The WWRP Polar Prediction Project
(2013-2022)

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Chair of the WWRP Polar Prediction Project
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Arctic Climate Change

Average Monthly Arctic Sea Ice Extent
September 1979 - 2013

Extent (million square kilometers)

Year

National Snow and Ice Data Center
Opportunities and Risks

Some statements from the report:

- The Arctic is likely to attract substantial investment over the coming decade ($100 bn)
- The environmental consequences of disasters in the Arctic are likely to be worse than in other regions
- Significant knowledge gaps across the Arctic need to be closed urgently
PPP Mission Statement

Promote cooperative international research enabling development of improved weather and environmental prediction services for the polar regions, on time scales from hourly to seasonal

An important addition: PPP constitutes the hourly to seasonal research component of the Global Integrated Polar Prediction System (GIPPS)
The WWRP-PPP Steering Group

- Thomas Jung (chair)
- Peter Bauer
- David Bromwich
- Paco Doblas-Reyes
- Chris Fairall
- Marika Holland
- Trond Iversen
- Brian Mills
- Pertti Nurmi
- Don Perovich
- Phil Reid
- Ian Renfrew
- Gregory Smith
- Gunilla Svensson
- Mikhail Tolstykh
- Jonny Day
Research Areas

Service-oriented Research
- User Applications and Societal Benefits
- Verification

Forecasting System Research
- Observations
- Modelling
- Data Assimilation
- Ensemble Forecasting

Underpinning Research
- Predictability and Diagnostics
- Global Linkages

Source: PPP Implementation Plan
Observations: Data Coverage

Polar data coverage of conventional observations in the ECMWF operational analysis on 1 January 2012

Synop, AIREP, DRIBU, TEMP and PILOT

P. Bauer (ECMWF)
The Russian ship MV Akademik Shokalskiy is trapped in thick Antarctic ice 1,500 nautical miles south of Hobart, Australia, Friday, Dec. 27, 2013.

Photo: Andrew Peacock/www.footloosefotography.com
Sea ice prediction

“Finally the wind has turned and a crack in the ice has developed which allows us to move slowly northward.” (Captain of the Akademik Shokalskiy)

MITgcm @ 4km resolution, Simulation described in Nguyen et al (2012) and Rignot et al. (2012)
Role of the polar regions for global NWP

Jung et al. (2014), GRL
Year of Polar Prediction (YOPP)

Goal:
„Enable significant improvement in environmental prediction capabilities for the polar regions and beyond, by coordinating a period of intensive observing, modelling, prediction, verification, user engagement and education activities.“
Preparation Phase 2013 to mid-2017

- Community engagement
- Align with other planned activities
- Develop implementation plan
- Preparatory research
- Summer school Workshops
- Liaise with funders

YOPP mid-2017 to mid-2019

- Intensive observing periods
- Dedicated model experiments
- Research into use & value of forecasts
- Intensive verification effort
- Summer school

Consolidation Phase mid-2019 to 2022

- Data denial experiments
- Model developments
- Dedicated reanalyses
- Operational implementation
- Operational implementation
- YOPP publications
- YOPP conference
The YOPP-Observational Component

- **Purpose:** Comprehensive observational „snapshot“ for
  - Improved initial conditions
  - Model development
  - Forecast verification

- **Selected Elements**
  - Mobile systems (buoys, ships etc.)
  - Extra observations from existing sites
  - Supersites ➔ model grid box (e.g., MOSAiC and SIOS)
  - Satellite snapshots
  - Special campaigns (aircraft etc.)
  - User relevant data ➔ verification
  - Data availability (GTS, data sharing)
The YOPP-Modelling Component

- **Purpose**
  - Improved coupled models

- **Selected Elements**
  - Operational forecasts with special archiving
  - Multi-model sea ice ensemble (TIGGE forcing)
  - Sub-seasonal and seasonal experiments (case studies, extra starting dates, special archiving)
  - Frontier experiments (e.g. high-resolution modelling)
  - Align Transpose-CMIP with YOPP
Polar Prediction

POLAR PREDICTION

There has been a growing interest in the polar regions in recent years, fuelled by concerns about amplification of anthropogenic climate change. Furthermore, increased economic and transportation activities in polar regions are leading to more demands for sustained and improved availability of integrated observational and predictive weather, climate and water information to support decision-making, on all time scales.


Delivering GIPPS will require research to improve process understanding (e.g. polar clouds, sea ice/ocean dynamics, permafrost and ice sheet dynamics), enhance our understanding of polar-lower latitude linkages, optimize the polar observing system, develop data assimilation systems, enhance modelling systems and advance ensemble prediction components to improve predictions across a wide range of time scales.

Two closely related initiatives are underway that aim to contribute to GIPPS:

- The World Weather Research Programme (WWRP) of WMO has established the Polar Prediction Project (PPP), whose mission is to “Promote cooperative international research enabling development of improved weather and environmental prediction services for the polar regions, on time scales from hours to seasonal.”
- The World Climate Research Programme (WCRP) has established the Polar Climate Predictability Initiative (PCPI) which contributes to the development of GIPPS on time scales of a season or beyond.

The International Coordination Office (ICO), hosted by the Alfred Wegener Institute Helmholtz-Centre for Polar and Marine Research, supports the implementation of PPP and ensures coordination with PCPI and other related activities with the aim to advance polar prediction capabilities.

http://polarprediction.net
YOPP Implementation Plan to be released soon!
**Summary**

- Polar prediction is a hot topic!
- Joint effort of weather and climate research community
- Enthusiastic community (ensure coordination)
- Sound plans for PPP are in place
- There is very good support for running PPP (WMO Trust Fund, ICO)
- There has been already significant progress
- PPP/YOPP has gained high visibility
THE WORLD WEATHER OPEN SCIENCE CONFERENCE

The weather: what's the outlook?
16 to 21 August 2014

WELCOME

WWOSC 2014
MONTRÉAL, CANADA

CONFÉRENCE SCIENTIFIQUE PUBLIQUE MONDIALE SUR
LA MÉTÉOROLOGIE

La météo : quel avenir?
16 au 21 août 2014

BIENVENUE

Co-organized by / Co-organisée par:

WMO OMM
ICSU
International Council for Science

Environment Canada

National Research Council Canada
Conseil national de recherches Canada
Tropical vs Arctic Atmosphere

- ECMWF model
- 6-hourly initial tendencies
- 120 forecasts (DJF 1989-2010)

Serrar (AWI)
Tropical vs Arctic Atmosphere

Tropical Ocean

Arctic Ocean

Serrar (AWI)
A hole over the Arctic

Polar data coverage of conventional observations in the ECMWF operational analysis on 1 January 2012

P. Bauer (ECMWF)
Forecast verification

Skill comparison of TIGGE medium-range ensemble forecasts
Z500 control run (OCT2006–NOV2013)

Jung and Matsueda, PPP special Issue in QJ
The Role of Sea Ice in Weather Prediction

T2m Difference: Observed Minus Persisted Sea Ice

P. Bauer (ECMWF)
Data assimilation in high latitudes

Annual difference in the number of cyclones: ASR vs ERA-Interim

Tilinina et al. (2014), GRL
Forecast verification

Bauer et al., PPP special Issue in QJ