

PPP

The Polar Prediction Project and the Year of Polar Prediction

Helge Goessling (AWI; Coord. Office Director)
on behalf of the PPP steering group and Coord. Office

10th AMOMF Workshop, SPRI, Cambridge, 17-19 June 2015

Photo: G. Dieckmann, AWI

WWRP

WMO
OMM

PPP

PPP mission statement

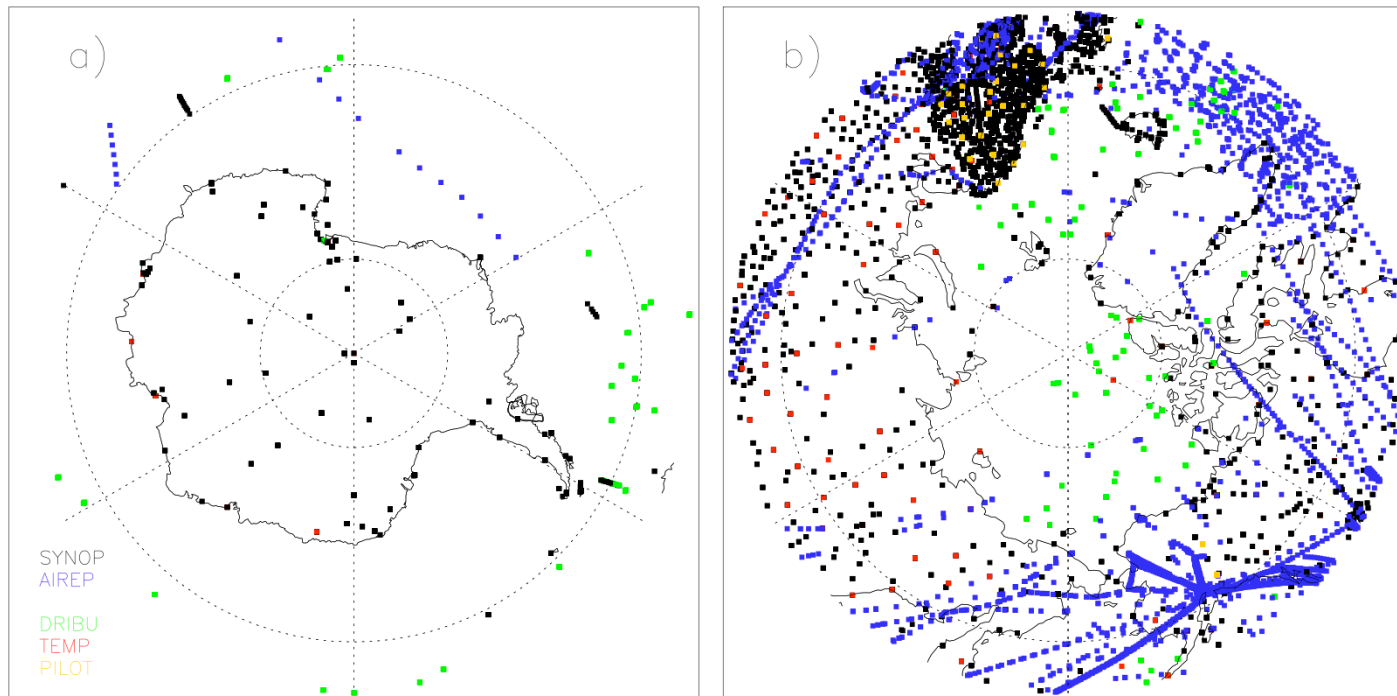
Promote cooperative international research enabling development of improved weather and environmental prediction services for the polar regions, on time scales from hourly to seasonal

WWRP

WMO
OMM

Why?

1. Significant gaps in the polar observing systems



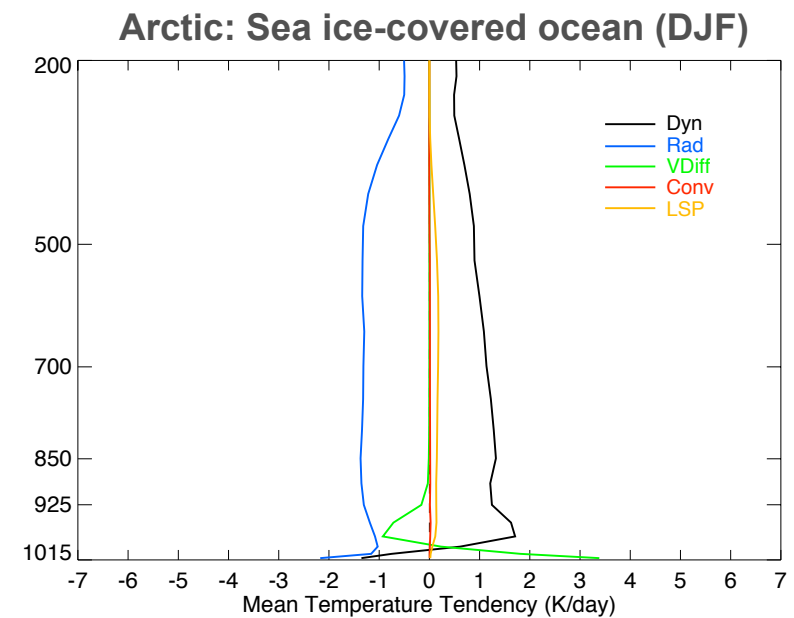
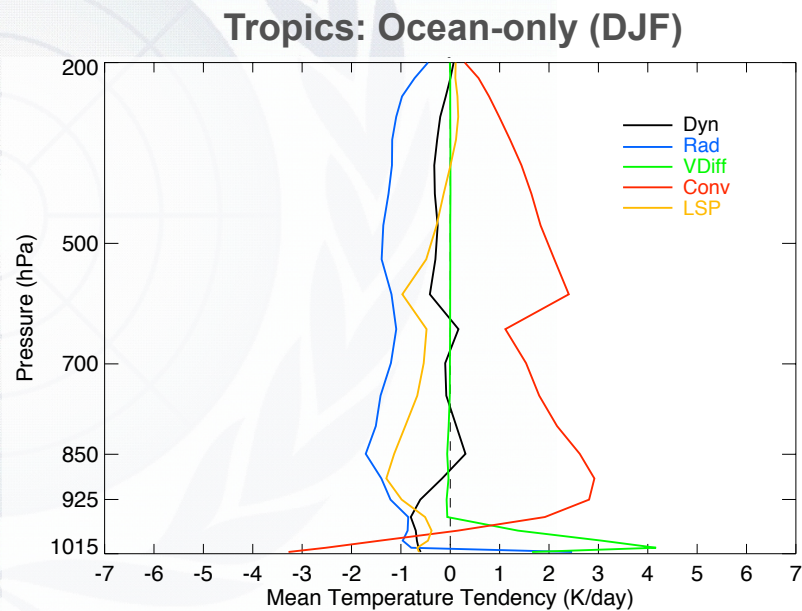
Synop, **AIREP**, **DRIBU**, **TEMP** and **PILOT**

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

P. Bauer (ECMWF)

Why?

2. Emphasis of previous international efforts on lower latitudes

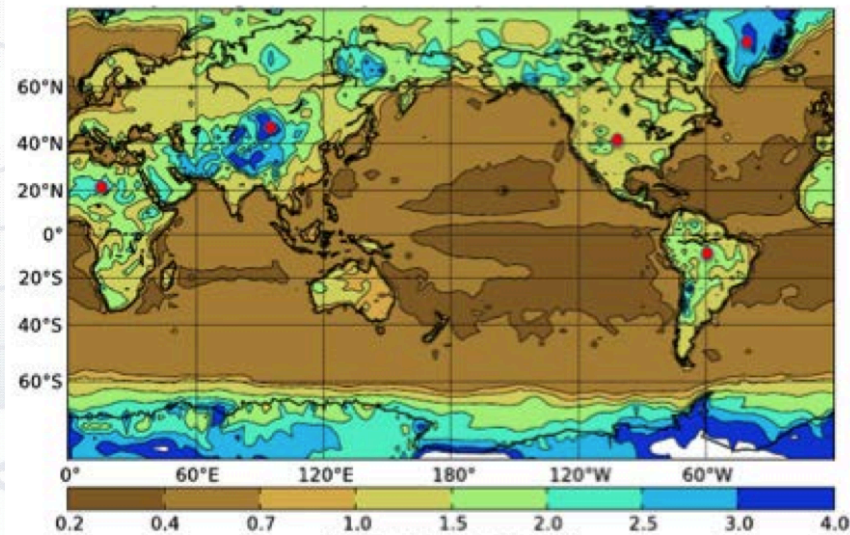


Why?

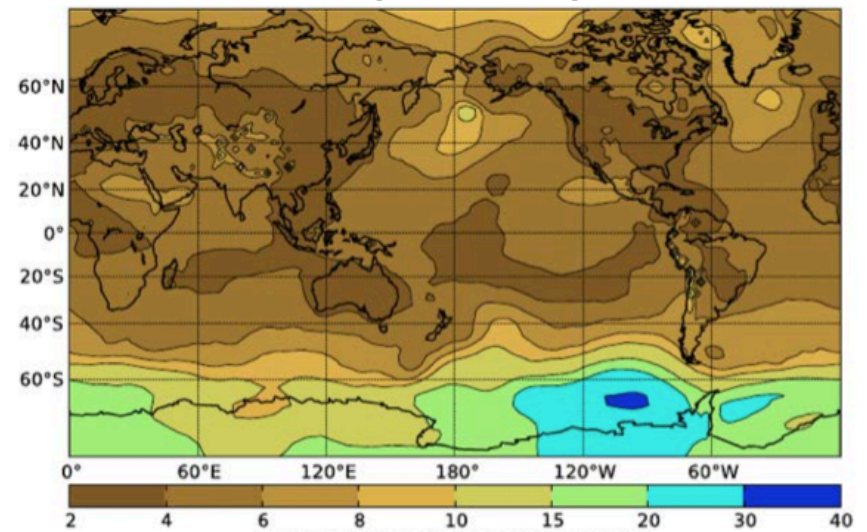
1. & 2. result in deficient forecasts

TIGGE* analysis spread (Oct-Nov 2010)

2-meter temperature (K)



500hPa geop. height (m)



* UKMO, ECMWF, NCEP, CMC, CMA

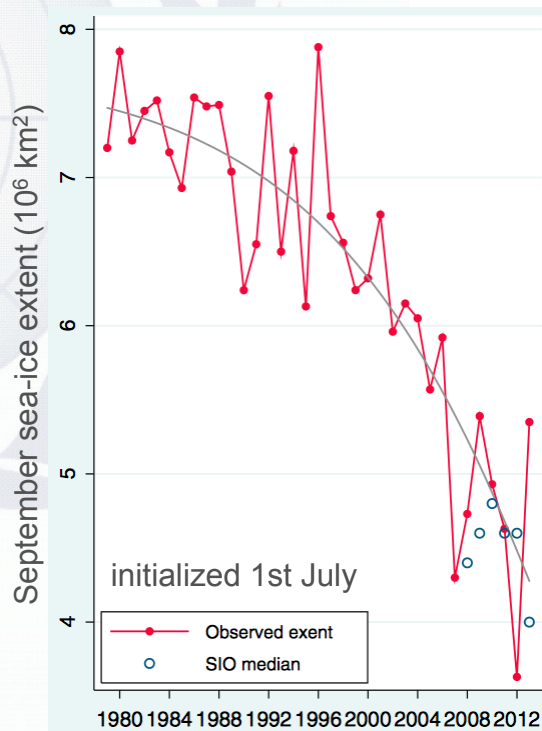
Hamill 2012, (pers. comm.)

Why?

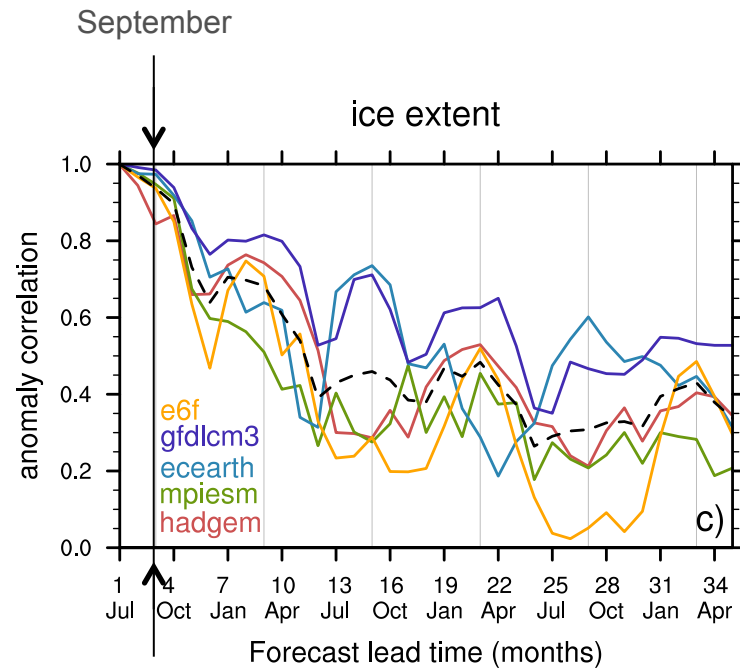
1. & 2. result in deficient forecasts

Potential versus realized seasonal sea-ice forecasting skill

SIPN Sea Ice Outlook



Stroeve et al. 2014



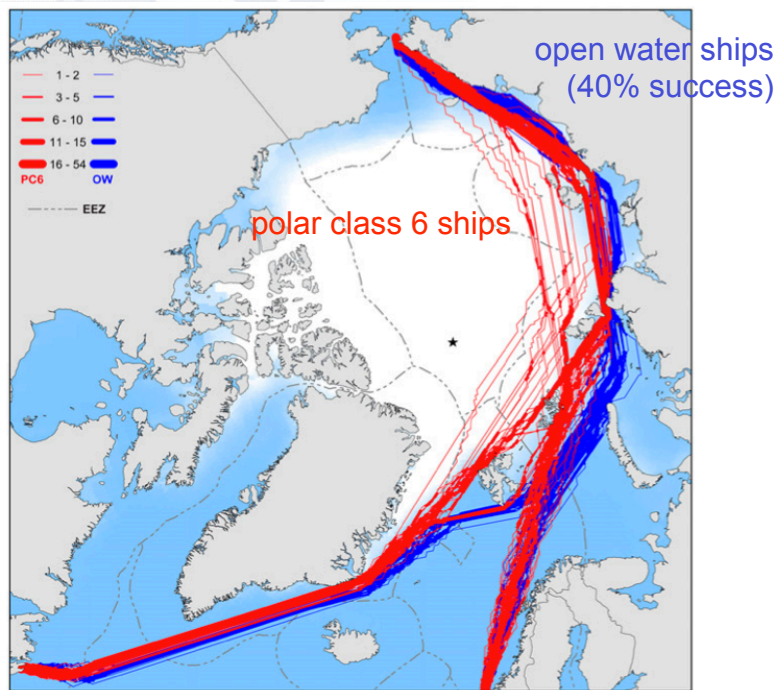
Tietsche et al. 2014 (modified)

Why?

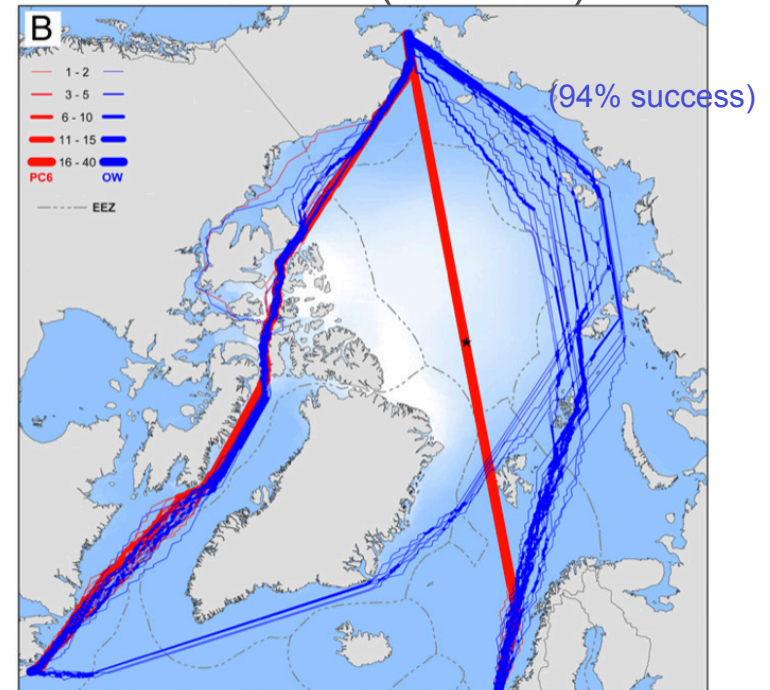
3. Arctic opening

Optimal Arctic shipping routes

1979-2005



2040-2059 (RCP 4.5)



Smith and Stephenson (2013)

Why?

3. Arctic opening

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

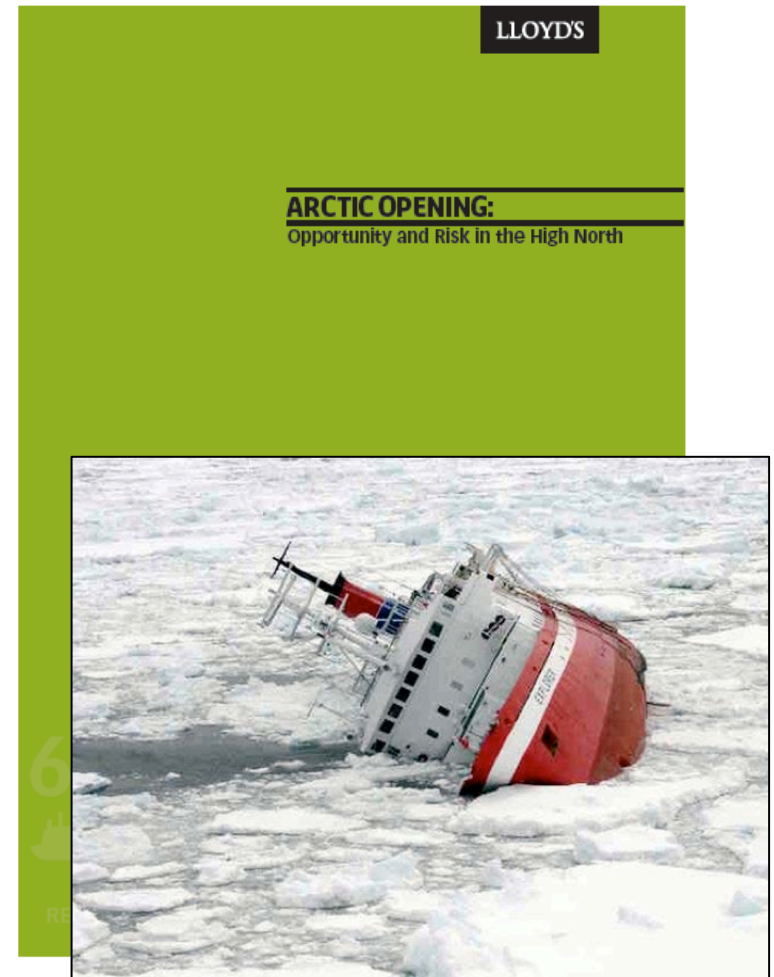


Photo by Chilean Navy/Reuters

Why?

4. Antarctic Logistics and Safety

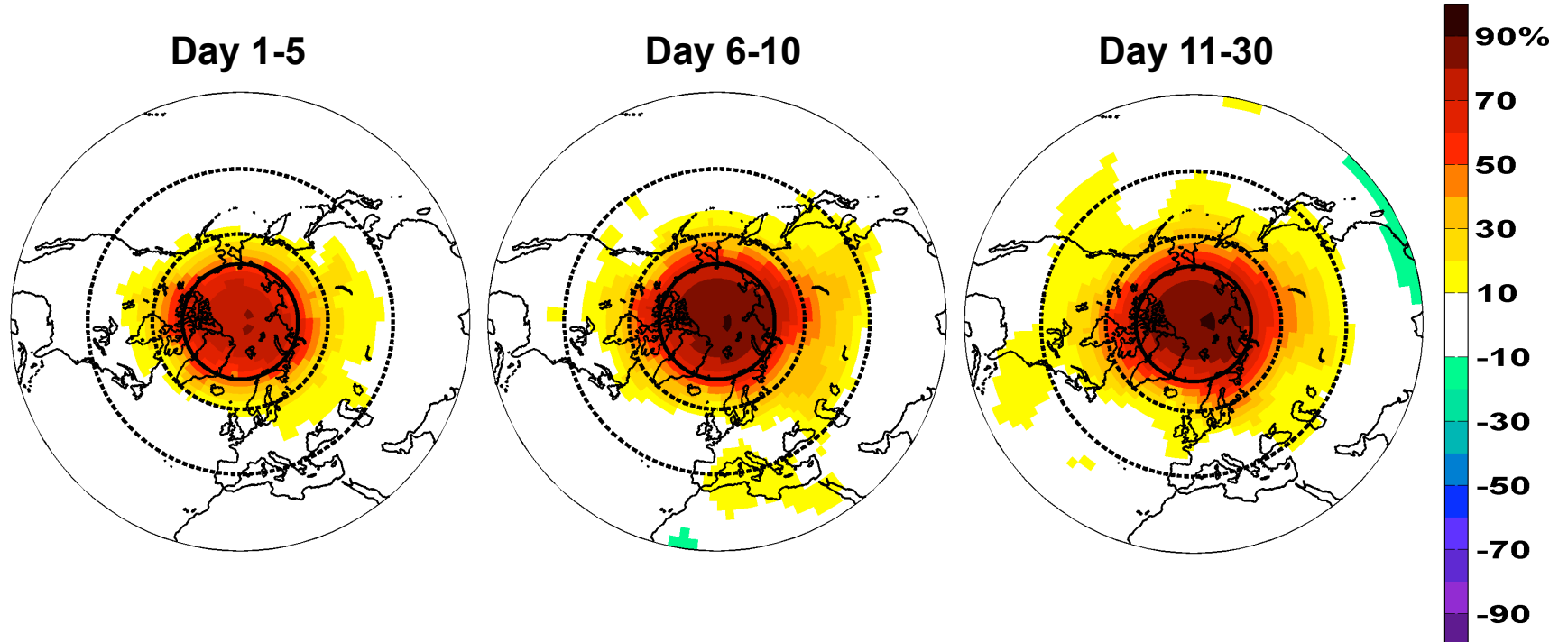
- Antarctica is a harsh environment
- Logistical support for research is expensive – more accurate predictions are needed
 - Typical cost is USD100k if a flight from NZ to McMurdo Station has to turn around because of unforecast poor weather at McMurdo
- Tourist expeditions are vulnerable to weather and ice



Photo: Andrew Peacock / www.footloosefotography.com

Why?

5. Potential for advanced predictions in middle latitudes



Jung et al. (2014), Geophys. Res. Lett.

Why?

6. Need for international coordination



What?

Research Goals

Service-oriented Research

User Applications

Verification

Forecasting System Research

Observations

Modelling

Data Assimilation

Ensemble Forecasting

Underpinning Research

Predictability and Diagnostics

Global Linkages

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

How?

SG4 meeting, October 2013, Boulder, USA



- Jun Inoue
- Alexander Makshtas
- Matthieu Chevallier
- Qinghua Yang

PPP

How?

International Coordination Office @ AWI:

Tasks:

- Inform
- Promote
- Coordinate
- Oversee implementation

Staffing:

- Helge Goessling (director)
- Stefanie Klebe (admin)
- Neil Gordon (consultant)
- Peter Chen (consultant)

WWRP

WMO
OMM

The screenshot shows a web browser displaying the 'News' page of the Polar Prediction project website. The browser's address bar shows the URL 'www.polarprediction.net/news.html'. The website has a blue header with the 'Polar Prediction' logo and a search bar. Below the header is a navigation menu with links for 'About PPP', 'YOPP', 'Documents', 'Meetings & Calendar', 'Steering Group', and 'News'. The main content area features a 'News' section with a Twitter icon. Three news items are listed: 1) '17 March 2015: APECS Webinar on Polar Environment Prediction now on vimeo' with a thumbnail image and a link to a vimeo video. 2) '04 March 2015: IARPC Webinar Series on YOPP on March 17, 3 to 4pm EDT' with a thumbnail image of three speakers and a link to an event page. 3) '03 March 2015: UK-Report "Responding to a Changing Arctic" recommends to support Arctic science' with a thumbnail image of a man and a link to the report. The page also includes a 'Contact | Legal | Sitemap' link in the top right corner.

<http://polarprediction.net>

How?

- ★ Develop Strong Linkages with Other Initiatives
- ★ Strengthen Linkages Between Academia, Research Institutions and Operational Centres
- ★ Establish and Exploit Special Research Datasets
- ★ Link with Space Agencies
- ★ Promote Interaction and Communication Between Research and Stakeholders
- ★ Foster Education and Outreach
- ★ Link with Funding Agencies

PPP

How?

WWRP

WMO
OMM

WWRP/PPP No. 2 - 2013

WWRP Polar Prediction Project Implementation Plan



WWRP/PPP No. 3 - 2014

WWRP Polar Prediction Project Implementation Plan for the Year of Polar Prediction (YOPP)



<http://polarprediction.net>

How?

Organization of PPP-related events



Expert meetings



Conferences and workshops



Panel discussions



Townhall meetings



How?

Organization of PPP-related events





YOOPP
YEAR OF
POLAR
PREDICTION

Year of Polar Prediction



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.“

Year of Polar Prediction

Goal:

„Enable prediction by coordinating modelling, prediction and education activities.“

YOPP

Cg-17/Doc. 4.3(5), CORR. 1, DRAFT 2, p. 10

Draft Resolution 4.3(5)/2 (Cg-17)

YEAR OF POLAR PREDICTION (YOPP)

THE WORLD METEOROLOGICAL CONGRESS,

Noting:

- (1) Resolution 4.3(5)/1 (Cg-17) – Global Integrated Polar Prediction System,
- (2) Resolution 58 (Cg-XVI) – WMO polar activities,
- (3) Resolution 59 (Cg-XVI) – International Polar Decade Initiative,
- (4) Resolution 17 (EC-64) – Polar Prediction Project,

Considering:

- (1) The concerns about amplification of climate change at higher latitudes combined with an increasing interest of many governments in Polar Regions calls for a much better understanding of weather, climate, water and related environmental variability and change, in order to improve our ability to reliably monitor and quantitatively predict weather and climate from the immediate term out to seasons, decades and centuries ahead,
- (2) The increased economic and transportation activities in Polar Regions, the life and livelihoods of communities, and the associated long-term requirement for sustained integrated observational and predictive environmental, climate and water information to support wide-ranging decision-making,
- (3) That there are key gaps in understanding, monitoring and forecasting environmental processes in Polar Regions, which would be clearly identified and evaluated through a focused period of intensified observations and numerical modelling experimentation,

global benefits of a Global Integrated Polar Prediction System (GIPPS), addressing key weather, climate, water and related environmental variability and change, prediction, contributing to all World Meteorological Organization activities, including Disaster Risk Reduction (DRR), and to the Global

PPP

Year of Polar Prediction



MOSAIC

Preparation Phase
2013 to mid-2017

YOPP mid-
2017 to
mid-2019

Consolidation
Phase
mid-2019 to
2022

Community engagement

Alignment with other
planned activities

Development of
Implementation Plan

Preparatory research

Summer school
Workshops

Fundraising &
Resource mobilization

Intensive observing periods
& satellite snapshot

Dedicated model
experiments

Coupled data
assimilation

Research into use &
value of forecasts

Intensive verification
effort

Summer school

Data denial experiments

Model developments

Dedicated reanalyses

Operational
implementation

YOPP publications

YOPP conference

WWRP

WMO
OMM

YOPP Summit

- A high-level event in preparation of YOPP with ~120 participants including scientists, stakeholders, and representatives from operational centres, international bodies, and funding agencies

Geneva, 13-15 July, WMO Headquarters
(by invitation only)



- Goals include the ...
 - formulation of stakeholder requirements,
 - development of priorities,
 - definition of intensive observing periods,
 - agreement on YOPP data legacy,
 - coordination of planned activities,
 - excitation of dedicated funding, and
 - gathering of formal commitments.

AMOMFW Discussion Points

- Who can contribute additional observations?
- Providing data (including unconventional) in near real-time (WIS/GTS) -> "How-to" under development
- Timing of SH Intensive Observing Periods?
- Plans or ideas for dedicated modelling?
- What about SH sea-ice predictions?
- Participation in YOPP Summit?

PPP

WWRP

WMO
OMM



end of presentation

About this presentation

This is a general PPP/YOPP overview presentation compiled by the PPP International Coordination Office.

Without any changes, the presentation should take approximately 20 minutes.

You can either remove or add slides from the collection of supplementary slides for shorter or longer presentations, or exchange and/or modify slides to better fit particular occasions.

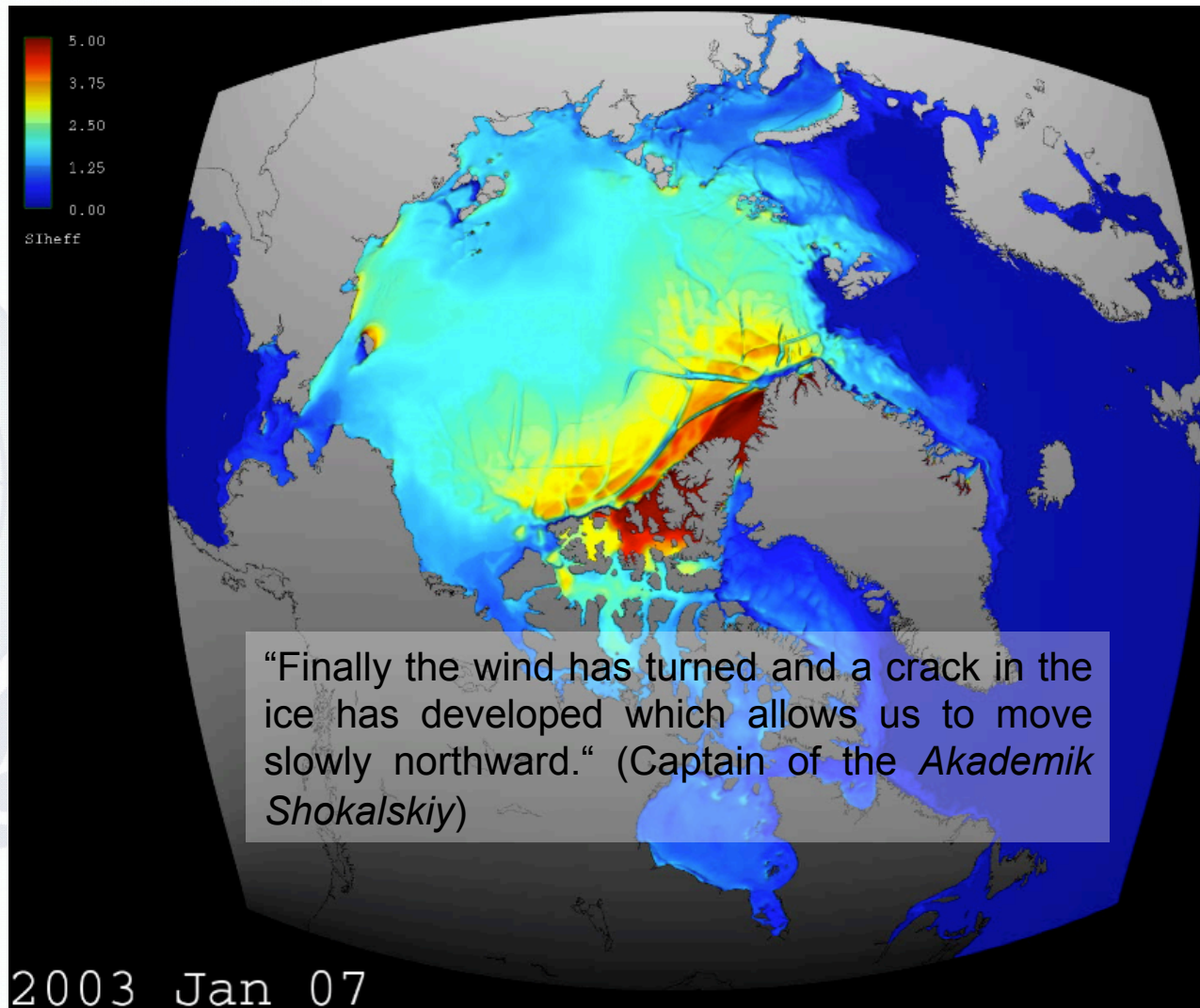
For questions or suggestions, please contact helge.goessling@awi.de .

Good luck with your presentation!

WMO's Focus on Polar Regions

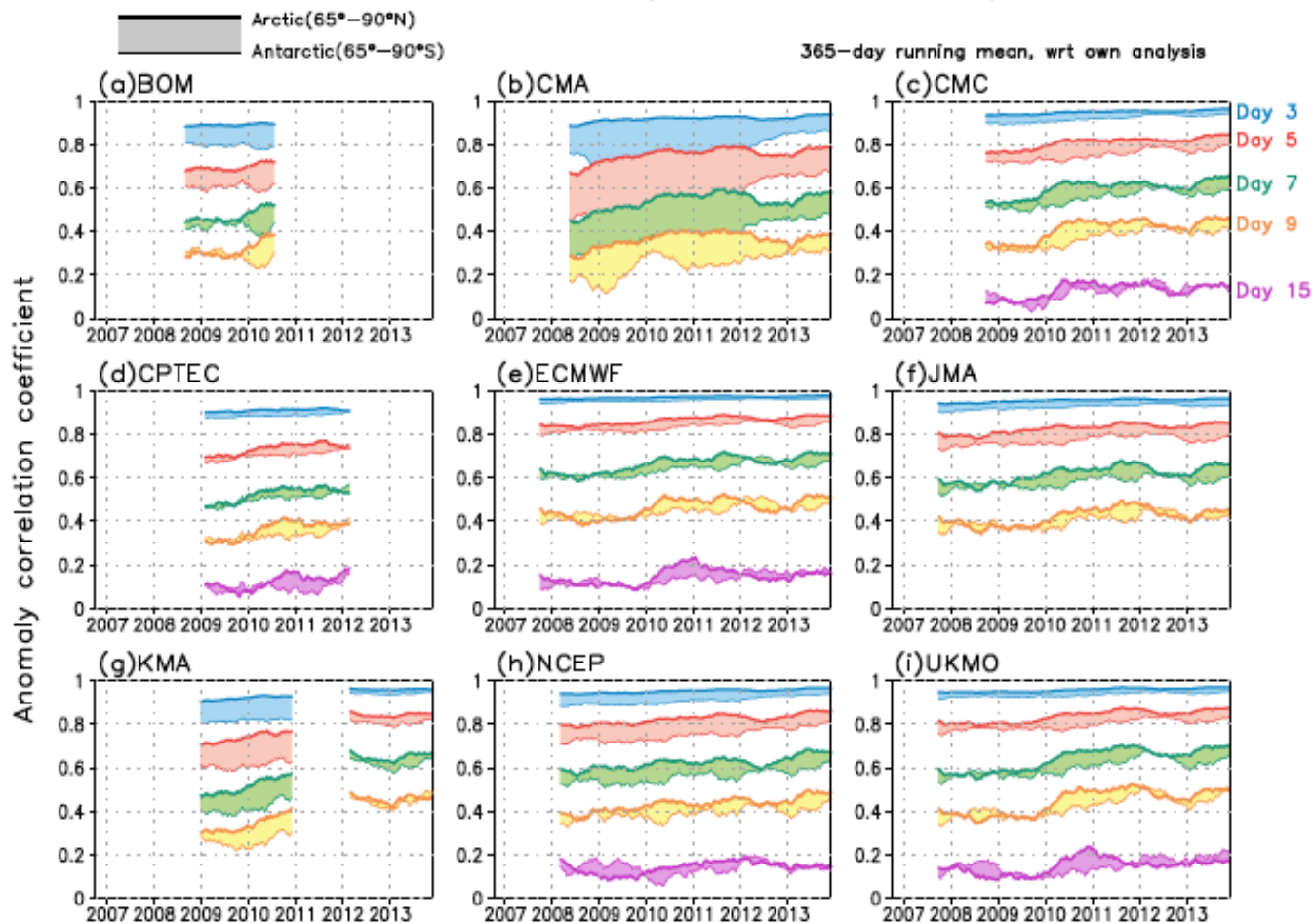
- ★ **From the draft WMO Strategic and Operating Plan for 2016-2019:**
"Expansion of maritime transportation into sparsely monitored Polar Regions comes with elevated risks in terms of increased variability of weather, climate and sea-ice conditions"
- ★ **At its 66th Session in July 2014, WMO Executive Council (EC) agreed that one of the top seven priorities for WMO in 2016-2019 would be to:**
"... implement operational polar weather, climate, and hydrological services focusing on operationalizing the Global Cryosphere Watch and advancing the Global Integrated Polar Prediction System (GIPPS) ..."
- ★ **EC also encouraged the Group of Earth Observations (GEO) to ...**
"... continue its collaboration with WMO in the key WMO activities, especially in improved discovery of, and access to, climate data and information, promotion of data sharing principles, and capacity building coordination. [...] WMO participation in GEO should provide an opportunity to improve global observing systems, especially in areas beyond national jurisdictions."

Sea Ice Modelling and Prediction



Forecast verification

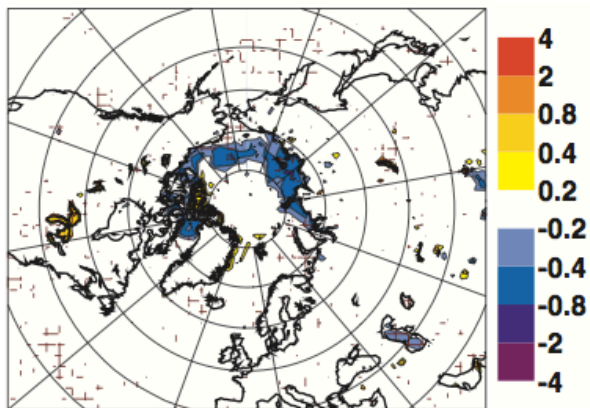
Skill comparison of TIGGE medium-range ensemble forecasts
Z500 control run (OCT2006–NOV2013)



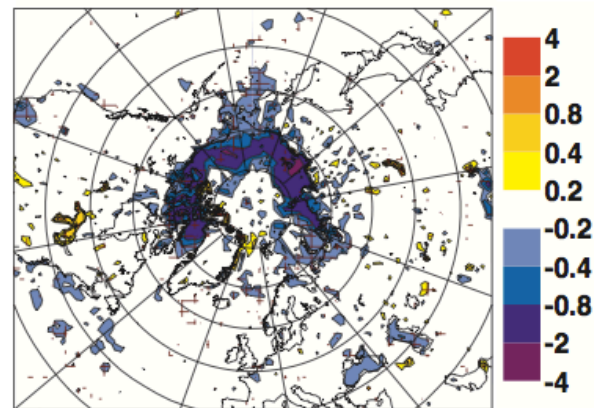
The Role of Sea Ice in Weather Prediction

T2m Difference: Observed Minus Persisted Sea Ice

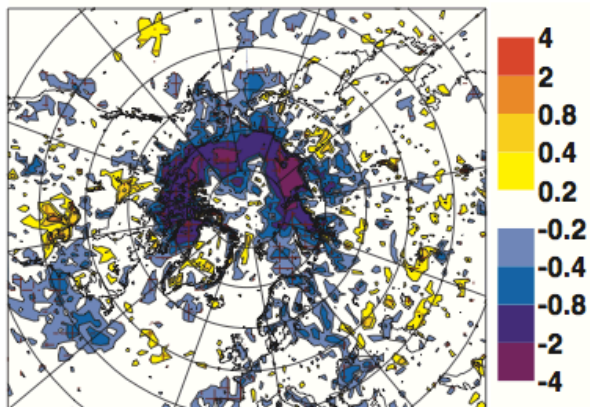
a) Forecast Day +2 (20111001-20111031)



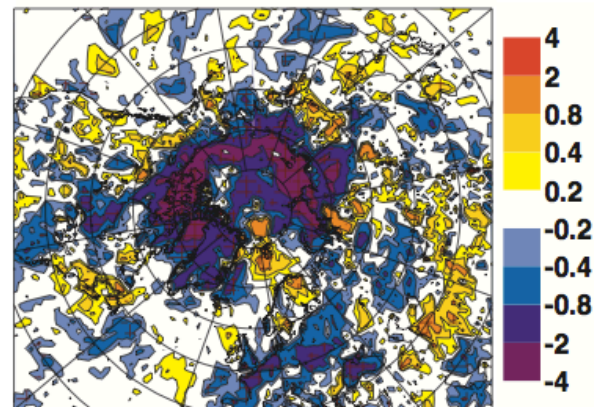
b) Forecast Day +5 (20111001-20111031)



c) Forecast Day +7 (20111001-20111031)

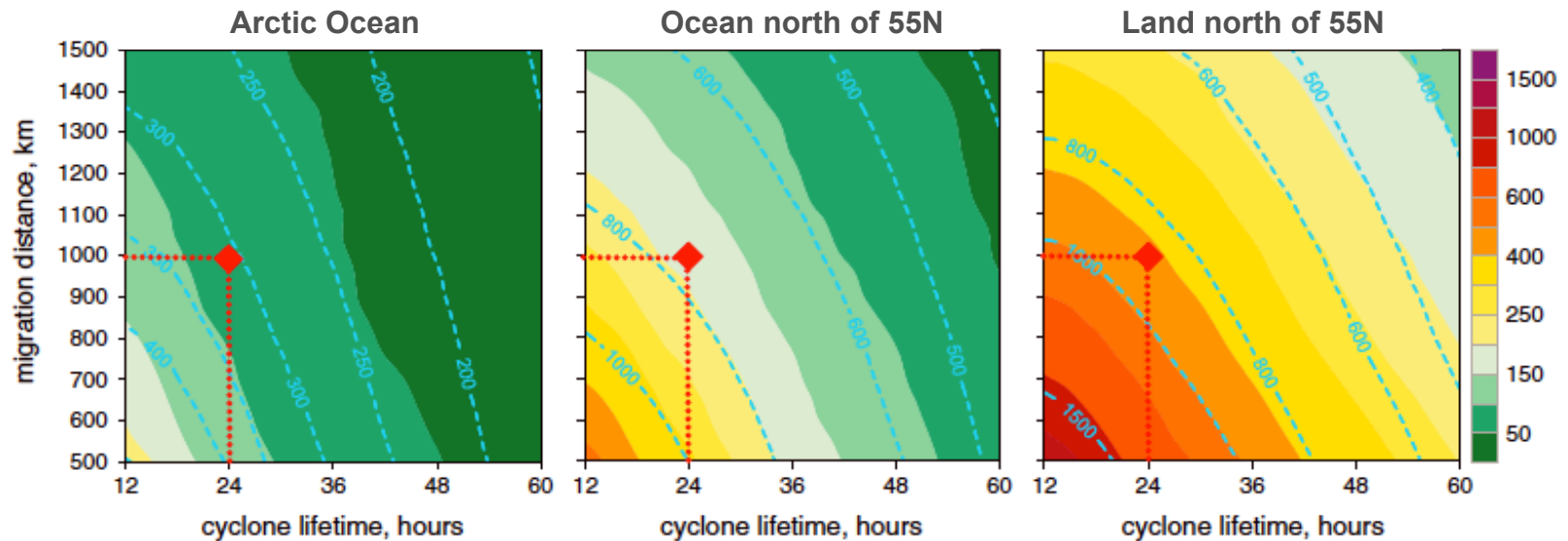


d) Forecast Day +10 (20111001-20111031)



Data assimilation in high latitudes

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

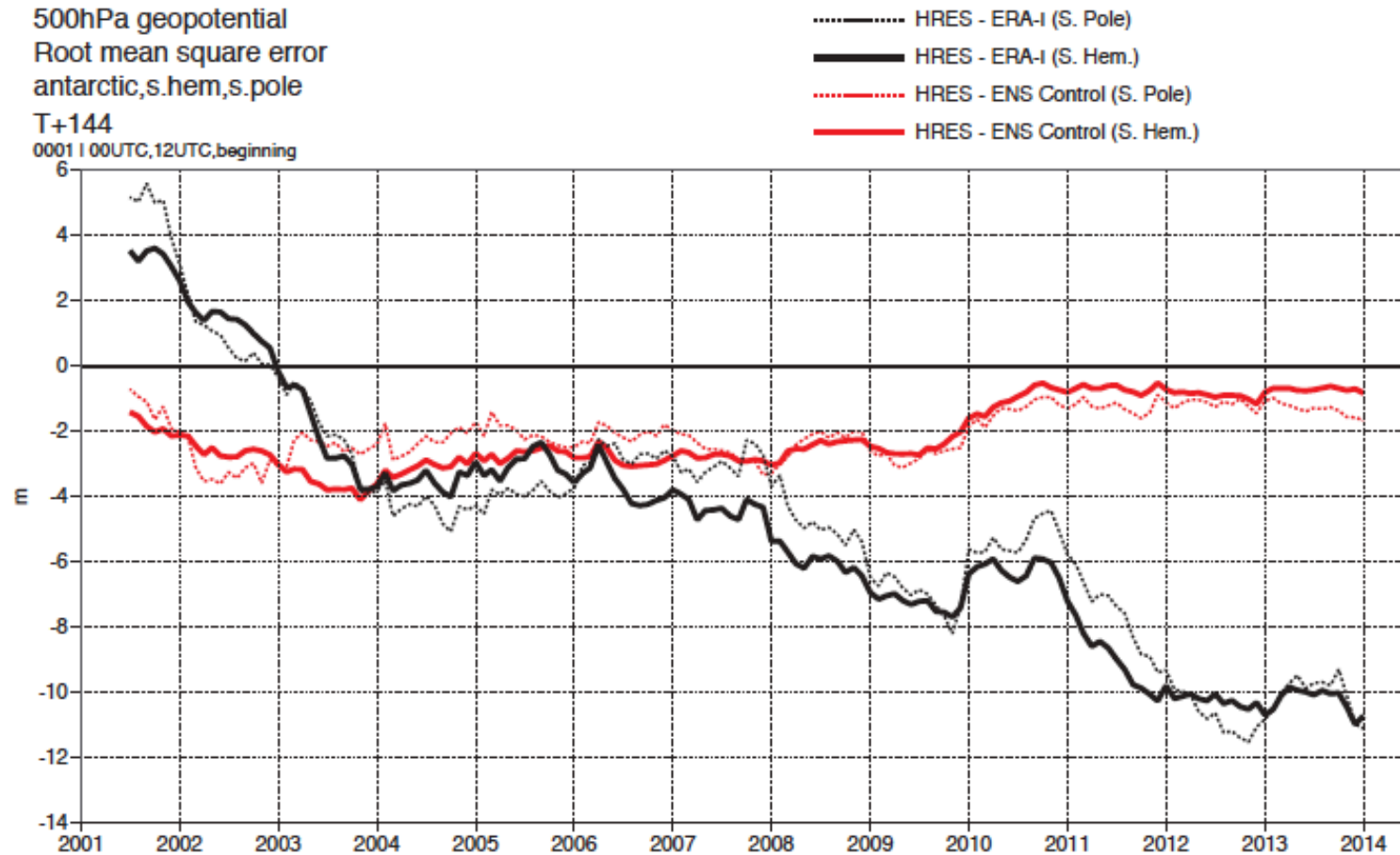


Forecast verification

500hPa geopotential
Root mean square error
antarctic,s.hem,s.pole

T+144

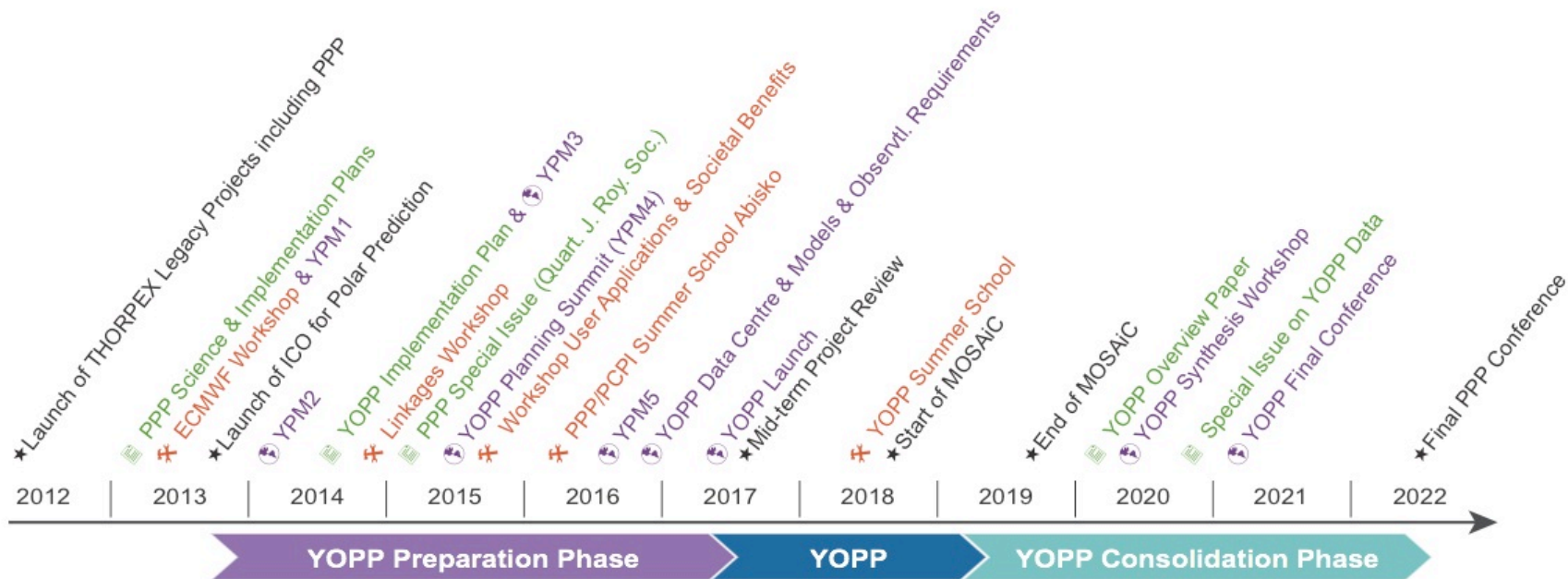
0001 | 00UTC,12UTC,beginning



PPP

WWRP

WMO
OMM



Time line of selected PPP activities

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 prediction)
- Align Transpose-CMIP with YOPP

The YOPP-Satellite Component

- Purpose
 - Improvement of satellite retrivals
 - Provide comprehensive satellite snapshot
- Selected elements
 - Satellite validation
 - Improved model and data assimilation systems
 - Improved atmospheric products in lower atmosphere
 - Sea ice information (deformation)
 - Ice bergs
 - Dedicated YOPP calls
- YOPP Planning Summit (13-15 July 2015, WMO-HQ)

YOPP and MOSAiC

- MOSAiC's contribution to YOPP:
 - Provide observational basis for model development (drifting model grid boxes)
 - Provide ground truthing for satellite community
 - Contribute to the pan-Arctic YOPP observing system (support cruises and flights)
- YOPP's contribution to MOSAiC
 - Model experiments at various resolutions
 - Forecasts (assessment + campaign planning)
 - Pan-Arctic measurements

WWRP-PPP Documents

- PPP Science Plan
- PPP Implementation Plan
- YOPP Implementation Plan
- Promotional material
- Article on PPP in the WMO Bulletin
- ECMWF workshop proceedings
- White papers
 - Observational requirements for polar prediction (Arctic Observing Summit 2013)
 - The WWRP Polar Prediction Project (WWOSC)
- QJ special issue on polar prediction
- BAMS article (in preparation)

Commitments

- Possible in kind support:
 - Operational centres (e.g. community data sets)
 - National weather services (e.g. extra observations)
 - Research institutes (e.g. dedicated campaigns)
 - Satellite agencies (???)
- Funding
 - Key to involving the research community
 - National component
 - International component

Summary

- Polar prediction is an important topic!
- Joint effort of weather and climate research community
- Enthusiastic community (ensure coordination)
- Sound plans for PPP are in place
- There is good support for running PPP (Trust Fund, ICO)
- PPP/YOPP has gained high visibility

Further information: <http://polarprediction.net>