a huge endeavour that needs the expertise of multiple nations and scientific disciplines but also the logistics face unparalleled challenges (infographic: Martin Künsting/Alfred Wegener Institute).

YOPP
YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

International Coordination Office (ICO)
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imagery and logistics in the field, and to provide an additional basis for forecast system evaluation.

International YOPP Participation in MOSAiC
Different members of the PPP Steering Group will either participate themselves, send colleagues aboard or will be involved elsewise with MOSAiC.

Environment and Climate Change Canada (ECCC) plans to use observations collected during MOSAiC for a variety of studies to improve coupled environmental prediction to support the YOPPSiteMIP and SIDFEx efforts. The unique location of MOSAiC observations and co-localization of atmosphere, sea-ice and ocean observations will be used by ECCC to improve boundary layer parameterization as well as fluxes across the sea-ice interface. In addition, ECCC is proving a real-time stream of graphical products from the Canadian Arctic Prediction System (CAPS) being run for YOPP. These products are shared with scientists aboard Polarstern for planning of field campaign activities and research efforts.

04 / 21

During the first six weeks, Polarstern's transit into the central Arctic Ocean will be supported by the Russian icebreaker Akademik Federov (Illustration: Thomas Rackow/Alfred Wegener Institute who will participate in the MOSAiC School as a lecturer on YOPP modelling, see #02).

The Polar Observations and Processes Group from the **U.S. National Oceanic and Atmospheric Administration (NOAA)** will provide off-site support sea-ice forecasting activities for Polarstern, in addition to their contribution to SIDFEx. They will also support the YOPPSiteMIP project by creating standardized files from the MOSAiC expedition that can later be used for the model evaluation.

Colleagues from the **Chinese National Marine Environmental Forecasting Center (NMEFC)**

will work with the observational data to simulate the sea-ice evolution during MOSAiC by a sea-ice column model. NMEFC will also run operational weather and sea-ice forecasts during MOSAiC.

In-Situ Observations
In-situ sea-ice observations by colleagues from **Dartmouth College, New Hampshire, USA**, will be complemented by the deployment of four autonomous seasonal ice mass balance buoys which measure air, snow, ice, and ocean temperature profiles as well as snow deposition and melt, ice growth, ice surface and bottom melt. These observations are designed to help 'scale up' the measurements at the MOSAiC Central Observatory (kilometers) to the distributed instrument network (tens of kilometers).

In support of MOSAiC and YOPP, the Arctic and **Antarctic Research Institute (AARI)** in St. Petersburg, Russia, will deploy four to five synoptic meteorological buoys during the MOSAiC drift in October 2019 in the Eurasian Arctic (Laptev Sea, East Siberian Sea) and potentially in spring 2020 in the Barents Sea and the Arctic Basin.

02 Start of MOSAiC School – Falling in Love with the Polar Regions | During the first leg of the MOSAiC expedition, the MOSAiC School 2019 will take place on board the icebreaking research vessel RV Akademik Fedorov, which will support Polarstern for six weeks on her way into the central Arctic. During the transit into the ice, twenty early career scientists will attend lectures, workshops, and hands-on exercises on e.g., Arctic atmosphere, sea-ice and ocean conditions aboard the floating

YOPP
YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

AWI **PPP** **WORLD METEOROLOGICAL ORGANIZATION**

International Coordination Office (ICO)
of the Polar Prediction Project

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university, .YOPP supports Thea Schneider, one of the twenty early-career scientists, and mathematician and climate scientist Thomas Rackow who will join the school as a lecturer for climate and sea-ice modelling.

Once arrived in the Arctic, MOSAiC School participants will support the MOSAiC teams to set up the distributed regional network of observational sites within an area of up to ~50 km distance from RV Polarstern. On their way back to Tromsø, students will be given another set of workshops and practical exercises, this time on media and outreach. Each participant will work on an individual communication project to prepare becoming a MOSAiC ambassador after returning from the cruise.

We've asked master student Thea Schneider from the University of Potsdam and postdoctoral scientist Thomas Rackow from the Alfred Wegener Institute to complete the following sentences to tell us about their expectations for the school:

I look forward to participate in the MOSAiC school because…
Thea: "*…being part of this huge international project is a once-in-a-lifetime chance and it offers so many unique experiences.*"

Thea Schneider currently completes her master studies in physics at the German University of Potsdam. Before she started her science career, she was trained a professional photographer and showed her photos at several exhibitions (photo: private).

Thomas Rackow works as a postdoctoral scientist at the Alfred Wegener Institute in Bremerhaven. When he is not thinking about sea ice, he likes to spend time with his daughter who loves to sing along her dad playing the guitar (photo: private).

Thomas: "*I look forward to teaching during the MOSAiC School because it is an incredible opportunity to experience the polar regions and at the same time to meet a group of young and motivated people that are interested in this beautiful region.*"

My role at the MOSAiC school is…
Thea: "*…to be a student and learn as much as possible from all the amazing scientists and other students on board. We will also help set up the Distributed Network around RV Polarstern.*"
Thomas: "*…obviously to give dancing courses and to play guitar during our social events. Besides that, I will give a YOPP lecture about modelling, help the students with hands-on exercises to produce their own drift forecasts for sea-ice buoys – and maybe even for Polarstern's drift – and support the daily organisation of the MOSAiC School whereever I can. I am the person responsible on board for making satellite and model data available and will provide visualization and – to some extent interpretation. Coordinating the availability of information with Russian experts on board will be important for the daily planning of the expedition.*"

YOPP YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

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International Coordination Office (ICO)
of the Polar Prediction Project

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My experience with the Arctic so far is…
Thea: "…a very short stay on Svalbard, which made me fall in love with the polar regions and made me come back to Svalbard to take some courses at the University Centre in Svalbard last year."
Thomas: "… mostly theoretical and from numerical models and forecasts of future Arctic climate and sea ice. Having generated computational grids for the Arctic at high spatial resolution, I feel quite familiar with the shape of the coastlines and bathymetry, but seeing it with my own eyes will bring my relation to this beautiful region to a whole new level!"

When I am back from the school in November, I would like to have…
Thea: "… experienced how daily life and research is like on an icebreaker, with all its ups and downs, and – to be honest – most of all I am crazy excited for the sea ice and to witness some of the processes I always read about and maybe even see a polar bear."
Thomas: "… seen polar lights and icebergs – yes, icebergs! – and to have experienced the rewarding but at the same time tough life during an expedition of this size."

I am going to share my school's experience with…
Thea: "… hopefully with all of you by creating a photographic documentation (exhibition, booklet, blog posts, Instagram), and I am planning on giving talks about MOSAiC at my hometown university and have a MOSAiC day at my old school."
Thomas: "… the public through The IcePod podcast (ed. note: Yes, stay tuned – YOPP will go audio!) and by sharing photos and personal drawings on my social media channels. On the longer term, I plan to also support the early career scientists participating in the MOSAiC School as MOSAiC ambassadors with their communication products."

Follow *@polarprediction*, *@the.answer.is.north* (Thea Schneider) and *@polarthomas* (Thomas Rackow) on Instagram and Twitter to find out about Thea's and Thomas' adventurous time with the MOSAiC School.

03 Arctic and Antarctic Forecast Data from Météo France | **As a contribution to the modelling efforts of the Year of Polar Prediction, Météo France now provides Arctic and Antarctic forecast data sets. The model output is publicly available and can be used to compare with observational data produced during the YOPP Special Observing Periods.**

During three YOPP Special Observing Periods, the number of observations of the weather and sea-ice conditions were increased in the Arctic and Antarctica. Model experiments during the remainder of the Polar 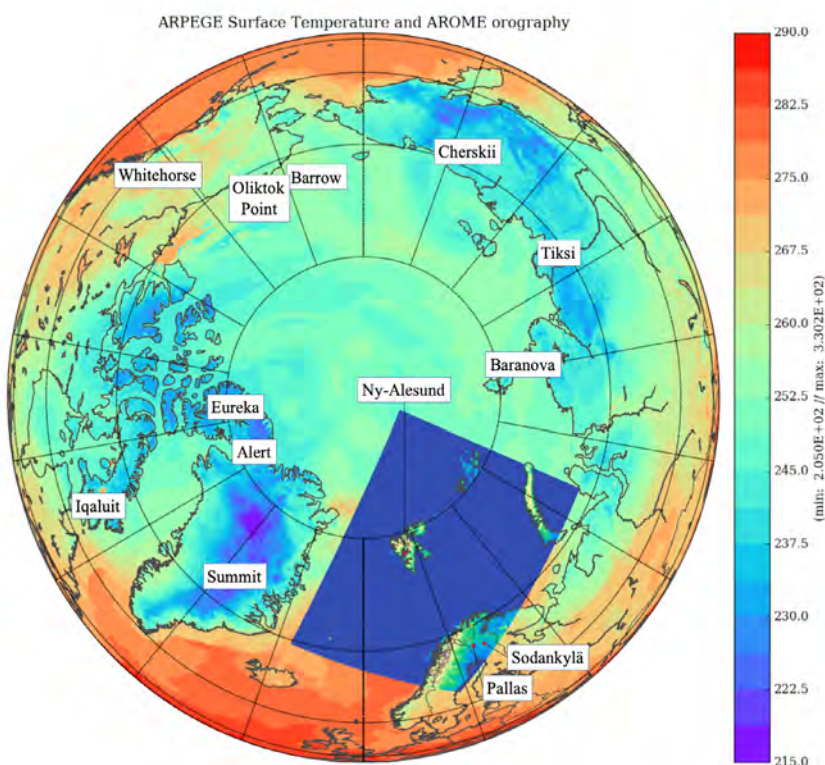Prediction Project until 2022 will show at what locations and which frequencies extra observations will be needed so that meteorological and sea-ice forecasts in the polar regions can be improved.

Small-Scale Large-Scale Research Action
One of the operational centers contributing to YOPP is the French weather service Météo France. The National Centre for Meteorological Research CNRM provides forecast data for the three Special Observing Periods that were held in 2018 and 2019 in the high northern and southern latitudes. CNRM's essential tools for operational weather forecasting are the two global numerical weather prediction models ARPEGE (ARPEGE stands for 'Action de Recherche Petite Echelle Grande Echelle'; in English: Small-Scale Large-Scale Research Action) and AROME (AROME is the acronym for 'Application of Research to Operations at Mesoscale').

A Data Point at Every 2.5 km
For the two Arctic Special Observing Periods from 1 February 2018 to 31 March 2018 and from 1 July 2018 to 30 September 2018, modelling output from ARPEGE are available with data points at about every 7.5 to every 12.5 km over the thirteen YOPP Supersites in the Arctic (see map page 07). This output data contains forecasts of temperature, wind, clouds, humidity and other parameters for three days. In addition, within the YOPP-endorsed project APPLICATE, model

YOPP YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

International Coordination Office (ICO)
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ARPEGE Surface Temperature and AROME orography

Surface temperature from the ARPEGE model in the Arctic. The inlet map displays the high-resolution orography used over a domain around Svalbard and the Barents Sea for the AROME model output (source: Eric Bazile/Météo France)

well as six-hour forecasts at 6 and 18 UTC are thus available for all 17 YOPP Supersites in the Antarctic and for four additional sites over the Third Pole/high mountain area. The experiments of the high-resolution AROME model forecasts with data points at every 2.5 km are still running but will be provided soon for the Antarctic YOPP Supersites Dumont d'Urville, Alexander Tall Tower!, and McMurdo.

The data and corresponding technical information are available from the YOPP Data Portal and from the ftp server *ftp://ftp.umr-cnrm.fr* (user: yopp/password: Arpege).
Contact: Eric Bazile *eric.bazile@meteo.fr*

experiments were carried out with the higher resolution model AROME over a domain around Svalbard and the Barents Sea: "*The model output from AROME provides data every 2.5 km for each day during the Arctic Special Observing Periods at 00 and 12 UTC*", says Eric Bazile who leads this Météo France effort in support of YOPP.

High-resolution Area from France Moved to Antarctica
In the Antarctic, the Special Observing Period took place during the last austral summer, from 16 November 2018 to 15 February 2019. As a contribution to the YOPP in the Southern Hemisphere (YOPP-SH) effort, Bazile and his colleagues Vincent Guidard and Niramson Azouz have developed a dedicated configuration of the ARPEGE model, called the ARPEGE-Southern Hemisphere (ARPEGE-SH) version. Usually, ARPEGE has a rather low resolution over Antarctica (one data point at every 35 km) and a much higher one over France (around 7.5 km distance between each data point). But for this Antarctic experiment, Bazile and his team moved the high-resolution area to Antarctica instead. Five- and ten-day forecasts at 00 and 12 UTC, as

04 Survey on the Use of Antarctic Weather and Climate Information| **For the YOPP-endorsed project "Use of Weather and Climate Information: Risk perception and decision-making in the Antarctic" (**UWCI**), the psychology researcher and weather observer Vicki Heinrich seeks dialogue with people who have been in Antarctica at least for six weeks in the past three years.** In her exploratory study of weather and climate information use and decision-making in Antarctica (see more on the project in the latest *PolarPredictNews* #11, item #20, pages 17-19), Vicki Heinrich who is based at Macquarie Island in the Southern Ocean invites eligible participants to complete a pre-interview questionnaire and conduct an interview with her (via Skype or in person) so she learns how decisions based on weather conditions in Antarctica and the sub-Antarctic are being made, and how people use, think about, and interpret climate and weather information.
The information collected in this survey will help provide evidence-based recommendations for

YOPP YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

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For her YOPPendorsed study, Vicki Heinrich seeks dialogue with Antarctic researchers, weather forecasters and other people involved in operations on the white continent (photo: Peter Hargreaves).

08 / 21

improvements in weather and climate products for the use in Antarctica and inform best practice weather-related decision-making. The outcome of this and following surveys and research within the UWCI study will particularly contribute to the efforts of the Year of Polar Prediction Task Team working on Societal and Economic Research and Applications (PPP-SERA).

The pre-interview questionnaire contains a few general questions about weather-related decisions and information sources that will contribute valuable data to the study from the additional participants. To complete the questionnaire please use this *link*. The full invitation can be found *here*.

Project updates are posted on the *@UWCIAntarctica project Facebook page.*

**f** **Contact:** Vicki Heinrich *vicki.heinrich@bom.gov.au*

05 Winter is Coming – MET Norway Contribution to 'Polar Prediction Matters' | In the new contribution to Polar Prediction Matters – the dialogue platform of providers and users of polar forecast services – Gunnar Noer and Rafael Grote report on recent

advances in forecasting of snow avalanches in mountainous parts of Norway. Norwegian winter sport activities in the mountains have always been closely linked to being aware of avalanche risks. A well-prepared alpine skier thus carries an avalanche transceiver when leaving Tromsø for a cross-country skiing tour in the Lyngen Alps.

In the past few years, the unusually high number of polar lows and long spells of heavy snowfall in northern Norway have led to an increase of winter accidents caused by snow avalanches, report Rafael Grote and Gunnar Noer from the Norwegian Meteorological Institute (MET Norway) in their article published in *Polar Prediction Matters*.

Therefore, MET Norway has recently adjusted their avalanche forecast to international standards. The authors of the article provide information about the Norwegian snow avalanche service VARSOM and explain how decisions about the level of hazard risks are being made and communicated to alert the Norwegian public. Read the full article *here*.

06 Where to Track the Sea Ice | *(by Malena Andernach and Kirstin Werner, Alfred Wegener Institute)* **The website** *seaiceportal.de* **makes**
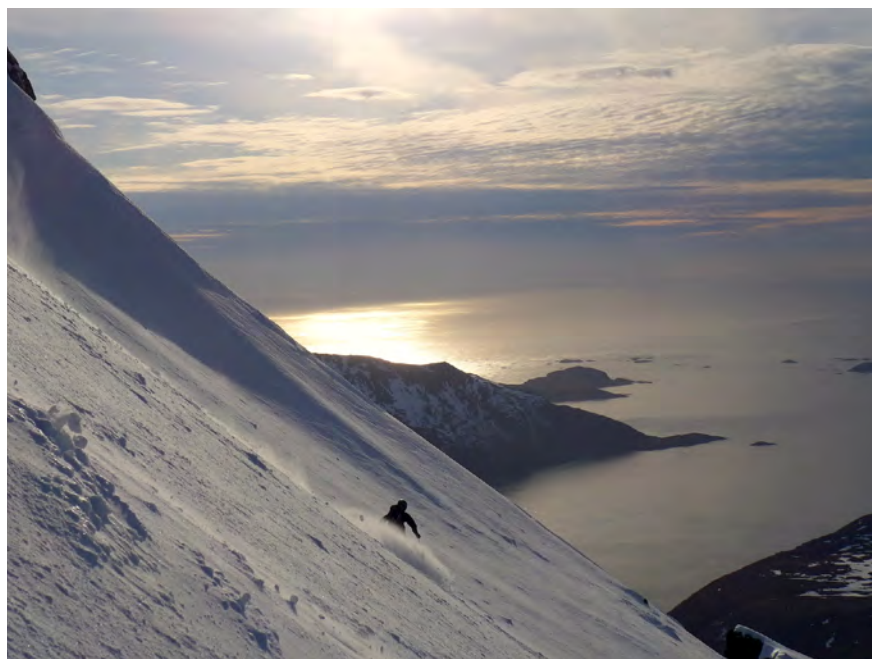
Skiing down the slopes of the "Storstolpan" in Troms. A popular but risky affair (photo: Hannah Vickers).

YOPP
YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

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International Coordination Office (ICO)
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an important contribution to YOPP by providing up-to-date information on Arctic and Antarctic sea-ice changes, including expert knowledge and a cartographic data archive with comprehensive sea-ice information.

Sea-ice concentration of the Arctic on July 24th, 2019. (Source: Seaiceportal.de)
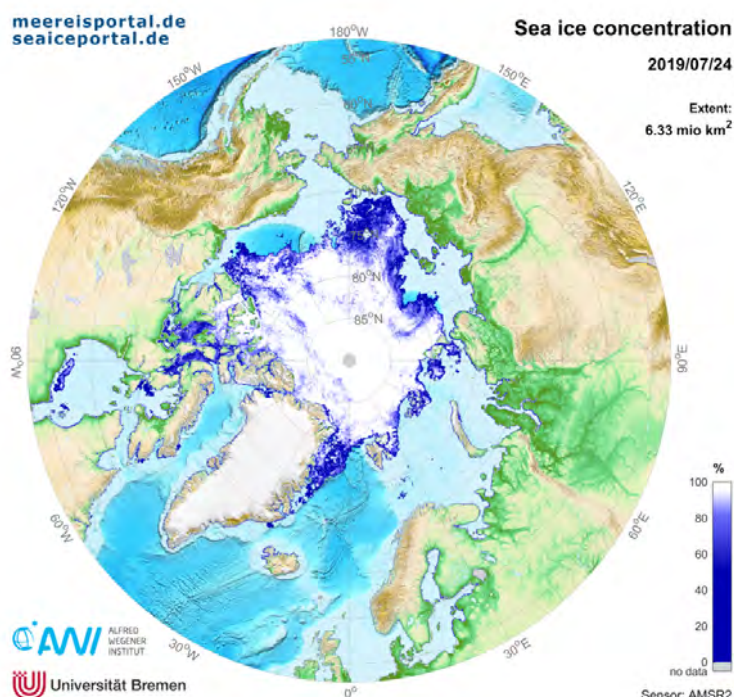
With the aim to share with all levels of society scientific knowledge and data of sea-ice trends in the Arctic and Antarctic, the Institute of Environmental Physics (IUP) at the University of Bremen and the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) launched the information and data portal *www.seaiceportal.de* (German version at *www. meereisportal.de*) in 2013. With its focus on weather and climate in the polar regions and beyond, the portal is also of particular interest for the YOPP community.

The Importance of Sea Ice
The Arctic: A place characterized by cold temperatures with seemingly endless expanses of sea ice providing unique habitats to animals and plants. But such appearances are deceptive. Meanwhile, everyone should have noticed that the Arctic is not in a good state. On the contrary: since a first disastrous record-low in 2007, news after news advise us on another year of Arctic minimum sea-ice extent. By the middle of this year, the Arctic sea ice has retreated to 1.91 million square kilometres below the 1981 to 2010 average.

Seasonal variations as well as long-term changes of sea ice affect the weather and climate of

the polar regions but also have global impacts. As it drives the thermohaline circulation of the Earth and thus the global climate, good knowledge on sea ice is indispensable for climate predictions in mid and lower latitudes but also significantly contribute to improved weather predictions in polar regions, as provided by YOPP.

Questions on Sea Ice and Ice Modelling
Coordinated by AWI colleagues Dr. Renate Treffeisen and Dr. Klaus Grosfeld, the website seaeiceportal.de provides background information on, e.g. the global relevance of sea ice, its trends and fluctuations, interactions with other components of the climatic system as well as on sea ice as a habitat. – What exactly is sea ice? When does it form? And how does the freezing process actually take place? The website provides answers to these and further questions.

In addition, users can learn about sea-ice modelling. Numerical models are used by climate scientists to simulate the changes in sea-ice extent. The models represent the real physical processes in the form of mathematical basic equations and approximation formulas (so-called parametrizations). This allows researchers to reconstruct past presence of sea ice and to make future scenarios. Moreover, sea-ice modelling is crucial for the description of the fundamental interactions of sea ice within the Earth's climate system. Whereas sea ice played only a subordinate role in the widely used General Circulation Models (GCMs) or Earth System Models (ESMs), it is increasingly represented now in newer global models. However, most of the climate models still tend to underestimate the decline in Arctic sea ice. Why? The website also

YOPP
YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

AWI PPP WORLD METEOROLOGICAL ORGANIZATION

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has an explanation to this question.

How to Measure Sea Ice?
Seaiceportal.de also delivers insights into the main monitoring methods of the most important sea-ice variables which are sea-ice cover, its thickness and the thickness of the overlying snow cover as well as sea-ice drift. In the more than one-hundred year history of sea-ice monitoring, the techniques have advanced from observations from ships and coastal stations only to nowadays regular airborne measurements and remote sensing satellites scanning, the latter delivering widely reliable and comprehensive information on sea ice. However, local field experiments such as ice core drilling and even diving under the ice are still conducted to obtain sufficient reference material.

The observational data, e.g. of the monthly sea-ice extent mean and anomalies, are presented in a wide range of maps, charts, and animations on the website. The original data on sea-ice concentration, extent, thickness, drift and on snow depth collected by the University of Bremen by means of several satellite and other sensors can be downloaded for free. Depending on the product, the selectable time period dates back to 2002, and the offered temporal resolution varies from daily to monthly.

Current Location and Daily Life Aboard Polarstern
Finally, *seaiceportal.de* delivers updates on polar expeditions, for example from the German research vessel Polarstern. Website visitors can track her current position on hourly updated maps. In addition, they can get interesting insights into the daily life on board a research icebreaker, e.g. how Christmas is celebrated at sea. During the upcoming Arctic ice drift MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate, see more information also at https://www.mosaic-expedition.org/) aboard Polarstern, seaiceportal.de will provide up-to-date maps showing the current position of the vessel from its start in September 2019 when the research vessel will depart from Tromsø,

Norway to spend the next year drifting through the Arctic Ocean, trapped in sea ice.
Contact: Renate Treffeisen *renate.treffeisen@awi.de*

07 Gerhard Adrian Elected New President of WMO | *(by Malena Andernach, Alfred Wegener Institute)* **The World Meteorological Organization (WMO), whose World Weather Research Programme established the Polar Prediction Project, has a new President: After 19 years of collaboration within various committees and bodies of the World Meteorological Organization (WMO), Prof. Dr. Gerhard Adrian, president of the German Weather Service DWD, was elected President of the WMO.** We congratulate Gerhard Adrian, who has been elected as new WMO President during the 18th World Meteorological Congress held from 3 to 14 June 2019 in Geneva. Gerhard Adrian, who has been leading the German Weather Service for nine years, is the first German President of the World Meteorological Organzation. He succeeds David Grimes, Assistant Deputy Minister and Head of Environment and Climate Change Canada's Meteorological Service, who served WMO two four-year terms. The Argentinian WMO Permanent Representative Celeste Saulo, who has been a strong supporter of YOPP over the years, was elected First Vice-President of WMO. The PPP
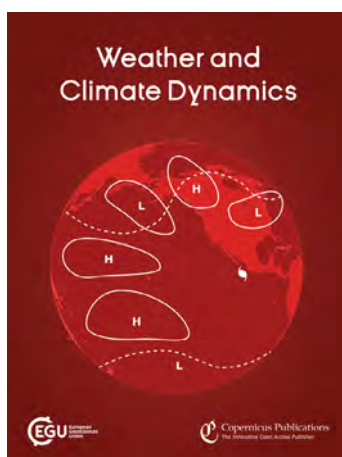

The new WMO president Gerhard Adrian and Thomas Jung, chair of the PPP Steering Group, at the WMO Congress in June 2019 (photo: WMO).

YOPP YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

AWI PPP WORLD METEOROLOGICAL ORGANIZATION

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of the Polar Prediction Project

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Steering Group and International Coordination Office would like to take the opportunity to thank the former WMO President David Grimes for his outstanding support during the planning and implementation of the Year of Polar Prediction.

Towards Improved Global Meteorological Infrastructures

Gerhard Adrian has become Germany's Permanent Representative at WMO in 2010; since 2011 he has also been member of the WMO Executive Council. During the coming four years, Adrian aims to further strengthen WMO through a sustainable strategy plan and efficient governance. He will also be engaged in implementing the current Governance Reform of WMO. Furthermore, he is planning to support enhanced collaboration among the different WMO offices and members, as a contribution to an improved global meteorological infrastructure, including a global exchange of data.

Increase Resilience to Extreme Events

Aim of the recently held World Meteorological Congress was to develop strategies to support the nations' efforts to increase their resilience to extreme weather, water, and climate events. Other goals were to enhance meteorological observations and predictions, and to close capacity gaps by e.g, agreeing on a common future strategy. By the end of Congress, a new WMO strategic plan for the time period from 2020 until 2023 has been presented. It includes the high-level vision and overarching priorities of the future direction of WMO, expressed as long-term goals for 2030 and strategic objectives. Three overarching priorities were introduced; these are to (1) enhance preparedness and to reduce any kind of damage, (2) support climate-smart decision making and (3) enhance the socioeconomic value of WMO services. New governance structures set up at WMO will particularly help to better address major risks and to meet the challenges posed by a changing world.

The new strategic plan of the WMO will have significant influences on WMO with potential implications also for the Polar Prediction Project. The International Coordination Office will provide regular updates.

08 New EGU Journal Weather and Climate Dynamics | **EGU has launched a new open-access journal on "Weather and Climate Dynamics" (WCD).** Published by Copernicus Publications, WCD is an open-access, two-stage journal with open review, following the model of other EGU journals. WCD is dedicated to the publication and public discussion of high-quality research on dynamical processes in the atmosphere. It is accepting submission of research papers in areas such as the dynamics of extreme weather events, interactions of atmospheric flows with cloud physics and/or radiation, links between the atmospheric water cycle and weather systems, storm track and Hadley cell dynamics, the role of atmospheric dynamics in palaeoclimate and climate change projections, and many other aspects of weather and climate dynamics. More information can be found on the WCD journal's *website*.

09 Wearing the Shoes of a Polar Scientist | *(by Lauren Farmer, Polar Citizen Science Collective; Sara Pasqualetto and Kirstin Werner, both Alfred Wegener Institute)* **The** *YOPP-endorsed* **project** *Sea Ice Research Team* **(SIRT) just completed their fifth summer season in the Arctic on board the Russian nuclear icebreaker** *50 let Pobedy***. SIRT is a program of the Polar Citizen Science Collective initiative that facilitates ship-based citizen science programs from start to finish.**

This cruise goes well beyond a classic, polar science expedition. It aims to be a once-in-a-lifetime journey for the tourists on board. The polar expedition leaders Alex Cowan and Lauren Farmer and the meteorologist Karolin Eichler are the SIRT team that facilitates education and engagement during the cruise to make the

YOPP
YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

ANI   PPP   WORLD METEOROLOGICAL ORGANIZATION

International Coordination Office (ICO)
of the Polar Prediction Project

Find more information at
www.polarprediction.net

adventurers aware of the exceptional features of the places they are visiting, but also to inform them about the work scientists and researchers carry out during polar research expeditions. Since 2015, SIRT – in collaboration with the polar cruise operator Poseidon Expeditions – has been collecting sea-ice and atmospheric data during repeated transects from Murmansk, Russia, to the North Pole during summer. The involvement of tourists in the scientific measurements during the ice-breaking cruises, led by trained guides, is a key element of this unusual Arctic undertaking. The tourists' engagement in the expeditions facilitated by the Polar Citizen Science Collective significantly contributes to the outreach activities carried out in the framework of the Year of Polar Prediction.

Fifteen tourists had the privilege this summer to join the citizen-science project aboard the Russian icebreaker 50 let Pobedy *to make sea-ice and meteorological observations at the North Pole (photo: Lauren Farmer).*

Enthusiastic Response

Aboard the *M/V 50 let Pobedy*, up to 15 tourists are given the opportunity to become polar scientists for the duration of the Arctic cruise. Passengers and expedition guides meet several times a day on the captain's bridge or at the top deck to make visual observations of the sea-ice and cloud conditions. Once the vessel reaches the North Pole, the group disembarks to enter the sea ice and to carry out depth profile measurements of melt ponds present on the ice. The response is enthusiastic: "*We are contributing to scientific research at the North Pole – that is something that very few people can say about themselves,*" said one of the cruise participants from the previous

expedition in 2015. During the cruise, the team of Alex Cowan, Lauren Farmer and Karolin Eichler maintained a blog entitled *The North Pole Reporter* to regularly update on the current state of the sea ice – the blog provides a fascinating real-time view of the changing Arctic Ocean.

Unique Finding

The tourist expeditioners are encouraged to share and discuss their observations among the group, while the guides aboard control the measurements and observations to ensure accuracy of the data. A unique observation was made on 24 July at the North Pole, when a white algae-like substance was found in several melt ponds and on the surface of a deteriorating ice layer – something the SIRT team never before observed during their prior 14 visits of the Arctic sea ice. A sample is currently being analyzed by the Shirshov Institute of Oceanology of the Russian Academy of Sciences.

More than sixty meteorological observations for the Voluntary Observing Ship Programme (VOS)

were made during this Arctic summer. Data were sent to the German Weather Service and submitted to the Global Telecommunication System. Depth profiles of melt ponds were measured during two visits of the geographic North Pole, and the team also beta-tested a new app for recording wildlife sightings, currently in development by the *Polar Citizen Science Collective.*

The following data were furthermore collected between 7 July and 10 August 2019 and are currently available through the *ASSIST Data Network*:
•   45 atmospheric observations timed to satellite overpasses of AQUA, TERRA and NPP for NASA's GLOBE Observer Program;
•   53 visual sea-ice observations including thickness, age and degree of melt, available through *Ice Watch*;
•   Aerial photography of sea-ice extent during helicopter sightseeing flights, with GPS track and altitude recorded.
Contact: Lauren Farmer *lauren.e.farmer@gmail.com*

10 Forefront of European Weather Research |
(by Sara Pasqualetto, Alfred Wegener Institute) **The European Meteorological Society (EMS) offered a platform for scientific exchange from 9 to 13 September 2019 in Copenhagen.** Up to six hundred representatives of European excellence in the fields of meteorology and climatology were expected to present results, draw common approaches and forge collaborations at the Annual Meeting of the European Meteorological Society: not only scientists but also businesses, civil society and users contributed to European weather and climate discussions.
A special focus of this year's edition has been the Arctic and Antarctic issues and challenges. Amongst others, colleagues from ECMWF showcased their centre's contribution to advancements in polar forecasting. PPP Steering Group chair Thomas Jung presented recent activities and results from the Polar Prediction world. The Year of Polar Prediction has thus been featured in one of the most important weather and
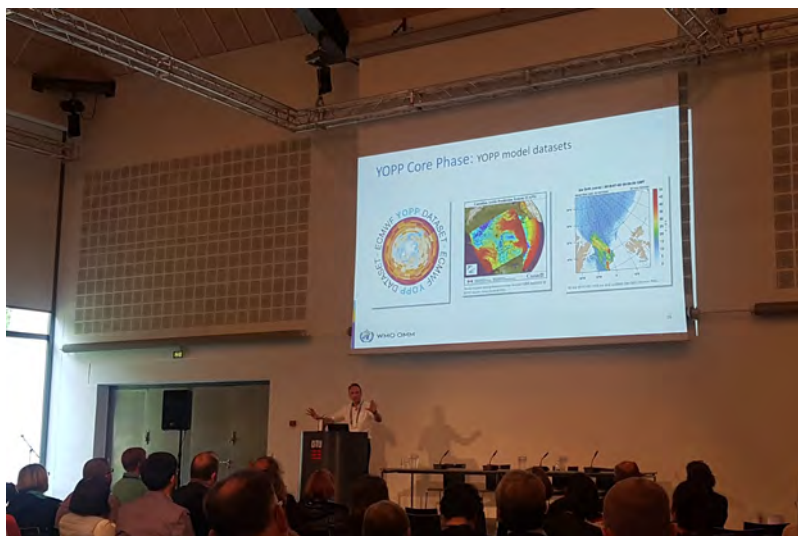
PPP SG chair Thomas Jung gives a strategic lecture at the 2019 Annual Meeting of the European Meteorological Society (photo: Jonathan Day/ECMWF).

climate-related scientific gatherings contributing to the considerations on how to enhance research and activities in the field of polar prediction. See more details at the EMS Annual Meeting *webpage*.

11 Sea Ice at the Interface | *(by Lorenzo Zampieri, Alfred Wegener Institute)* **The city of Winnipeg (Manitoba, Canada) hosted the Sea-Ice Symposium of the International Glaciological Society (IGS) from 19 to 23 August 2019. The Sea-Ice Symposium is a gathering of the scientific sea-ice community that takes place every five years.**

The focus of the 2019 event has been the 'sea ice at the interface' and set a new record for an IGS event (see *IGS website*), with approximately 350 scientists from all around the world taking part in the meeting. Focusing on both polar regions, state-of-the-art sea-ice research has been presented with an interdisciplinary approach. Beside the typical geophysical sea-ice research with observational and modelling approaches, the conference touched themes related to global climate, polar marine ecosystems, globalization, and Indigenous cultures. Specifically, the sessions focused on the implications that changes to sea ice, ice sheets, glaciers, ice shelves and continental runoff have on climate systems within and beyond polar regions, including consequences for environmental and ecological

YOPP
YEAR OF
POLAR
PREDICTION

Newsletter #12 // Sept. 2019

AWI **PPP** WORLD METEOROLOGICAL ORGANIZATION

International Coordination Office (ICO)
of the Polar Prediction Project

Find more information at
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Manitoba, Arctic-Facing Region
Manitoba, as Arctic-facing region, served as perfect setting for the symposium and demonstrated how relevant sea-ice changes can be for a sustainable development of the Arctic economy on different scales. Manitoba's town Churchill represents a good example in this context, being the only Arctic harbor connected to the rest of north America with a train line. The retreat of the Arctic sea ice in the Baffin Bay is opening new opportunities for this settlement – this summer, a cargo ship transporting grain sailed from the Canadian Arctic towards the Mediterranean Sea for the first time. The expansion of human activities in these remote regions should, however, be accompanied by solid and seamless research to reduce the risks associated with the extreme polar environment but also to protect the fragile Arctic ecosystem and to allow local communities to be the first beneficiaries of this development, and not only marginal spectators. All these themes and open questions are well aligned with the mission of the Year of Polar Prediction. The meeting nicely shows how sea ice, and more generally polar research, is proceeding together to address the upcoming challenges.

The next IGS Sea-Ice Symposium will take place in 2022 in the Bremen region (Germany), organized by the Alfred Wegener Institute and the University of Bremen. This event will serve as an excellent occasion to take stock of the upcoming MOSAiC
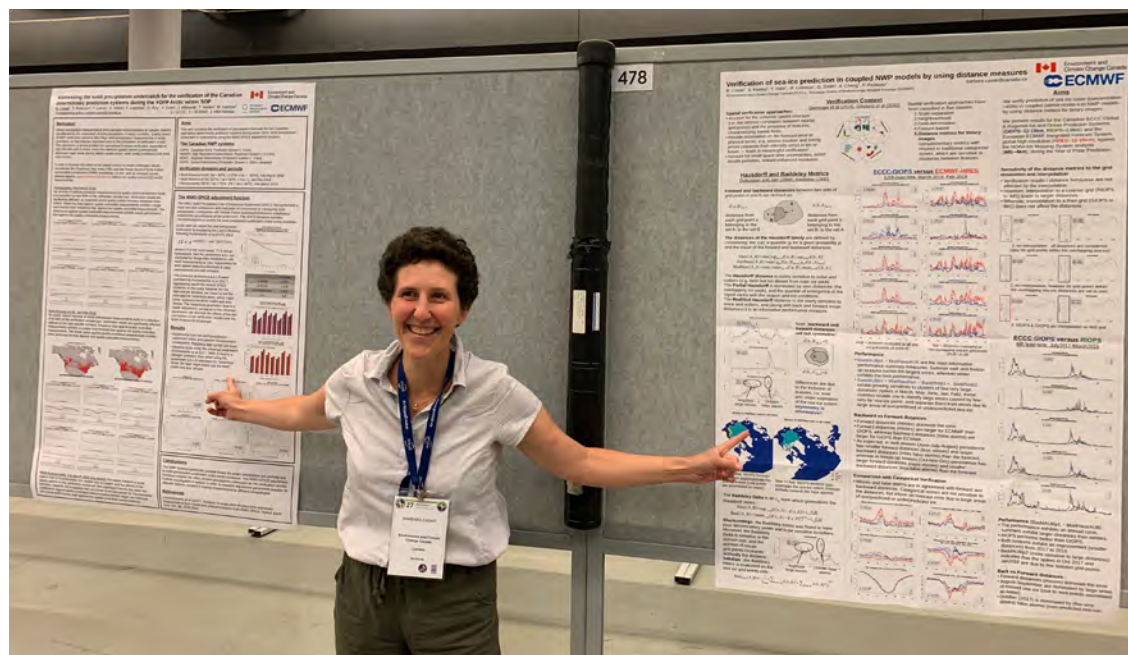
integrity, and socioeconomic development.

Polar bear at the Assiniboine Park Zoo of Winnipeg (Manitoba, Canada). The picture was taken during the visit to the 'Journey to Churchill Northern Species' exhibition organized in the frame of the IGS conference. The polar bears kept in the zoo are young cubs abandoned by their mothers that could not be reintroduced into the wild (photo: Lorenzo Zampieri/Alfred Wegener Institute).

expedition, which is expected to further bring forward our understanding of the sea-ice system and its interaction with the global climate. More information can be found on the workshop website.

12 YOPP Session at 2019 IUGG General Assembly | *(by Barbara Casati, Environment and Climate Change Canada and Taneil Uttal, NOAA Earth Systems Research Laboratory)* **First Results from the Year of Polar Prediction (YOPP) at the 2019 International Union of Geodesy and Geophysics (IUGG) General Assembly.**

The International Union of Geodesy and Geophysics (IUGG) General Assembly took place in Montréal, Canada, from 8 to 18 July 2019. Several scientific sessions and joint symposia were organized by the nine IUGG associations, including the *International Association of Cryospheric Science* (IACS) and the *International Association of Meteorology and Atmospheric Science* (IAMAS). Three polar-related sessions took place: Past and Future Changes in Polar

YOPP YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

International Coordination Office (ICO)
of the Polar Prediction Project

WORLD METEOROLOGICAL ORGANIZATION

Find more information at
www.polarprediction.net

PPP Steering Group member Barbara Casati was one of the many presenters at the YOPP session at the 2019 IUGG General Assembly in Montréal, Canada (photo: Éva Mekis/ECCC).

YOPP contribution to polar science. Links to the three tracks of the YOPP session are:

Saturday, July 13th, 08:30 - 10:00
Saturday, July 13th, 13:30 - 15:00
Saturday, July 13th, 16:30 - 18:00

13 Fourth YOPP in the Southern Hemisphere meeting | **The fourth meeting of the Year of Polar Prediction Task Team active**

Climate System and their global Linkages; The Arctic in the 21st Century: a Hotbed of Global Changes; and First Results from the Year of Polar Prediction (YOPP). The latter showcased several contributions gravitating on monitoring, prediction and verification efforts during YOPP including presentations describing the YOPP Supersite Model Intercomparison (YOPPsiteMIP), and preliminary results for the Canadian site of Iqaluit, the Finnish site Sodankylä, and for the Antarctic sites Dumont D'Urville and Dome C/Concordia. The Canadian Arctic Prediction System (CAPS) developed specifically for YOPP by Environment and Climate Change Canada was also presented, along with verification results comparing the Canadian numerical weather prediction systems during the YOPP Special Observing Periods. Post-processing data and different forecast products based on YOPP datasets for Arctic sea-ice and blizzard warnings were also discussed. One track of the YOPP Session was dedicated to the Southern Hemisphere and featured the significant contribution of Météo France with the AROME Numerical Experiments over the Antarctic (see item **#03**), and several studies on measurements and validation of the microphysic structure of clouds and precipitation, as well as the atmospheric boundary layer. The session was overall quite successful and mirrored the strong

in the Southern Hemisphere (YOPP-SH) took place from 27 to 28 June 2019 in Charleston, South Carolina, USA. As in previous years, it was preceded by the annual Workshop on Antarctic Meteorology and Climate (WAMC, see more here), this year organized by NAVWAR, the Naval Information Warfare Systems Command.

The meeting aimed at bringing together all parties involved in Antarctic meteorology and the advancement of this discipline through scientific research and improving operational support during YOPP. In particular, the efforts in extra observations made during the YOPP-SH Special Observing Period (SOP-SH1) from 16 November 2018 to 15 February 2019 were reported during this meeting. In total, almost 2,100 extra radiosondes have been launched during the three austral summer months from 24 stations and research vessels by 13 nations involved. The high-resolution radiosonde data was collected by the British Antarctic Survey that hosts the publicly available ftp server *ftp://ftp.bas.ac.uk/src/YOPP-SH/radiosondes*. An overview on the radio soundings on the GTS during SOP1 was made available by NCAR *http://www2.mmm.ucar.edu/rt/amps/information/YOPP_SH_SOP_raob_accounting.html*.

YOPP
YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

AWI PPP WORLD METEOROLOGICAL ORGANIZATION

International Coordination Office (ICO)
of the Polar Prediction Project

Find more information at
www.polarprediction.net

The YOPP in the Southern Hemisphere meeting took place on 27 and 28 June in Charleston, SC, USA (photo: NAVWAR).

Modelling and Verification for YOPP-SH

Updates on various modelling, verification, and Observing System Experiments (OSE) efforts for YOPP-SH were presented at the meeting. Several nations have contributed real-time numerical weather prediction output during YOPP-SH SOP1. Météo France now provides high-resolution weather forecasts for Antarctica for YOPP-SH SOP1 available from the ftp server *ftp://ftp.umr-cnrm.fr* (user: yopp/password: Arpege, see further details at *#03*). Results from the SIPN South effort were presented, as well as an update from the YOPPSiteMIP group. These activities show a strong engagement by the YOPP-SH community and will be continued during the YOPP Consolidation Phase, which is the final phase of YOPP lasting until end of 2022.

Winter Observations

During the meeting, it was agreed to hold a second Southern Hemisphere Special Observing Period (SOP-SH2) during Antarctic winter. In order to cover the sea-ice growth in early winter, the intent is to schedule it between mid-April to mid-July 2021. The ocean community will need to become involved with this.

Impact of YOPP on Society

In order to estimate the impact of YOPP, the Societal and Economic Research and Applications group of YOPP (PPP-SERA) is active in stakeholder engagement collecting requirements of Antarctic

operators using weather and sea-ice forecasts for their decision-making. A Weather and Society workshop will be organized in 2020 aligned with the SCAR meetings in Hobart, Tasmania. Also, it was suggested to hold a Special Service Period

during austral summer 2020/2021 when research investments could be assessed in regard of their benefits for safety in operations.

Training Project

The Italian CAPIRE-YOPP schools project contributed significantly to the educational and outreach efforts of the Antarctic Special Observing Period. Almost four hundred students have monitored for more than six months the activities carried out at the Italian-French Antarctic station Concordia and to some extent have worked with the data from there.

The agenda, the presentations and the meeting report can be found *here*.

14 PAMIP – Investigate Causes and Consequences of Polar Amplification | (by Tido Semmler, Alfred Wegener Institute) **From 24 to 27 June 2019, almost forty invited participants met in the surroundings of Exeter, United Kingdom to discuss first results of the Polar Amplification Model Intercomparison Project (PAMIP).** A coordinated modelling effort is a must-have to assess how mid-latitude weather and climate are affected by the ongoing rapid changes in the polar regions. The Polar Amplification Model Intercomparison Project (PAMIP) investigates the causes and global consequences of polar amplification, through the creation and analysis of an unprecedented set of coordinated model experiments. From 24 to 27 June 2019, almost forty representatives of various modelling centers worldwide met in the vicitiy to Exeter, United Kingdom, to present early results from PAMIP and related modelling activities, and to strengthen collaboration between PAMIP

Participants of the PAMIP workshop in the surroundings of Exeter, UK (photo: Jinro Ukita, Niigata University, Japan).

contributors. The [YOPP-endorsed] European Horizon2020 project [APPLICATE] is one of the leading projects contributing to this effort.

As a result of the workshop, a common work plan has been established to efficiently organize the evaluation of the results. A series of papers will be submitted to peer-reviewed journals till the end of the year, which is the deadline for consideration of the results in the sixth assessment report of the Intergovernmental Panel on Climate Change (IPCC). Presentations from the workshop can be found [here].
Contact: Doug M. Smith [doug.smith@metoffice.gov.uk]

15 Ninth International Workshop on Sea-Ice Modelling, Data Assimilation and Verification | *(by Lorenzo Zampieri and Sara Pasqualetto, Alfred Wegener Institute)* **More than sixty scientists attended the ninth International Workshop on Sea-Ice Modelling, Data Assimilation and Verification (IICWG-DA) from 17 to 19 June in Bremen, Germany. IICWG-DA is a joint initiative of the International Ice Charting Working Group (IICWG), the Year of Polar Prediction, GODAE Oceanview (GOV), and the Coordination & Support**

Action KEPLER by the European Commission. The meeting in Bremen was part of a series of workshops organized by the IICWG Data Assimilation Working Group to discuss cross-cutting issues in sea-ice modelling, observations and data assimilation and how deficiencies of current systems can be more efficiently diagnosed and addressed.

'Diversity' and 'sharing' are probably the words that express the success of the IICWG-DA initiative. The meeting represented a friendly and inclusive forum for scientists from three different continents (America, Europe and Asia) with different backgrounds and working approaches. The synergies between the modelling and observational communities, as well as the collaboration between research institutions, numerical weather prediction centers and national agencies generated a

From 17 to 19 June 2019, the IICWG-Data Assimilation workshop took place in Bremen, Germany (photo: David Sel/SJS).

YOPP
YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

AWI PPP WORLD METEOROLOGICAL ORGANIZATION

International Coordination Office (ICO)
of the Polar Prediction Project

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Markus Rex from the Alfred Wegener Institute leads MOSAIC as the chief scientist (Photo: Alfred Wegener Institute).

constructive discussion that set the bar for further developments in the field of sea-ice prediction.

The workshop certified the tendency of assimilating more and more sea-ice observational products, together with their uncertainties in our sea-ice prediction models. Sea-ice thickness and freeboard measurement are now considered the new standard for data assimilation, and the sophistication of the assimilation techniques themselves has grown substantially in recent years. Interestingly, the resolution increase of the models has brought the community towards the employment of high-resolution observational products (e.g., SAR and MODIS images), while the fact that our models can now explicitly resolve linear kinematic features such as ice leads and ridges is currently boosting the research on new sea-ice rheologies for a better agreement of the model results with observations.

Presentations and posters of the IICWG-DA workshop can be downloaded from the *workshop website*.

16 YOPP-endorsed! – Multidisciplinary drifting Observatory for the Study of Arctic Climate MOSAiC | YOPP endorsement is available for projects, programmes and initiatives but also for institutions and operational centers that contribute to making the Year of Polar Prediction successful. More than eighty projects, programmes and initiatives already received project endorsement from YOPP.

The YOPP-endorsed **Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC)** expedition starts this fall when Polarstern leaves for the central Arctic to drift an entire year with the sea ice. MOSAiC has played a key role for the Polar Prediction Project from the early start of MOSAiC planning. The unique comprehensive data sets which are expected from this huge overwintering field campaign will substantially contribute to improving polar predictive capabilities. We spoke with Markus Rex from the Alfred Wegener Institute who leads the expedition.

Prof. Rex, as the expedition head of this unique Arctic ice drift experiment – how does your current daily work look like?
It's busy and any day is different! We still have to deal with lots of things that need to be in place before we will leave Tromsø on 20th September. And I have to do all my teaching and hold many exams for the University before I leave for such a long time.

From a scale from 0 to 10, how excited are you, and what is it that keeps you awake at night the most just few weeks before the start of MOSAiC?
15! I am really looking forward to get started now. Fortunately I have a very robust sleep and it's not easy to keep me awake during night. But of course we need to make sure everyone of the overall about six hundred people that we will have in the field during the expedition returns safely and that is

YOPP YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

AWI PPP WORLD METEOROLOGICAL ORGANIZATION

International Coordination Office (ICO)
of the Polar Prediction Project

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what concerns me most besides organizing the great science, that we will be able to do.

Which legs will you yourself be on board Polarstern? *I will be on board for about seven months during legs 1 (three months), 4 (two months), and 6 (two months). Including the travel time on the partner icebreakers I will be away for almost nine months.*

What will be your duty when being on board?
While on board I will organize the daily routine, making sure everybody is safe during the daily work on the dynamic sea-ice surface and making sure all groups have their equal and fair share of the vessel's resources.

So partly you will also coordinate MOSAiC from your office at the Alfred Wegener Institute Potsdam. How will this look alike?
While I am not on board I will stay in very close communication with the team on board.

When do you consider MOSAiC a successful campaign?
When all return safely and we reach our scientific goals!

What is most challenging for the MOSAiC expedition but also for you as the leader of the campaign?
The logistics of this massive endeavour! We need to operate, support and resupply a modern research ice breaker frozen into the Central Arctic sea ice for more than a year. This has never been done before.

Besides the challenging logistics, the interdisciplinarity of the team is a real highlight of MOSAiC. But it also is a challenge. The different scientific communities had to learn to communicate with each other efficiently - a fascinating process, which at time was not easy but overall was a tremendous success already now.

How does MOSAiC contribute to the goals of the Year of Polar Prediction? What are the benefits of MOSAiC to be linked to YOPP?
Both projects strive to better understand the Arctic climate system – YOPP with a focus on weather

During the recent YOPP Southern Hemisphere Special Observing Period, Markus Rex launched radiosondes from RV Polarstern – here with New Years wishes (Photo: Alfred Wegener Institute).

forecast and MOSAiC with a focus on climate processes and their representation in global climate models. But there is no clear distinction between these areas and both projects benefit from each other immensely.

How many nations and partners are involved with MOSAiC? Who is supporting MOSAiC in respect of financial resources?
We have about seventy institutional partners from 19 countries. All contribute to the funding of MOSAiC and 17 nations have persons on board and directly contribute to the logistical costs of the expedition. About half of the overall resources come from Germany's Ministry for Education and Research (BMBF) mostly via the Helmholtz Association.

Will something have changed for you personally in a year from now?
Likely… a long expedition always enriches the life of everybody who was part of it and has a lasting effect. I still have good friends who I met on my first three-months long Antarctic expedition back in 1994. But ask me again, in one year from now!

How can the polar prediction community follow MOSAiC over the year?
Check out our Website at https://www.mosaic-expedition.org, our Progressive Web App with daily updates at https://follow.mosaic-expedition.org or follow us on Instagram or Twitter. There are plenty of options to stay connected to MOSAiC!

New Publications

17 What Determines the Choice of a Route Over Another for Aircraft Crossing the Arctic?

| As a frequent traveler on the United Airlines flight 895 from Chicago to Hong Kong, one would notice that the plane eventually is crossing the Arctic region. It is common practice for intercontinental flights coming from North America to reach their destination in Asia via the Arctic, and notably through the Atlantic, the central Arctic and finally the Pacific. This article analyses the correlation between flight routes and the upper atmospheric flow over the Arctic Ocean, particularly its location, strength and seasonal variability. An increase in the frequency of Alaskan blocking during winter is correlated with a decrease of sea ice in the Bering Sea, thus making the case for an application of sea-ice extent predictions to support the planning and performance of aircraft operations in the Arctic. During the summer season, airplanes are usually able to seize strong tail winds in the northern parts of Greenland and Barents Seas, due to blockings in these regions, and often opt for the route following the Atlantic and the Pacific to not incur into strong head winds.

Sato, K., Inoue, J. 2019. *Relationship between transpolar flights over the Arctic and the upper atmospheric circulation*. Okhotsk Sea and Polar Oceans Research, 3, 1-6.

18 An NWP Model Intercomparison of Surface Weather Parameters in the European Arctic during the YOPP Special Observing Period Northern Hemisphere 1

| This paper illustrates first results from the Arctic winter Special Observing Periods carried out during the Year of Polar Prediction. Motivated by the need for accurate and reliable weather predictions due to enhanced human activity in the Arctic, this study compares the capabilities of four operational and/or high-resolution models to forecast weather conditions in the Arctic during winter. Authors discuss the impact of observation errors and representativeness on the verification. While the forecasts differ in their spatial details, forecast accuracy varies with region, parameter, lead time, weather, and forecast system. Several common model deficiencies are found, such as forecasting temperature during cloud-free, calm weather, a cold bias in windy conditions, or the distinction between freezing and melting conditions. While there are certainly advantages by using high-resolution models, e.g. their accuracy in specific variables, a faster error growth occurs in these forecast systems, the study also shows that observation errors and representativeness can account for a substantial part of the difference between forecast and observations in standard verification.

Køltzow, M., Casati, B., Bazile, E., Haiden, T., Valkonen, T. 2019: An NWP Model Intercomparison of Surface Weather Parameters in the European Arctic during the Year of Polar Prediction Special Observing Period Northern Hemisphere 1. Weather and Forecasting, 34, 959-983. *https://doi.org/10.1175/WAF-D-19-0003.1*

19 Polar Ocean Observations: A Critical Gap in the Observing System

| This community-led review paper outlines the status of existing near-real time ocean observational efforts in polar regions, discusses gaps, and explores perspectives for the future of operational oceanographic predictions in both the Arctic and Antarctic polar regions. With the declining ice cover accompanied by an increase in maritime traffic and exploitation of marine resources, a significant gap becomes apparent in the ocean observing system in polar regions, hindering the reliability of ocean and sea-ice forecasts. Specific recommendations of the authors include open access to data as a critical capability for improved sea-ice and weather forecasting. Dedicated efforts are also needed to make use of additional observations made as part of YOPP to inform optimal observing system design.

Smith, G.C., Allard, R., Babin, M., Bertino, L.,Chevallier, M. et al. 2019: Polar Ocean Observations: A Critical Gap in the Observing System and its Effect on Environmental Predictions from Hours to a Season. Front. Mar. Sci. 6, 1–28. *https://doi.org/10.3389/fmars.2019.00429*

YOPP YEAR OF POLAR PREDICTION

Newsletter #12 // Sept. 2019

AWI PPP WORLD METEOROLOGICAL ORGANIZATION

International Coordination Office (ICO)
of the Polar Prediction Project

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20 Upcoming Events

16-20 September 2019
Ocean Obs'19
Honululu, Hawaii, United States

19 September 2019
Start of APECS-APPLICATE-YOPP Online Course
Home Computer ;-)

23-27 September 2019
IICWG Annual Meeting
Copenhagen, Denmark

1-4 October 2019
WMO WWRP Scientific Steering Committee
Geneva, Switzerland

3-5 October 2019
IX Chilean Congress on Antarctic Research
Olmué, Chile

7-9 October 2019
Workshop for the Antarctic Regional Climate Centre (RCC)
Bologna, Italy

10-13 October 2019
Arctic Circle Assembly
Reykjavik, Iceland

18-22 November 2019
3rd Polar Data Forum
Helsinki, Finland

25 November 2019
Arctic Future Symposium
Brussels, Belgium

26-27 November 2019
Arctic Earth System Modelling Workshop
Reykjavik, Iceland

4-5 December 2019
Arctic Shipping Summit
Hamburg, Germany

9-10 December 2019
7th WMO Workshop on the Impact of Various Observing Systems on NWP
Geneva, Switzerland

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 November/December 2019.

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