The Polar Prediction Project
and the
Year of Polar Prediction

Neil Gordon
New Zealand

11ICSHMO – Santiago, Chile – 5 October 2015
YOPP
YEAR OF POLAR PREDICTION
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.

Research icebreaker Polarstern during her 2013 winter expedition to Antarctica (Photo: S. Hendricks, AWI).
Why?

1. Significant gaps in the polar observing systems

Polar data coverage of conventional observations in the ECMWF operational analysis on 15 April 2015.

P. Bauer (ECMWF)
2. Emphasis of previous international efforts on lower latitudes

S. Serrar (AWI)
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?

3. Arctic opening

Optimal Arctic shipping routes

1979-2005

- open water ships (40% success)
- polar class 6 ships

2040-2059 (RCP 4.5)

- (94% success)

Smith and Stephenson (2013)
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
## Antarctic Tourism Numbers

*Courtesy of IAATO*

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<tbody>
<tr>
<td>Seaborne tourism with landings</td>
<td>28,304</td>
<td>25,341</td>
<td>25,526</td>
<td>23,305</td>
<td>20,271</td>
<td>18,534</td>
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<td>Seaborne tourism, no landings</td>
<td>8900</td>
<td>9459</td>
<td>9670</td>
<td>9070</td>
<td>4872</td>
<td>14,373</td>
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<tr>
<td>Air &amp; cruise combination, with landings</td>
<td>2294</td>
<td>1471</td>
<td>1848</td>
<td>1587</td>
<td>860</td>
<td>531</td>
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<tr>
<td>Air &amp; land tourism, Antarctic interior</td>
<td>531</td>
<td>431</td>
<td>361</td>
<td>354</td>
<td>516</td>
<td>386</td>
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<tr>
<td>Over-flights, no landings</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>40,029</strong></td>
<td><strong>36,702</strong></td>
<td><strong>37,405</strong></td>
<td><strong>34,316</strong></td>
<td><strong>26,519</strong></td>
<td><strong>33,824</strong></td>
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Passenger numbers for 2014-15 and 2015-16 as of April 10, 2015, subject to change. See also [www.iaato.org/tourism-statistics](http://www.iaato.org/tourism-statistics)
5. Potential for advanced predictions in middle latitudes – Northern Hemisphere Example

Why?

5. Potential for advanced predictions in middle latitudes – Southern Hemisphere Example

Correlation of South American precipitation with Weddell Sea sea-ice concentration for summer and winter (SAM and ENSO signals filtered out) and precipitation composite of November precipitation for high minus low Weddell Sea sea ice. Contours for significant signals (99%).

Saurral et al. (2014)

See Panel 2 this afternoon’s Posters.

Slide courtesy of Doblas-Reyes (YOPP Summit presentation)
Why?

6. Need for international coordination
Research Goals

Service-oriented Research
- User Applications
- Verification

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

Underpinning Research
- Predictability and Diagnostics
- Global Linkages

Source: PPP Implementation Plan
How?

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
- Jun Inoue
- Alexander Makshtas
- Matthieu Chevallier
- Qinghua Yang *membership ending

SG6 Meeting, July 2015, Geneva, Switzerland
Tasks:
- Inform
- Promote
- Coordinate
- Oversee implementation

Staffing:
- Helge Goessling (director)
- Stefanie Klebe (admin)
- Peter Chen (consultant)

How?

International Coordination Office @ AWI:

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
How?

Organization of PPP-related events

Photos by N. Gordon
How?

Organization of PPP-related events

Barcelona
Dec. 2014

Workshop
"Polar-lower lat. linkages"

presentations and audio available at http://polarprediction.net
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

Preparation Phase 2013 to mid-2017
- Community engagement
- Alignment with other planned activities
- Development of Implementation Plan
- Preparatory research
- Summer school Workshops
- Fundraising & Resource mobilization

YOPP mid-2017 to mid-2019
- Intensive observing periods & satellite snapshot
- Dedicated model experiments
- Coupled data assimilation
- 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
- YOPP publications
- YOPP conference

MOSAiC
YOPP Timeline

2012: Launch of THORPEX Legacy Projects including PPP
2013: WWRP/PPP Science and Implementation Plans, WWRP/PPP Workshop
2014: WWRP/PPP Workshop, Launch of ICO for Polar Prediction
2015: YOPP Preparation Phase, YOPP 1st Planning Meeting (YPM1)
2016: YOPP Implementation Plan & YPM2
2017: YOPP 2nd Planning Meeting (YPM3)
2018: YOPP Summit (YPM4), YOPP Workshop on User Applications & Socio-economic Benefits
2019: YOPP Data Portal established & Models ready to run
2020: WWRP/PPP 2nd Polar Prediction School
2021: YOPP 2021, End of MOSAIC
2022: YOPP Overview Paper, YOPP Final Conference

YOPP Preparation Phase
YOPP
YOPP Consolidation Phase
YOPP Summit

- A high-level event in preparation of YOPP (120 scientists, stakeholders, and representatives from operational centres, internat. bodies, funding agencies)

- Goals and outcomes included: the identification 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.

- A revised YOPP Implementation Plan will be published later 2015.
Use of consistent metadata and pointers to other online locations where data can be retrieved

Setup of YOPP data portal that exploits the expertise gained with the Global Cryosphere Watch (GCW) portal [http://gcw.met.no](http://gcw.met.no)

Need to identify some data centres that archive YOPP data, support the process, and provide DOIs (e.g. PANGAEA [http://pangaea.de](http://pangaea.de))

Data publication in data journals; YOPP special issue in ESSD planned to strengthen data legacy

Data provision open access and fast; if relevant for operational use, (near-)real-time submission via WIS/GTS
# YOPP Summit Partner Presentations

<table>
<thead>
<tr>
<th>Organization</th>
<th>Topic</th>
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<tr>
<td>WWRP-DAOS</td>
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<td>WGNE</td>
<td>NOAA YOPP</td>
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<td>S2S</td>
<td>NOAA UAVs</td>
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<td>CliC - PCPI</td>
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<td>SOOS/SORP</td>
<td>NMEFC</td>
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<td>WCRP Polar Challenge</td>
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The Southern Ocean and YOPP

COLLABORATIVE EFFORTS (Slide courtesy of Mike Sparrow)

• Overlap in data requirements of YOPP and SOOS/SORP (joint advocacy for e.g. collection, discovery and access)
• SOOS endorsement process to become a SOOS/YOPP endorsement?
• Many activities driving observations and modelling in the Southern Ocean – need an efficient communication pathway
• Development of Southern Ocean initiatives within YOPP will benefit the SOOS observing and state estimation community, and the resources already in place and that are planned in
British Antarctic Survey
Potential YOPP Contributions
(Courtesy of BAS)

- Antarctic and Southern Ocean cloud processes
- Atmosphere-ocean fluxes (open and ice-covered ocean)
- Sea ice processes
- Linkages (teleconnections) between polar latitudes and lower latitudes
- Improve the polar observing system
- BAS is open to collaboration to contribute expertise and infrastructure
PPP/YOPP sub-committees

- Sub-committees dealing with different important aspects of YOPP have been established. The sub-committees organise dedicated workshops and other meetings to prepare for YOPP.

  - **Societal and Economic Research and Applications**
    - Lead: Brian Mills
  
  - **Coordinated model experiments**
    - Lead: Thomas Jung
  
  - **Arctic Observations and Intensive Observing Periods**
    - Lead: Chris Fairall
  
  - **Sea-Ice Prediction**
    - Lead: Greg Smith
  
  - **Education**
    - Lead: Jonny Day
  
  - **YOPP Data Component**
    - Lead: Øystein Godøy
  
  - **YOPP Southern Hemisphere**
    - Lead: David Bromwich
## Coordination Committee for YOPP SH

**Lead** - David Bromwich  
[bromwich.1@osu.edu](mailto:bromwich.1@osu.edu)  

**Website**  
[http://polarmet.osu.edu/YOPP-SH/](http://polarmet.osu.edu/YOPP-SH/)

<table>
<thead>
<tr>
<th>Location</th>
<th>Representatives</th>
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| Australia      | Scott Carpentier  
Phil Reid |
| Chile          | Jorge Carrasco                                                                 |
| Germany        | Thomas Jung  
Gert Koenig-Langlo                                                             |
| Italy          | Paolo Grigioni  
Vito Vitale                                                                    |
| Japan          | Naohiko Hirasawa                                                                |
| Korea          | Seong-Joong Kim                                                                 |
| Russia         | Alexander Klepikov                                                              |
| United Kingdom | Tom Bracegirdle  
Steve Colwell  
Tom Lachlan-Cope                                                              |
| Germany        | Thomas Jung  
Gert Koenig-Langlo                                                             |
| Italy          | Paolo Grigioni  
Vito Vitale                                                                    |
| Japan          | Naohiko Hirasawa                                                                |
| Korea          | Seong-Joong Kim                                                                 |

**Southern Ocean Observing System (SOOS)**  
Stephen Ackley  
Matthew Mazloff

**CLIVAR-CliC-SCAR Southern Ocean Region Panel (SORP)**  
John Fyfe  
Ben Galton-Fenzi  
Francois Massonnet  
Kevin Speer
Southern Hemisphere YOPP Observing

- Importance of accurate predictions during southern summer for key stakeholders such as the logistics community and the tourism industry
- Enhanced research capacity exists during summer
- Expected concentration on October 2018 to March 2019 (with shorter IOPs)
How You Can Be Involved

• Check out http://polarprediction.net
• YOPP Summit presentations and reports http://www.polarprediction.net/yopp/yopp-summit.html
• Subscribe to mail list polarprediction@climate-cryosphere.org) (email office@polarprediction.net to ask)
• Take advantage of educational activities through APECS http://www.apecs.is including APECS-WWRP-Polar Prediction Project Webinar Series series
• Contact David Bromwich bromwich.1@osu.edu about YOPP Southern Hemisphere Coordinating Committee
• Plan contributing activities and seek YOPP Endorsement http://www.polarprediction.net/yopp/yopp-endorsement.html
• Take advantage of additional data during YOPP Phase 2017-2019 and Consolidation Phase 2019-2022
Gracias