World Weather Research Programme (WWRP)

Gilbert Brunet
WWRP/JSC Chair

WCRP JSC Committee 34th Session, Brasilia, Brazil, 27-31 May 2013

Long-term objectives of WWRP

- To improve public safety and economic productivity by accelerating research on the prediction of high-impact weather;
- To demonstrate improvements in the prediction of weather, with emphasis on high-impact events through the exploitation of advances in scientific understanding, observational network design, data assimilation and modelling techniques and information systems;
- To improve understanding of atmospheric processes of importance to weather forecasting through the organization of focused research programmes (e.g., WWRP Strategic Plan, RDPs);
- To encourage the utilization of relevant advances in weather prediction systems to the benefit of all WMO Programmes and all Members (e.g., FDPs);
- To maintain a strong focus on training opportunities for young scientists, in particular from developing countries, so that as many countries as possible will be able to contribute to and benefit from the research advances.

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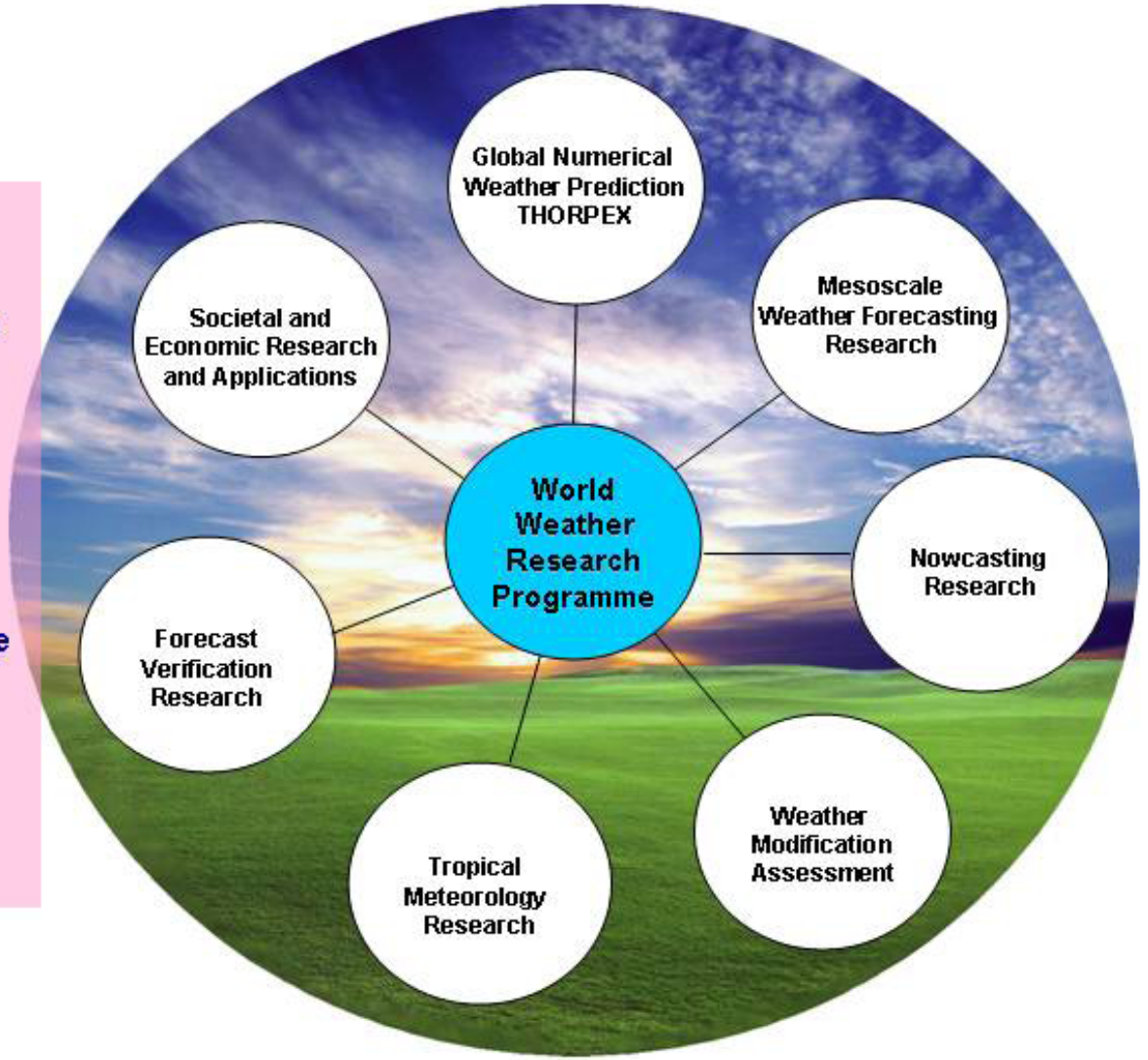
WORLD WEATHER RESEARCH PROGRAMME

Major Partners

- Joint Working Group on Numerical Experimentation (WGNE)
- World Climate Research Programme (WCRP)
- WMO Weather and Disaster Risk Reduction Services
- Global Atmosphere Watch (GAW)
- WMO Integrated Global Observing System (WIGOS) and Information System (WIS)
- The International Council for Science (ICSU): Integrated Research on Disaster Risk (IRDR)
- Hydrological Research Community
- Ocean Observations and Modelling Research Community



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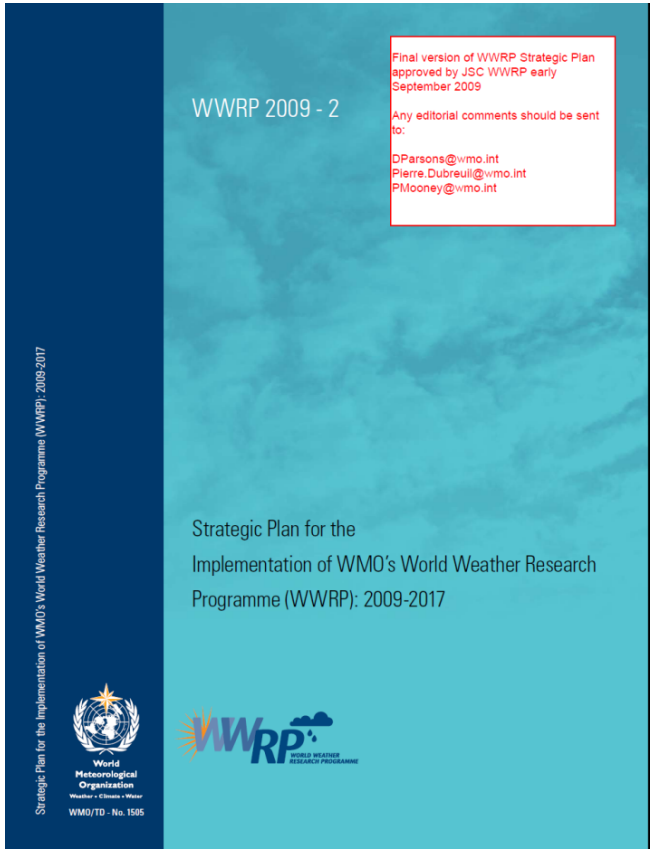
WWRP Strategic Plan

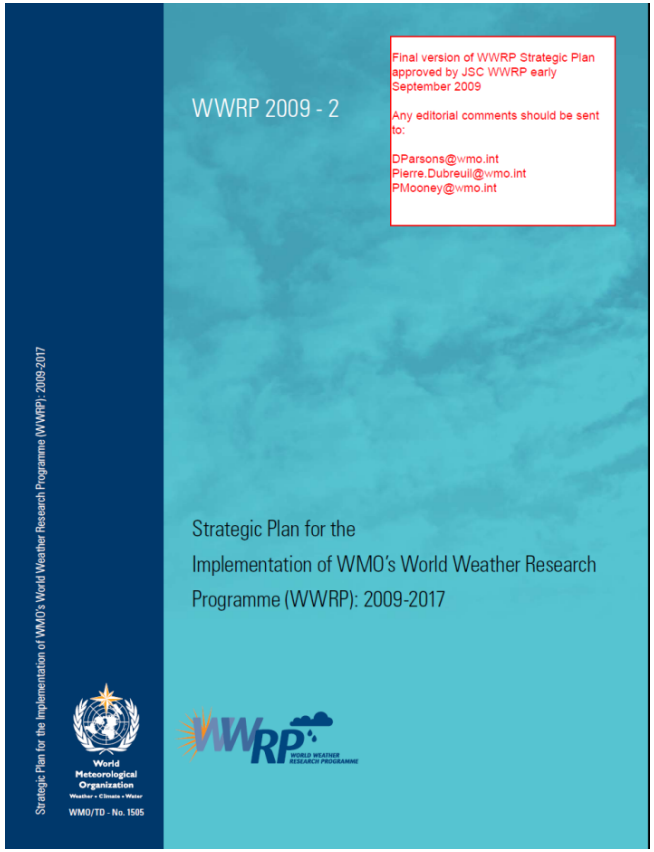
- The first Strategic Plan for the Implementation of WMO's World Weather Research Programme (WWRP): 2009 – 2017 (WMO/TD-No. 1505).
- The WWRP strategic plan integrates WMO Member activities in THORPEX, tropical meteorology, mesoscale weather forecasting, nowcasting, verification and societal and economic applications with those of partners in global and regional forecast research and earth observation.
- The plan maintains and reinforces the traditional strong links with GAW, the World Climate Research Programme (WCRP) and other WMO activities.



NB: GARP and Charney

WWRP Strategic Plan

- Implementation activities outlined in the first Strategic Plan address cross cutting activities at the interface of:
  - nowcasting-mesoscale;
  - mesoscale-global;
  - weather-climate prediction research.
  - research-operations that are related to the delivery of a weather and climate services:
    - ensemble weather prediction systems;
    - tropical convection;
    - sub-seasonal to seasonal prediction;
    - polar prediction.



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A World Weather Research Programme

Accelerating improvements in the accuracy of one-day to two weeks high-impact weather forecasts for the benefit of society, economy and environment

2005

2014

THORPEX Legacy Projects

- Establishment of three THORPEX legacy projects aligned to the requirements of WMO Members and the GFCS namely:

  - the sub-seasonal to seasonal prediction project (S2S);
  - the polar prediction project (PPP); and
  - the new high-impact weather (HIW) prediction project.

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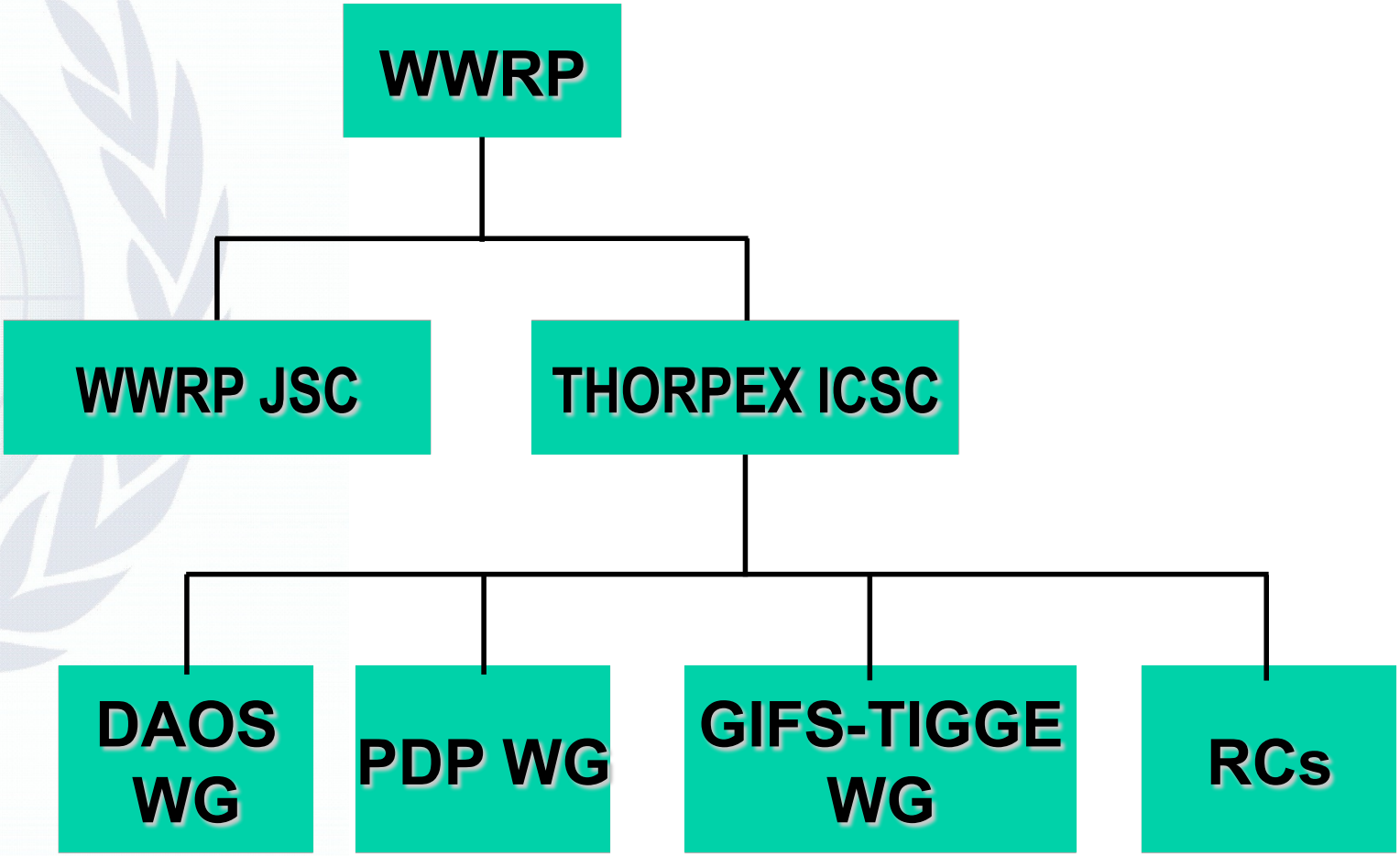
THORPEX Current Structure



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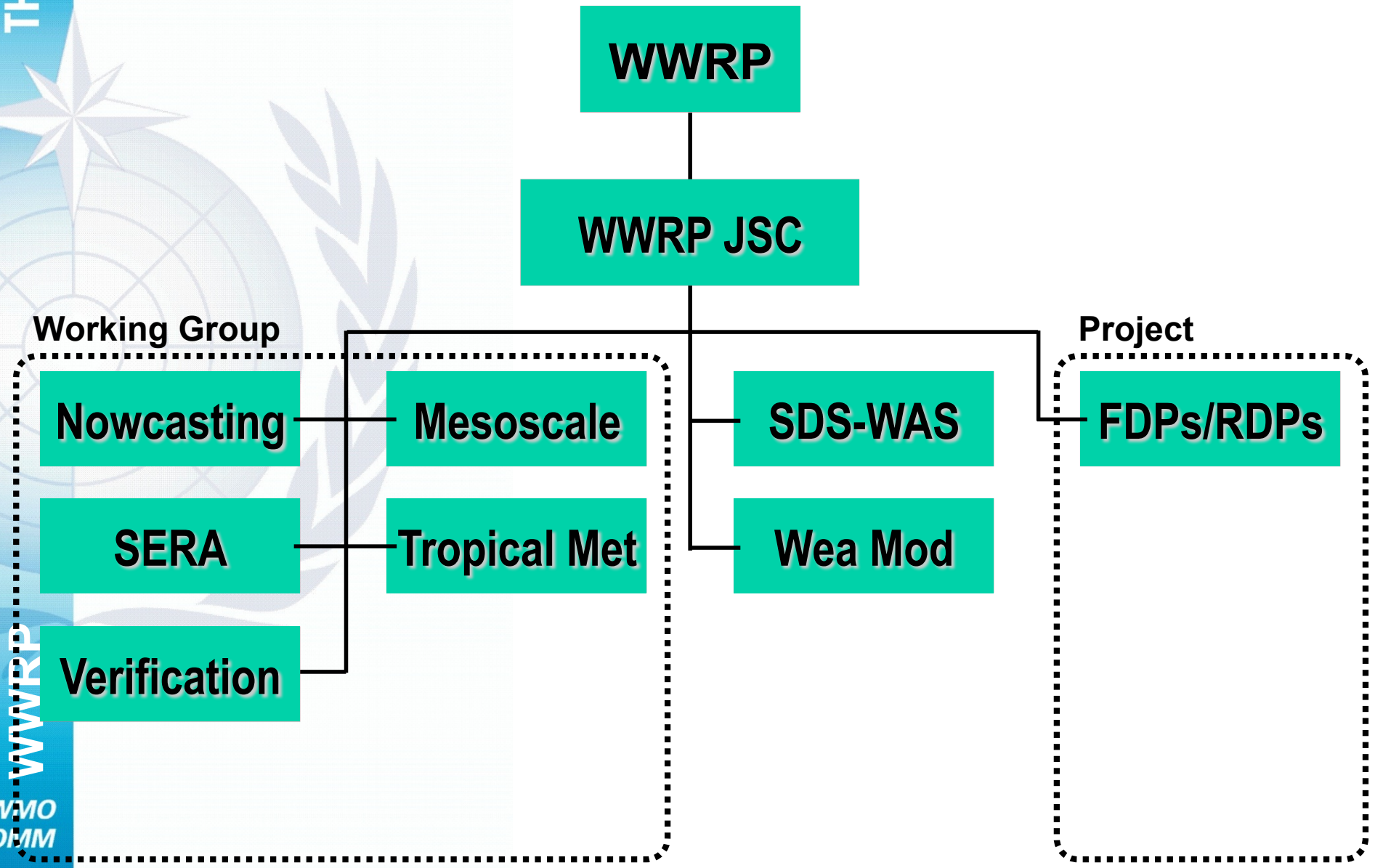
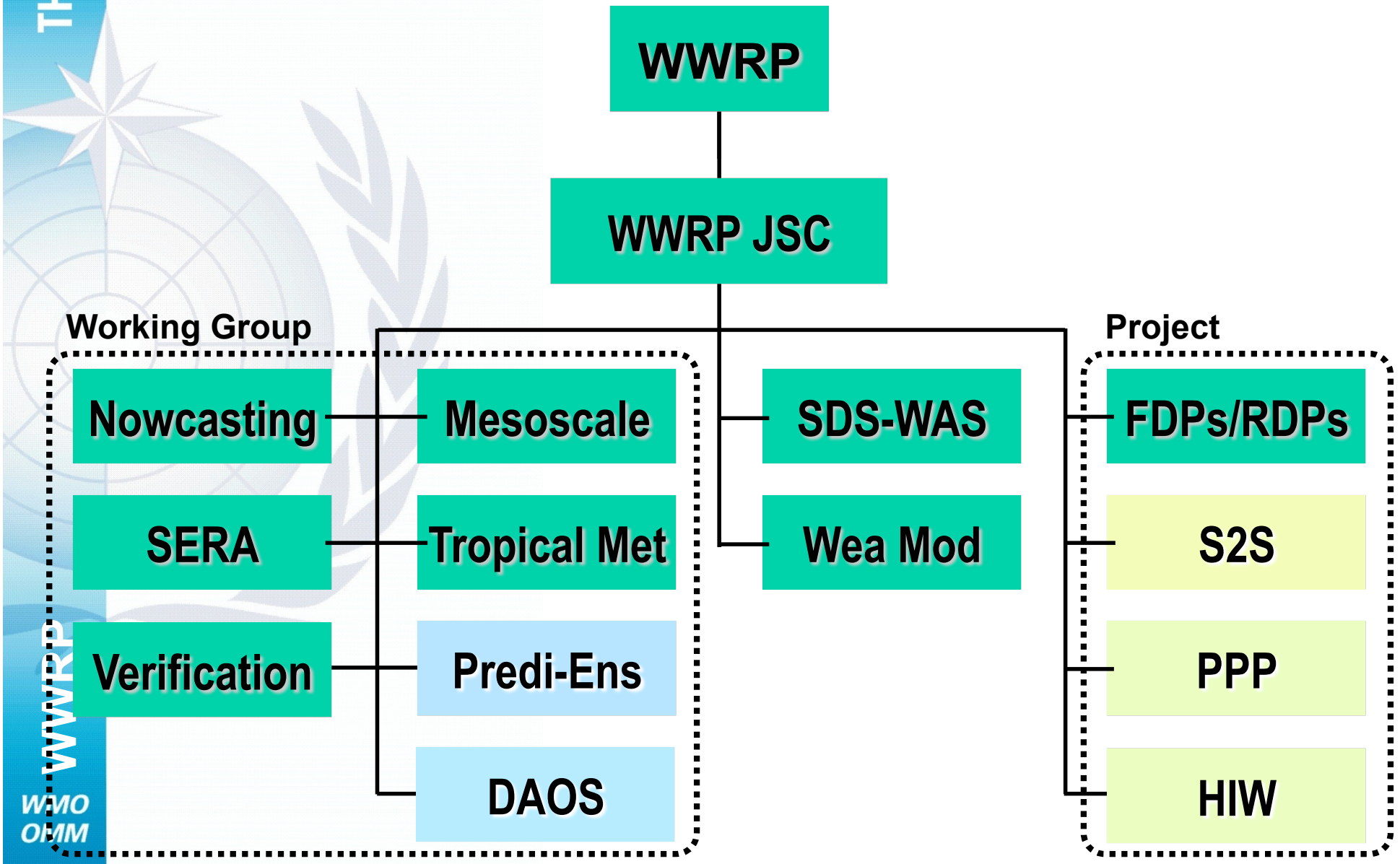
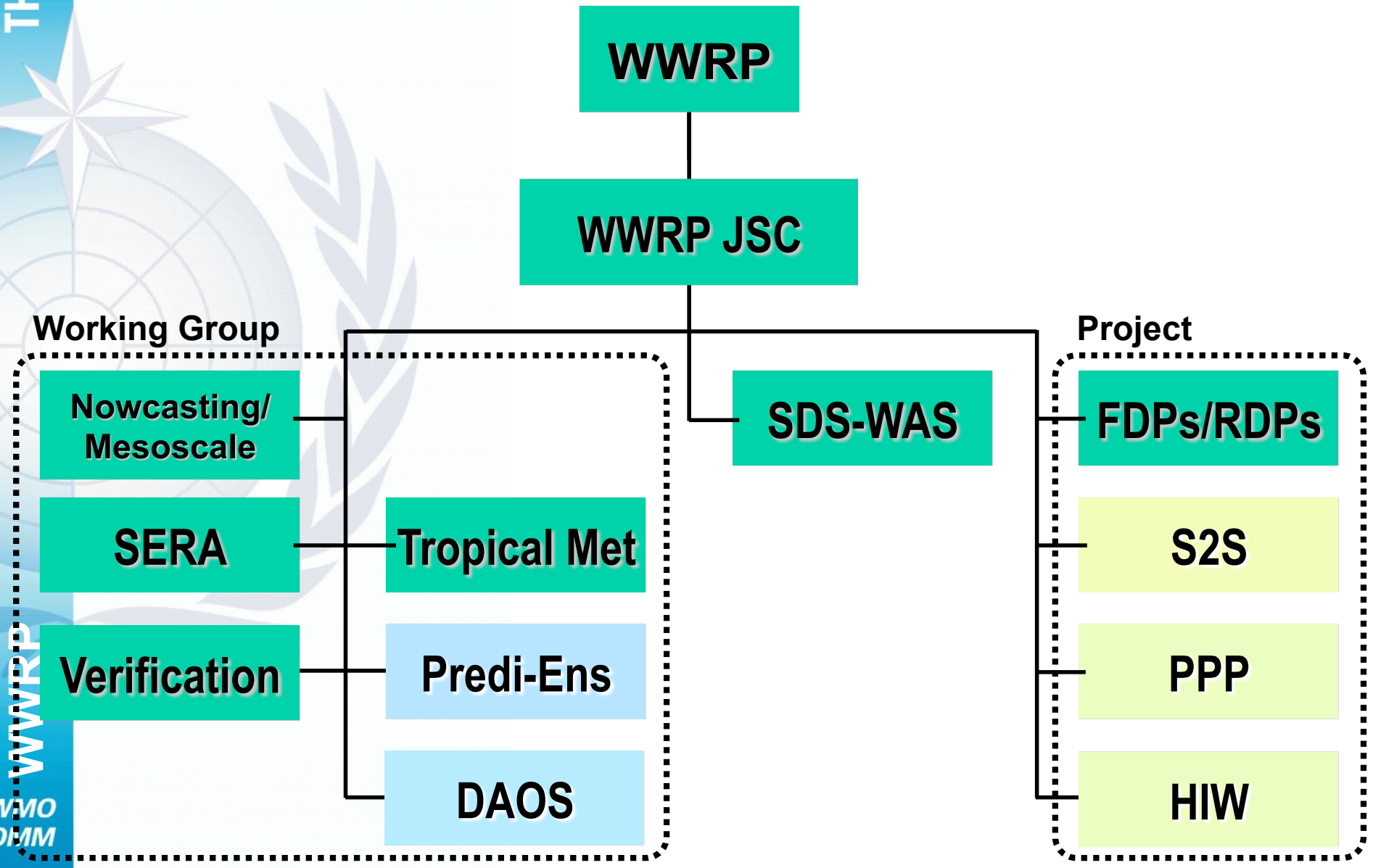
Current Structure



New Structure



Planned Future Structure



WWRP Strategic Plan

- Implementation activities outlined in the first Strategic Plan address cross cutting activities at the interface of:
  - nowcasting-mesoscale;
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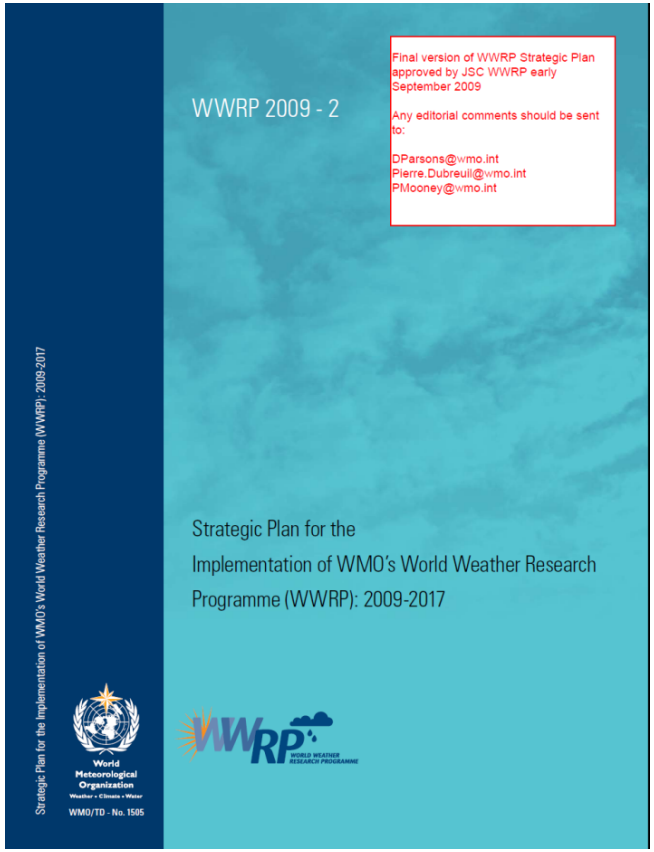
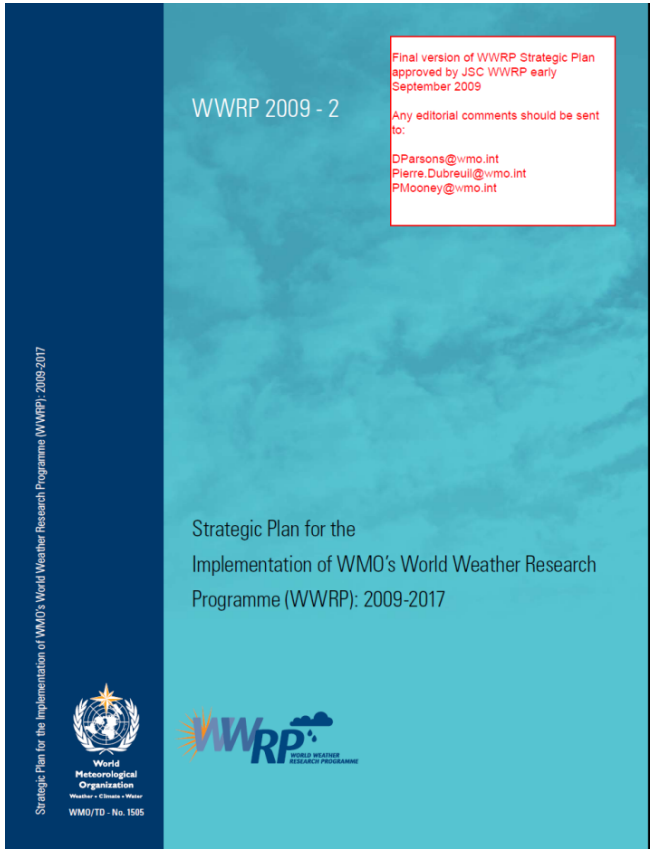
    - sub-seasonal to seasonal prediction;
    - polar prediction.



WWRP Strategic Plan: on good track!

- Implementation activities outlined in the first Strategic Plan address cross cutting activities at the interface of:
  - nowcasting-mesoscale (HIW, PPP);
  - mesoscale-global (HIW, PPP);
  - weather-climate prediction research (PPP, S2S).
  - research-operations that are related to the delivery of a weather and climate services:
    - ensemble weather prediction systems (HIW, PPP, S2S);
    - tropical convection (HIW, S2S);
    - sub-seasonal to seasonal prediction (S2S);
    - polar prediction (PPP).



The WWRP Polar Prediction Project

Acknowledgement: Thomas Jung

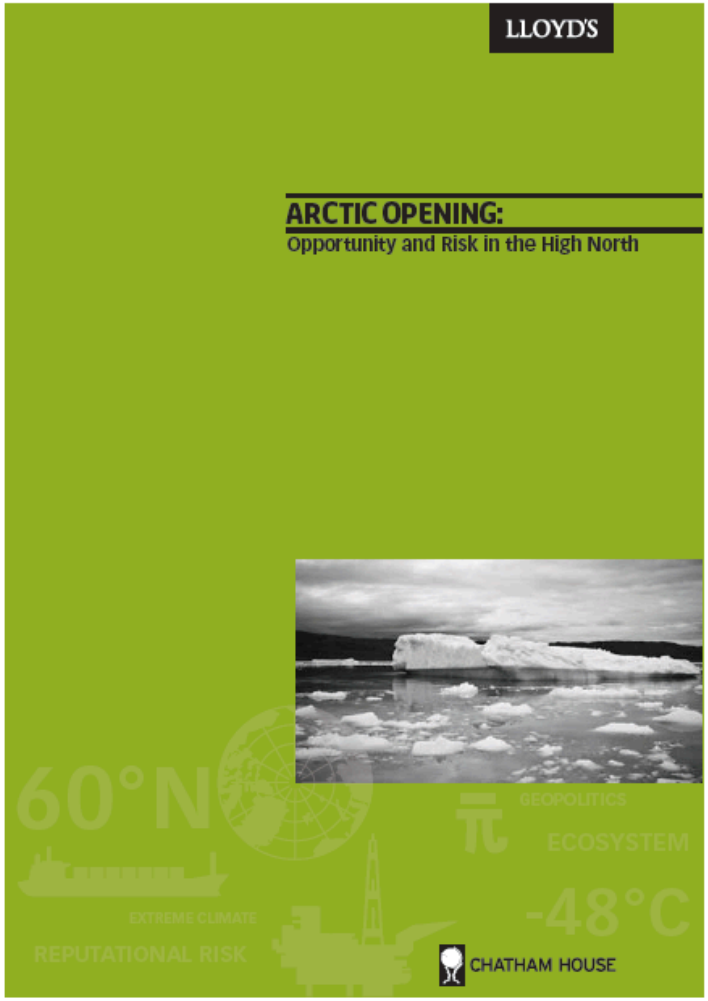
Chair of the WWRP Polar Prediction Project

Alfred Wegener Institute

Arctic Climate Change: Opportunities and Risks

Excerpts from Lloyd's 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



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Background

Month	Milestones
Nov 2009	CAS recommends IPY legacy project
Oct 2010	WWRP and WCRP workshops in Norway
Sep 2011	Endorsement of PPP through THORPEX ICSC
Sep 2011	Formation of PPP steering group
Dec 2011	1st PPP steering group meeting (implementation plan)
Mar 2012	2nd PPP steering group meeting (implementation and science plan)
Jun 2012	Approval of PPP through WMO EC
Dec 2012	3rd PPP steering group meeting (further Project planning)

WWRP-PPP Steering Group

- Thomas Jung (chair)
- Peter Bauer
- Chris Fairall
- David Bromwich
- Trond Iversen
- Marika Holland
- Brian Mills
- Pertti Nurmi
- Ian Renfrew
- Gregory Smith
- Gunilla Svensson
- Mikhail Tolstykh
- Paco Doblas Reyes (ex-officio)
- Peter Lemke (ex-officio)
- Neil Gordon (WMO consultant)

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:

„This constitutes the hourly to seasonal research component of the WMO Global Integrated Polar Prediction System (GIPPS)“

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Research Areas

Forecasting System Research

Observations	Modelling
Data Assimilation	Ensemble Forecasting

Role of Sea Ice in Medium-Range Weather Forecasting

T2m Difference: Observed Minus Persisted Sea Ice

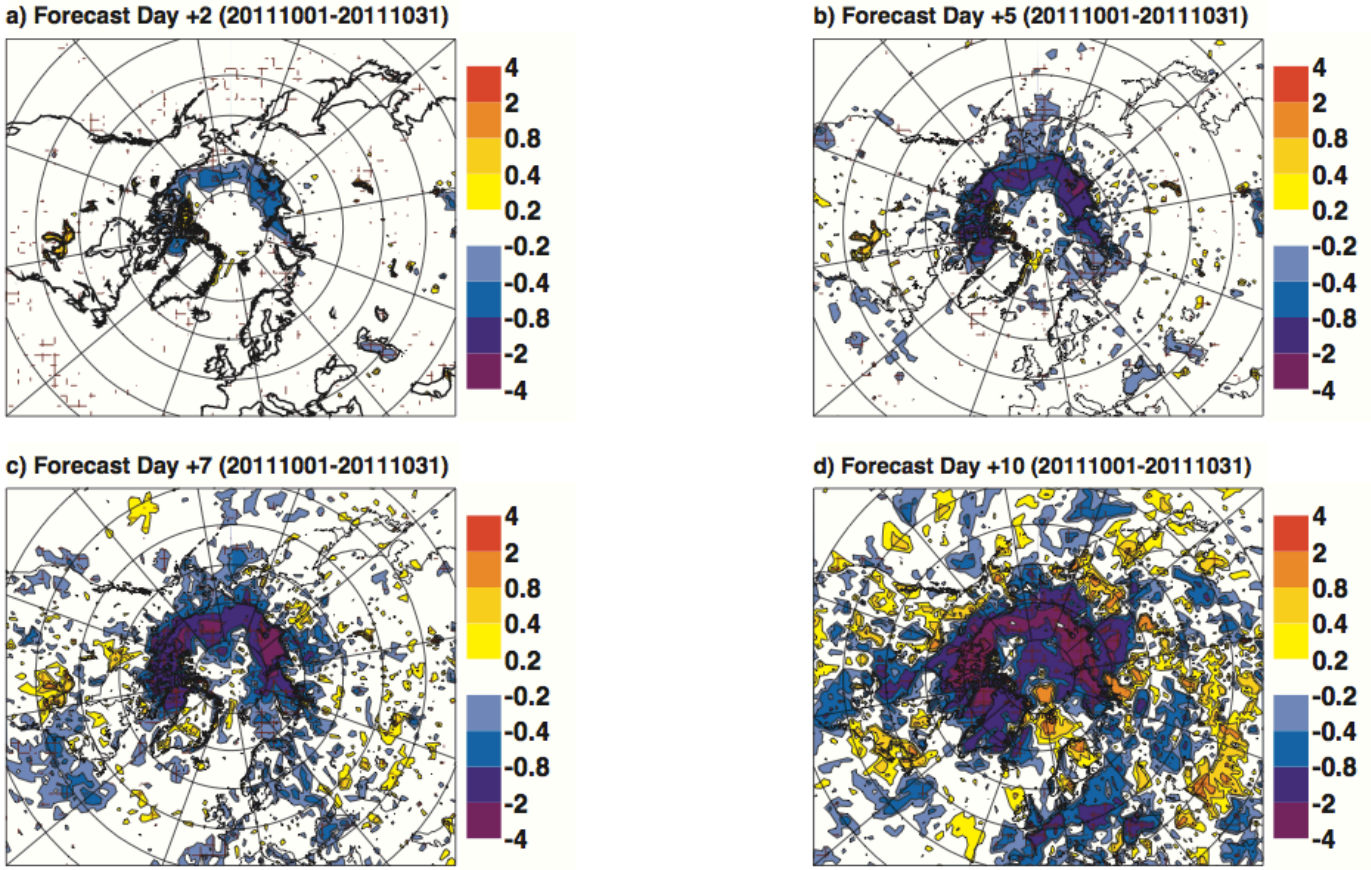

Figure courtesy of P. Bauer (ECMWF)

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Research Areas

Underpinning Research

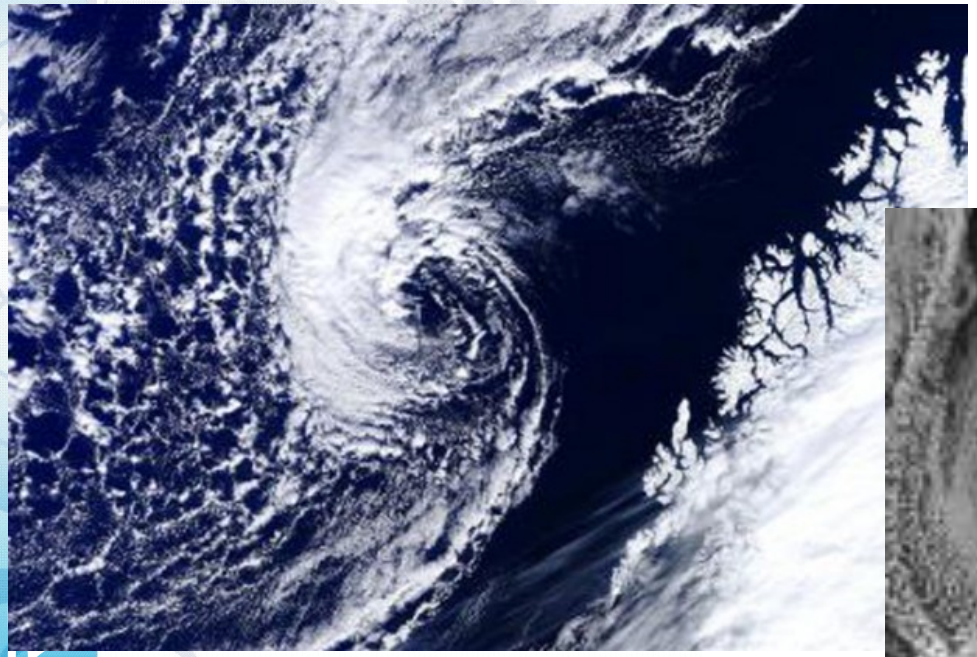
- Predictability and Diagnostics
- Teleconnections

Forecasting System Research

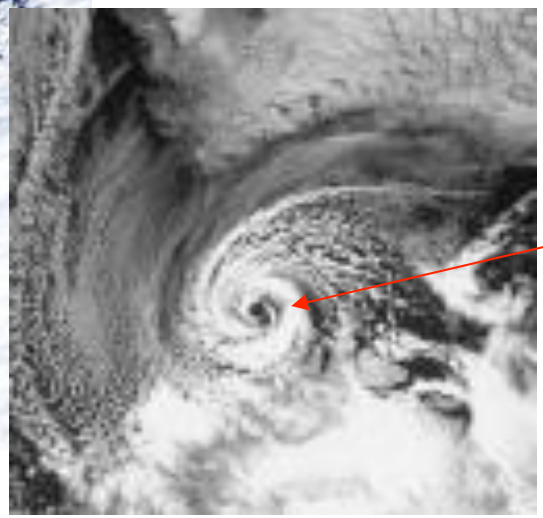
- Observations
- Modelling
- Data Assimilation
- Ensemble Forecasting

PROBLEMS OF POLAR RESEARCH:

Predominance of meso-scale phenomena and smaller-scale systems with rapid development (polar lows, low-level fronts and jets,etc)



Polar low: the arctic hurricane



Less skilful numerical predictions than at mid-latitudes and in the tropics

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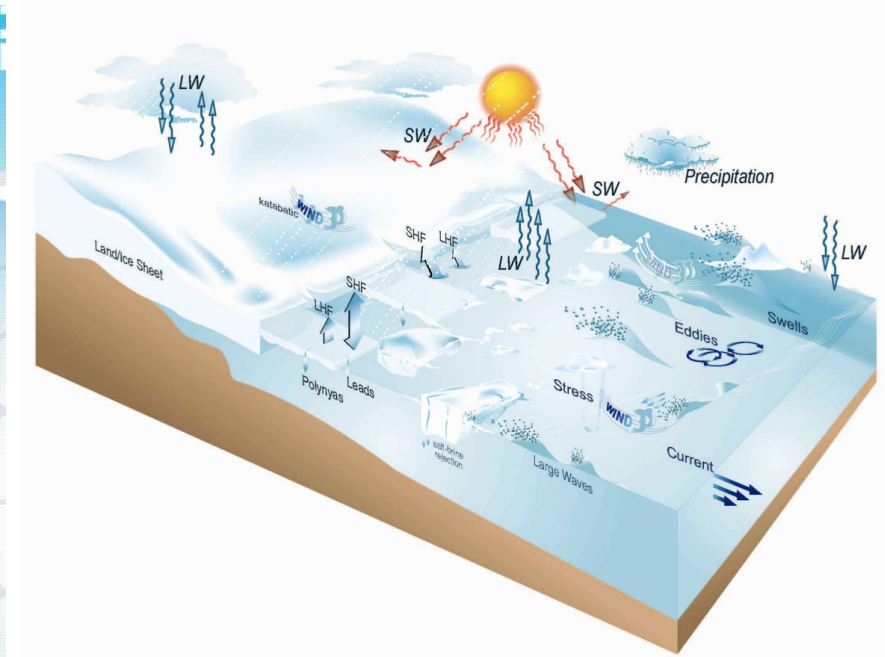
PROBLEMS OF POLAR RESEARCH:

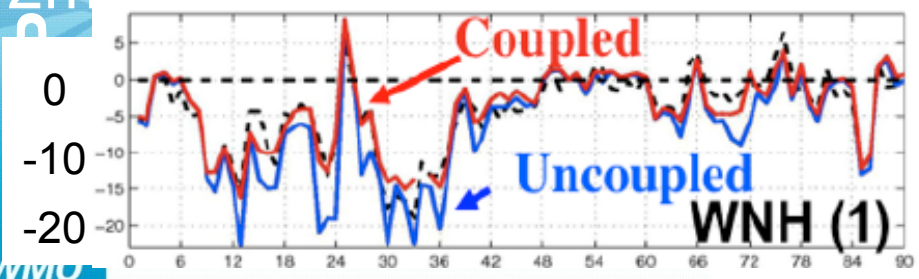
Insufficient knowledge of physical processes



- stable boundary layers
- polar clouds and precipitation
- sea ice/ocean dynamics
- hydrology
- permafrost
- ice sheet dynamics

Strong coupling of atmosphere, land, ice, and ocean

24h forecast,



Regional coupled atmosphere-ocean-ice modelling system (CMC) for the Gulf of St. Lawrence

Faucher (2011)

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Research Areas

Service-oriented Research

Societal and Economic Research Applications (SERA)

Verification

Underpinning Research

Predictability and Diagnostics

Teleconnections

Forecasting System Research

Observations

Modelling

Data Assimilation

Ensemble Forecasting

Polar Verification

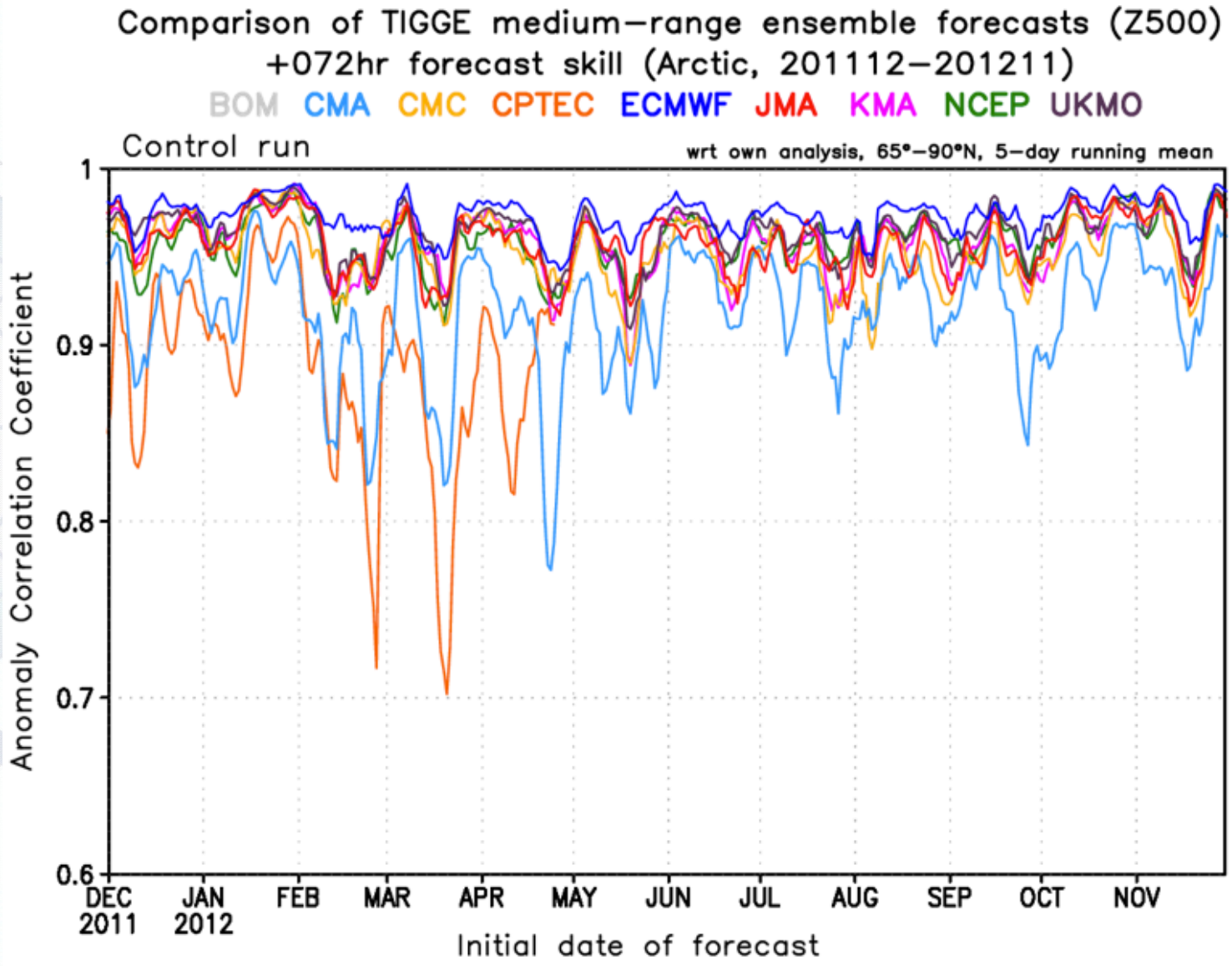


Figure courtesy of Mio Matsueda (Univ. Oxford, JMA)

Year of Polar Prediction (YOPP)

Aims:

- Intensive observational *and* modelling period to advance polar prediction capabilities
- Research into forecast-stakeholder interaction
- Enhanced verification
- Education of students and early career scientists (APECS)

Important:

- Engagement of other committees
- Alignment with other (planned) activities such as MOSAiC

YOPP: Time line

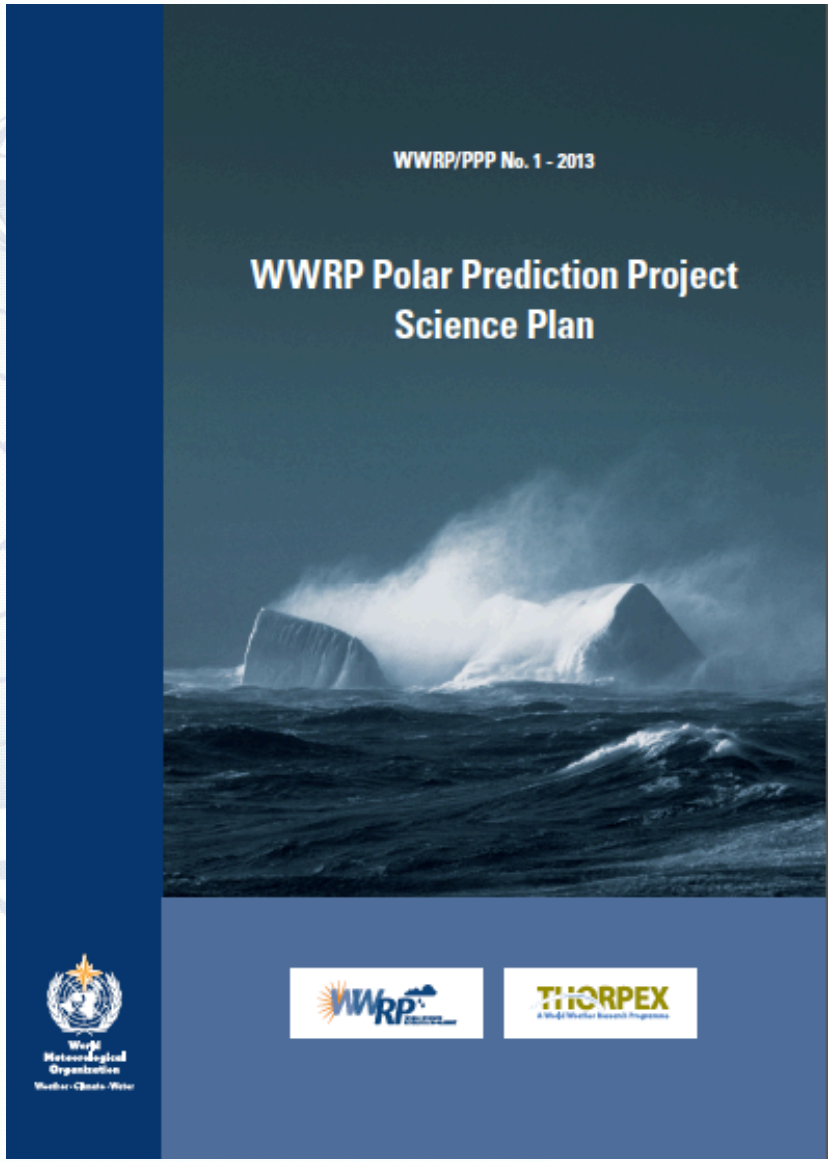
- Community engagement
- Gap analysis
- Implementation plan
- Explore means of funding
- ...

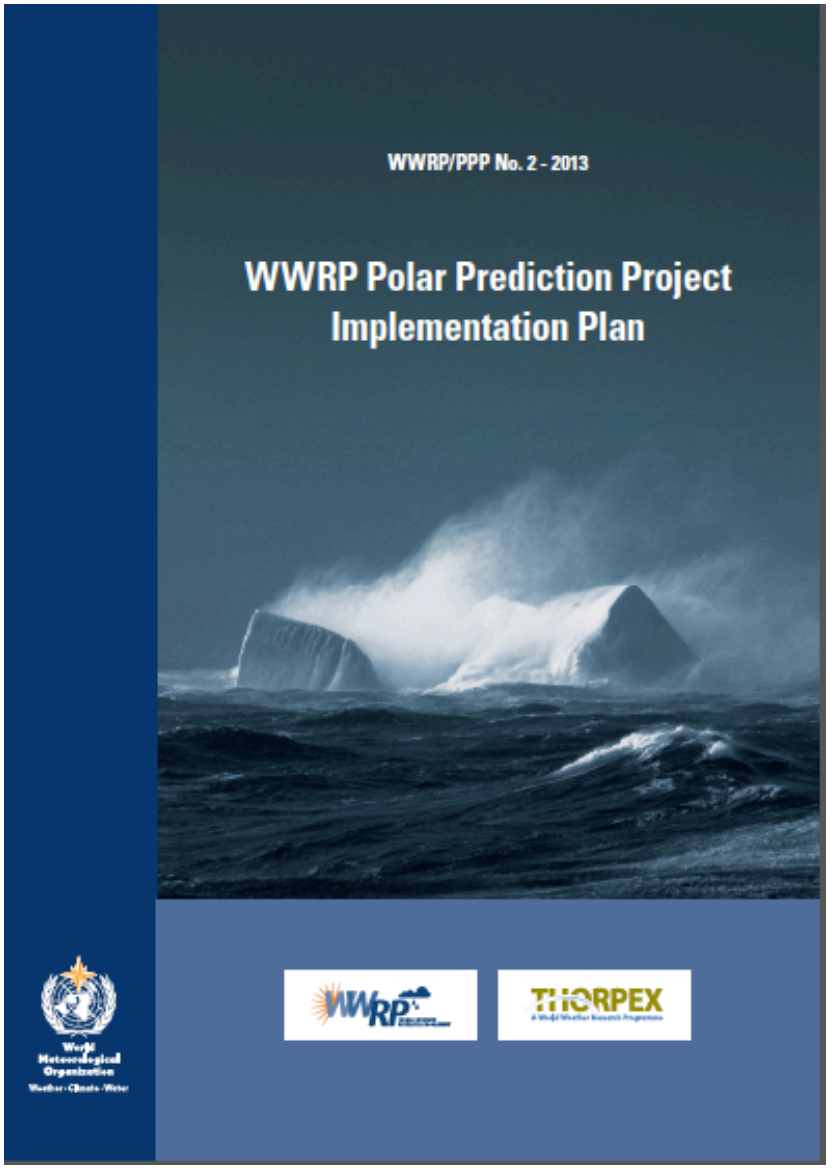
- Data denial experiments
- YOPP special issue
- Establish YOPP data centre
- Operational implementation
- ...

Next steps

Month	Milestones
Jun 2013	Publication of the Implementation Plan and Science Plan
Jun 2013	Launch of the ICO (awaiting approval)
Jun 2013	Launch of PPP website
Jun 2013	ECMWF-WWRP/THORPEX Polar Prediction Workshop
Jun 2013	1st YOPP planning meeting
Oct 2013	4th PPP steering committee meeting

WWRP-PPP Plans





WCRP Polar Climate Predictability Initiative and WWRP

Leads: Ted Shepherd and Cecilia Bitz

Improve knowledge and understanding of past polar climate variability: Julia Jones and Sarah Gille

Assess reanalyses in polar regions: Dave Bromwich and Jim Renwick

Jointly with PPP

Improve understanding: of polar climate predictability: John Fyfe and Ed Hawkins

Jointly with PPP

Assess performance of CMIP5 models in polar regions: Hugues Goosse and Jennifer Key

Model error in polar regions: Gunilla Svensson and Markus Jochum

Jointly with PPP

Improve understanding how jets and non-zonal circulation influences the Southern Hemisphere: Marilyn Raphael and Gareth Marshall

WMO/WWRP/THORPEX World Weather Open Science Conference
17 – 21 August 2014, Montréal, Canada
Scientific Program

The overarching theme of the OSC is ***Seamless Prediction of the Earth System: from minutes to months***. The science presented at the conference will range from basic research that extends our knowledge of processes and methods to the applied research required to put the prediction system together and assess the impacts of weather and climate events.

The scientific program will be organized around five science themes:

- Data Assimilation and Observations;
- Predictability and Dynamical/Physical/Chemical Processes;
- Interactions between sub-systems;
- Prediction of the Earth system: putting it all together;
- Impacts of weather and climate events *(joint session with UPC)*

A particular focus will be given also to major cross cutting themes, such as ensemble prediction.

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International Organizing Committee (IOC) co-chairs: M. Béland and A. Thorpe
Science Programme Committee (SPC):

- ***Co-chairs***
  - Gilbert Brunet (Met Office, UK; gilbert.brunet@metoffice.gov.uk)
  - Sarah Jones (DWD, Germany; Sarah.Jones@dwd.de)
- ***Data Assimilation and Observations***
  - Eugenia Kalnay (U. of Maryland, USA; ekalnay@atmos.umd.edu)
  - Yoshiaki Sato (JMA, Japan; y-sato@met.kishou.go.jp)
  - Roger Saunders (UK; roger.saunders@metoffice.gov.uk)
- ***Predictability and Dynamical/Physical/Chemical Processes***
  - Heini Wernli (ETH, Switzerland; heini.wernli@env.ethz.ch)
  - David Parsons (U. of Oklahoma, USA; dparsons@ou.edu)
- ***Interactions between sub-systems***
  - Andreas Schiller (CSIRO, Australia; andreas.schiller@csiro.au)
  - Gianpaolo Balsamo (ECMWF; gianpaolo.balsamo@ecmw.int)
  - Oystein Hov (NMI, Norway; oysteinh@met.no)
- ***Prediction of the Earth system: putting it all together***
  - Philippe Bougeault (Météo-France France; Philippe.Bougeault@meteo.fr)
  - Beth Ebert (BOM, Australia; e.ebert@bom.gov.au)
  - Martin Miller (ECMWF, UK; Martin.Miller@ecmwf.int)
  - Marty Ralph (ESRL, USA; marty.ralph@noaa.gov)
- ***Impacts of weather and climate events (joint session with UPC)***
  - Johnny Chan (U. of Hong Kong, China; johnny.chan@cityu.edu.hk)
  - Walter Dabbert (Vaisala Inc., USA; Walter.Dabberdt@vaisala.com)

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Thank you!
Merci!