Polar Prediction

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Why *Polar Prediction*?

AWI

HELMHOLTZ GEMEINSCHAFT

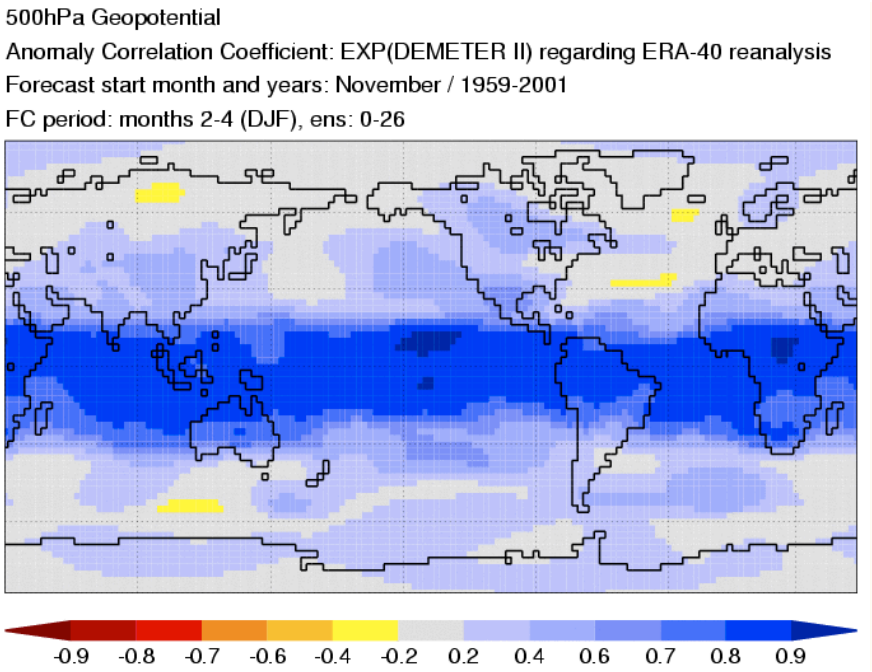
Why *Polar Prediction*?

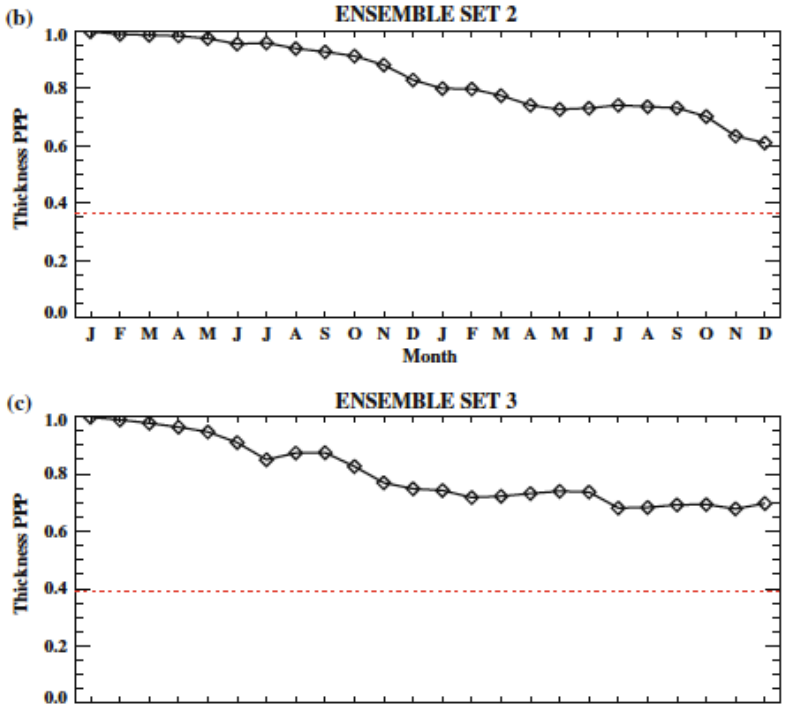
- Growing demand for prediction services in the polar regions

Example: Route planning

Why *Polar Prediction*?

- Growing demand for prediction services in the polar regions
- Relative lack of (operational) *polar prediction systems*





Holland et al. (2009)

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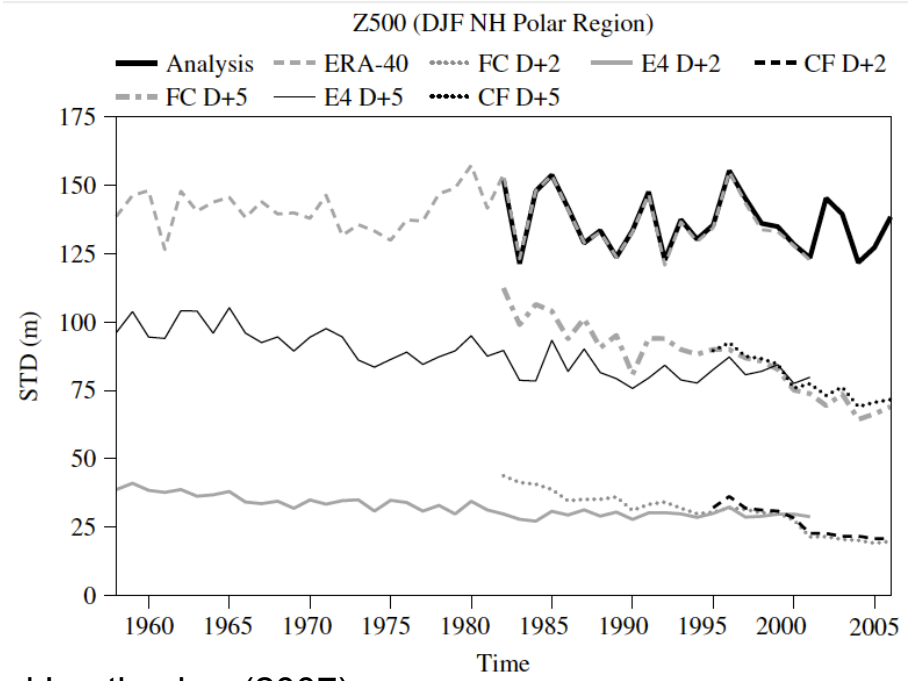
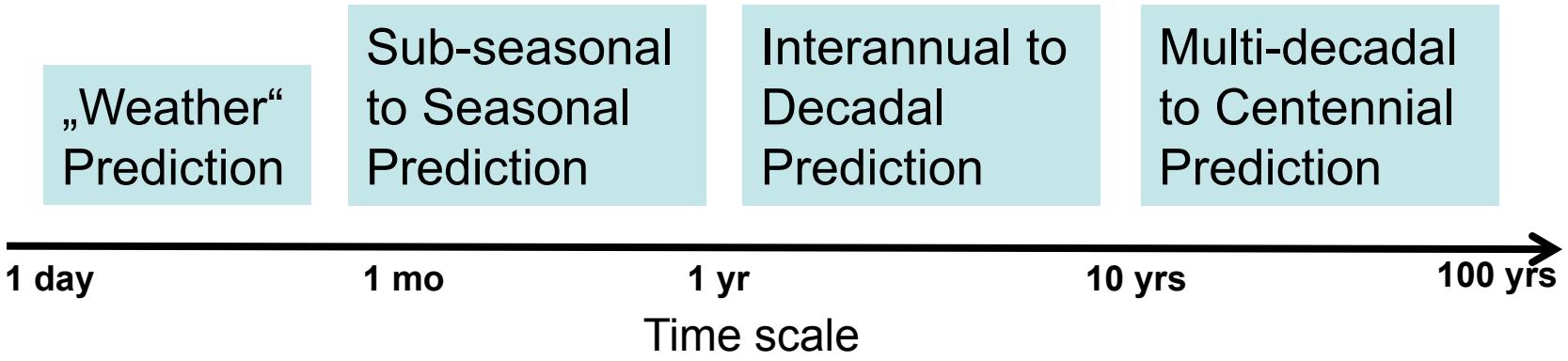


Jung and Leutbecher (2007)

Why *Polar Prediction*?

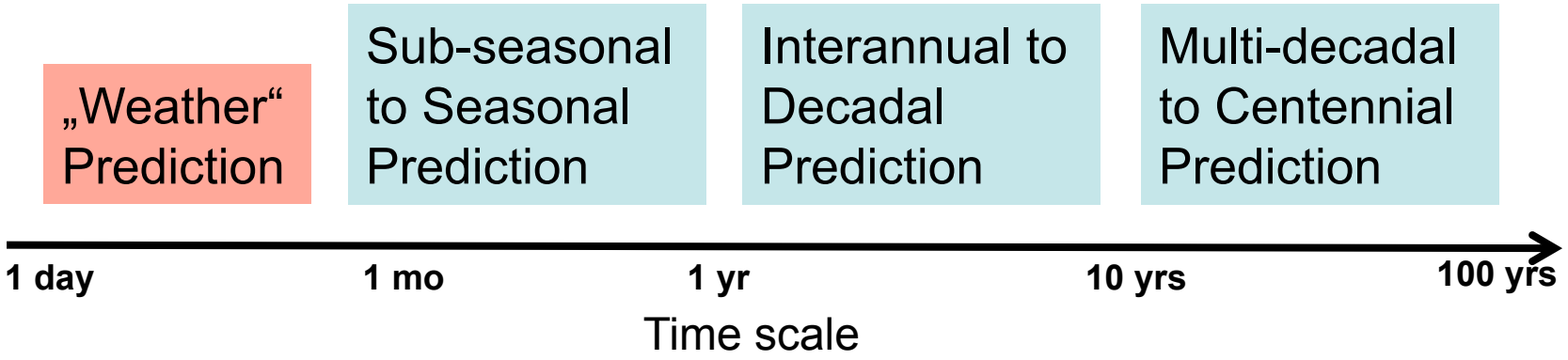
- Growing demand for prediction services in the polar regions
- Relative lack of (operational) *polar prediction systems*
- Exciting scientific challenges
  - Observing system development
  - Understanding (processes, teleconnections, predictability=instabilities+structure of imperfections, ...)
  - Model development
- Polar prediction naturally brings together different communities
- Growing interest at an international level (WWRP Polar Prediction Project, WCRP Polar Predictability Initiative etc.)

Polar Prediction: Time scales



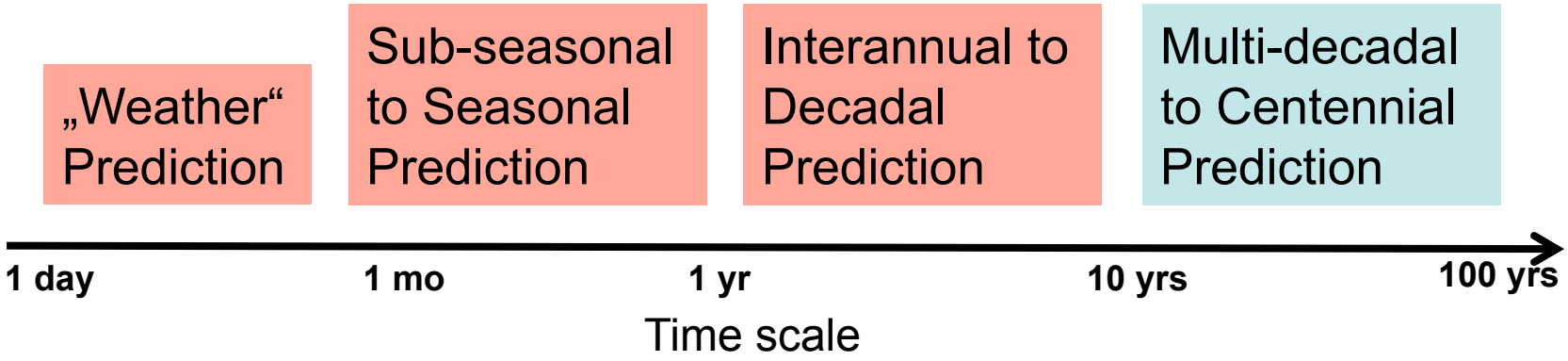
Seamless prediction (processes, tools, ...)

Polar Prediction: Time scales



- Improvement of forecast skill
  - Optimization of the observing system
  - Improved process understanding
  - (Coupled) Model development
  - Data assimilation system development
  - Representation of initial and model uncertainty
- Global linkages
- Strengthen connections with forecast users

Polar Prediction: Time scales



- Determine limits of predictability
- Improvement of forecast skill
  - Optimization of the observing system
  - Improved process understanding
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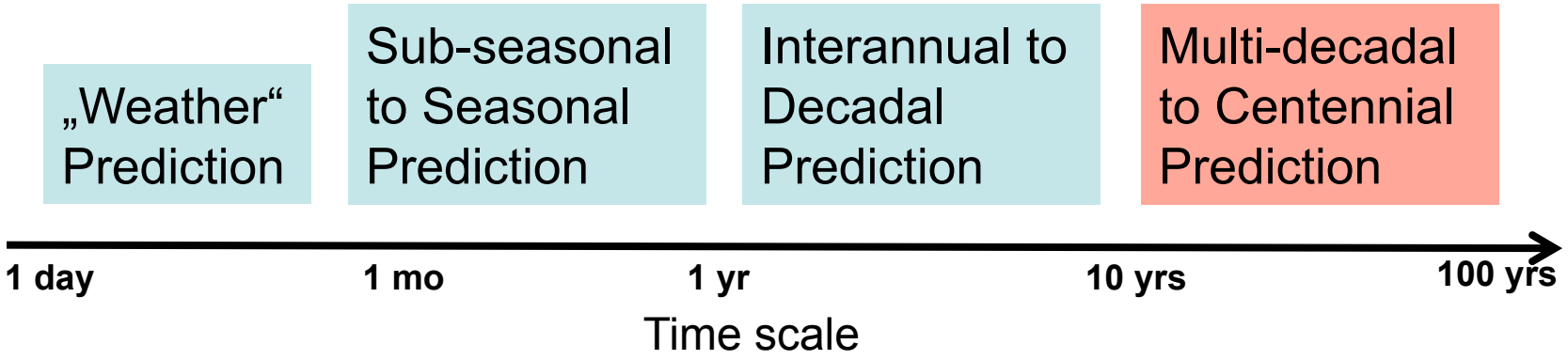
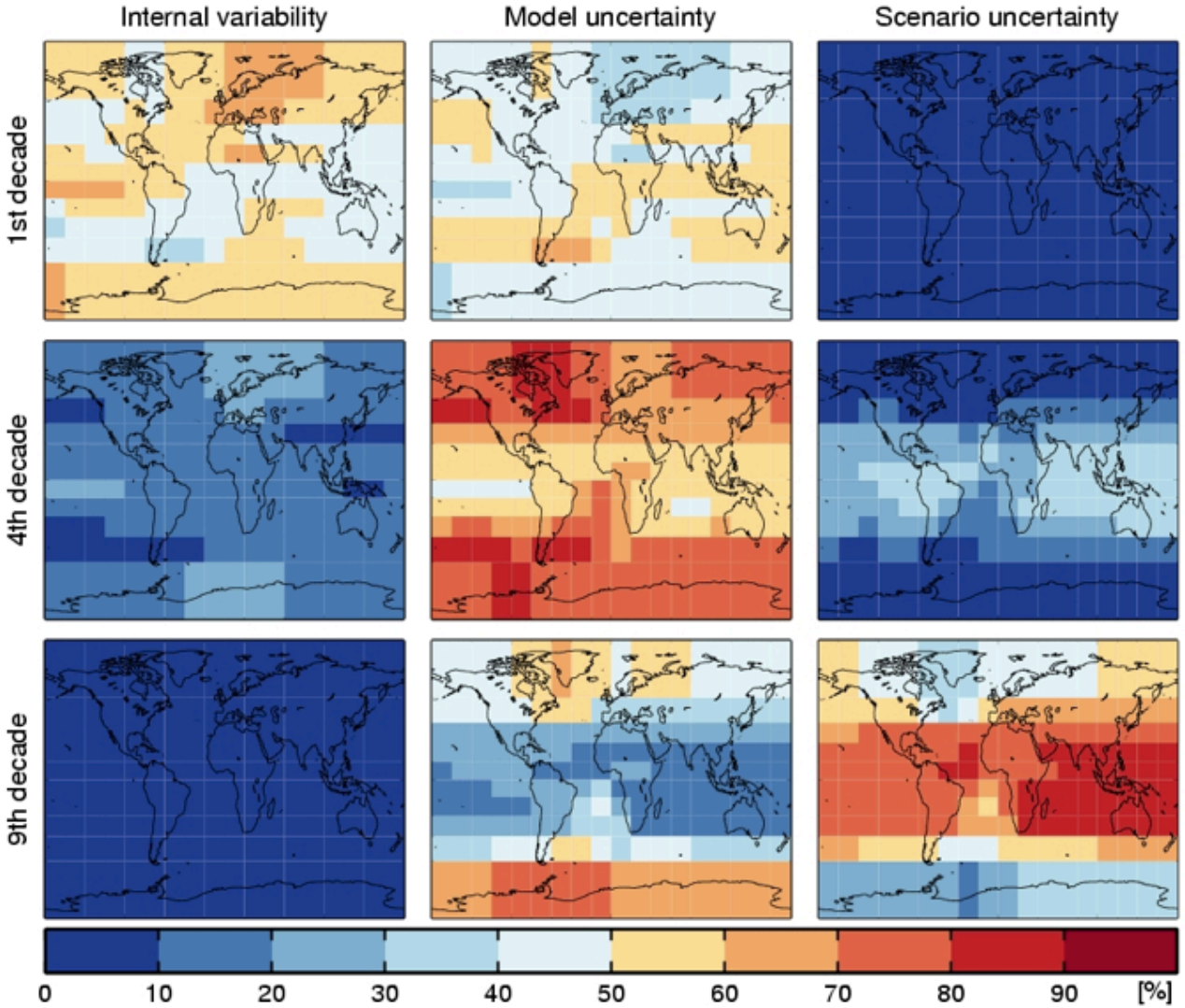
Polar Prediction: Time scales



- Long-term monitoring
- Narrow uncertainty of regional climate change projections
- Global linkages

Uncertainty of regional climate change predictions



Hawkins and Sutton (2009)

International background: GIPPS

AWI

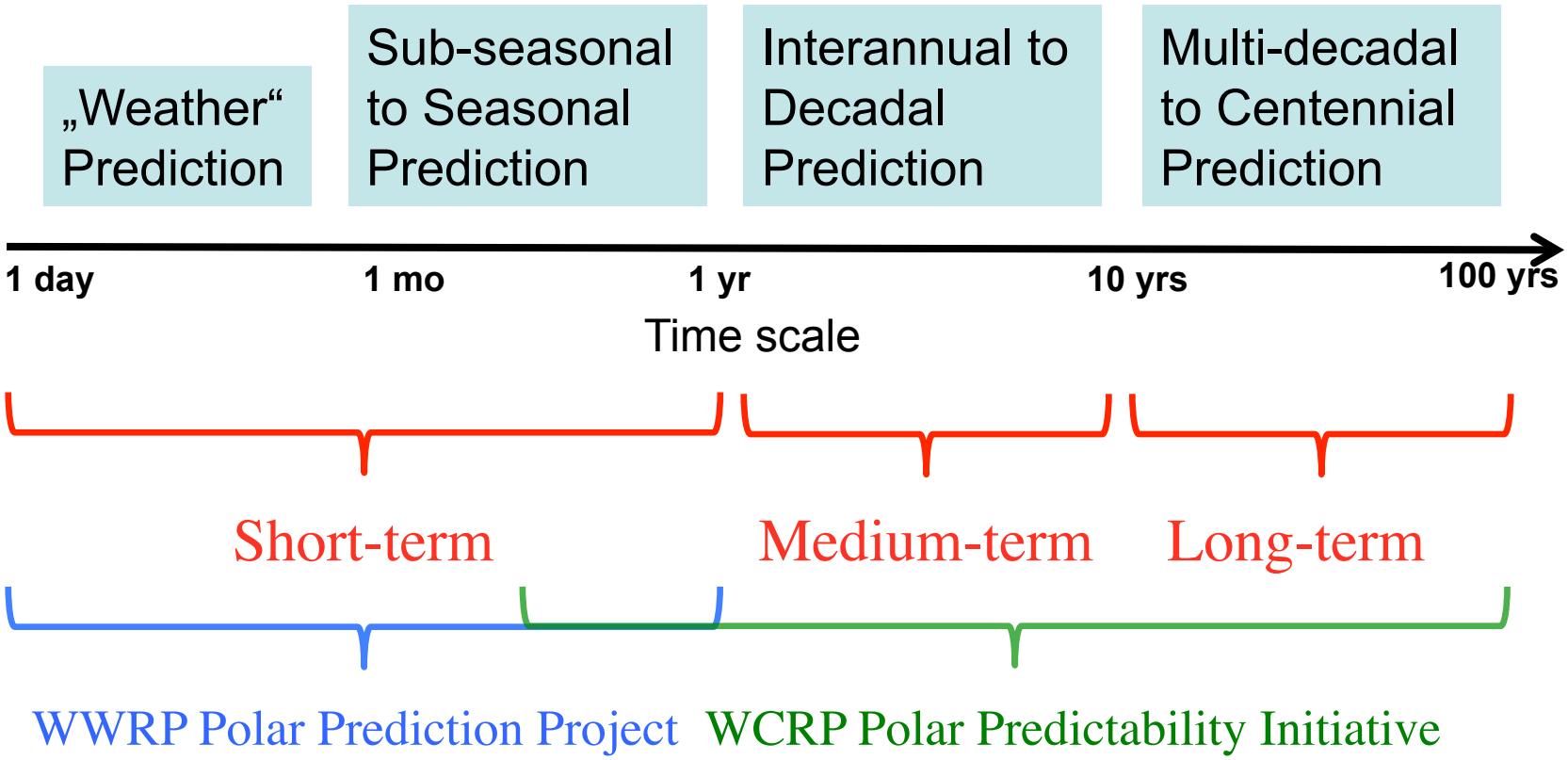
1. Global Integrated Polar Prediction System (GIPPS)

- **"Global": international effort and poles have global influence on systems (weather, climate, biological, chemical etc.)**
- **"Integrated": reflects interconnections between the systems and the System itself will be integrated (research, observations and services)**
- **Approved by Cg-XVI in 2011**

2. EC-PORS:

- **WMO Executive Council Panel of Experts on Polar Observations, Research and Services**
- **Established in 2008 to assist the WMO Executive Council in its oversight of WMO polar activities**

Polar Prediction: GIPPS



Summary

- Polar prediction would be a good research topic
- Focus should be on longer time scales (seasonal and beyond)

Thank you!

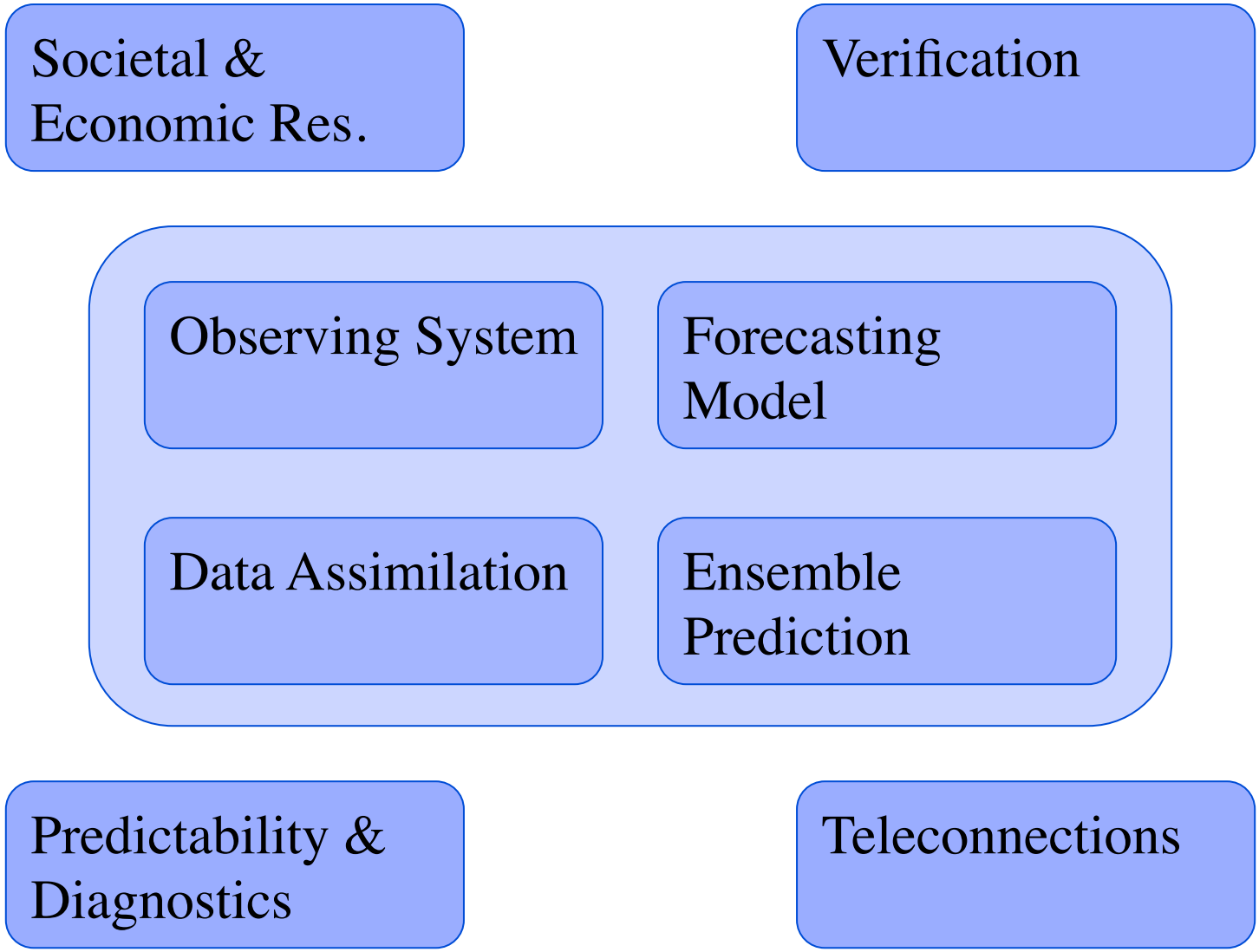
WCRP: Imperatives

- Reconstruct past climate variations (100+ years)
- Improve reanalysis products for the high latitudes
- Optimize, develop, and sustain observational networks
- Improve the climate models that are used for simulating past and future polar climate
- Assess model performance and inform new model development
- Define proper use of models to answer frontier questions
- Improve prediction

WCRP: Frontier questions

- Why are the climates at the two poles changing differently to each other (with the Arctic changing rapidly, and the Antarctic unevenly), and differently to global climate?
- Why are climate models generally unable to capture the observed behaviour in polar regions?
- What does high latitude climate change mean for lower latitudes?
- Do the ongoing amplified changes in the Arctic have an influence on extremes in the Arctic?
- How predictable is Arctic climate?
- Is the stability of ice sheets changing? What is the probability of catastrophic ice sheet breakdown in the next few decades?

Research components



Year of Polar Prediction (YOPP)

- Intensive observational *and* modelling period
- Observations
  - Observing system design
  - Model development
- Numerical experimentation
  - Special data sets (e.g., process tendencies)
  - High-resolution modelling
  - Transpose-AMIP
- SERA: Montoring of forecast use in decision making
- Tentatively scheduled for the period 2017-2018
- Should involve different initiatives

YOPP: Time line

Preparation Phase	YOPP 2017-2018	Consolidation Phase
• Establish planning group • Carry out YOPP planning workshop • Develop strategy • Carry out preparatory research • ...		• Analysis of YOPP data • Operational implementation of YOPP findings • Reanalysis • ...