

Year of Polar Prediction (YOPP): Arctic-midlatitude linkages considered from a prediction perspective

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Part I: Year of Polar Prediction

- In the late 2000s several aspects came together
 - Discussion on the legacy of the International Polar Year (IPY, 2007-2008)
 - Discussion of the future of the World Weather Research Programme (WWRP)
 - Arctic climate was changing rapidly
- *Polar prediction* moved into the focus
- WWRP decided to launch the Polar Prediction Project (2013–2022)
- **Year of Polar Prediction (YOPP)**

YOPP mission statement:

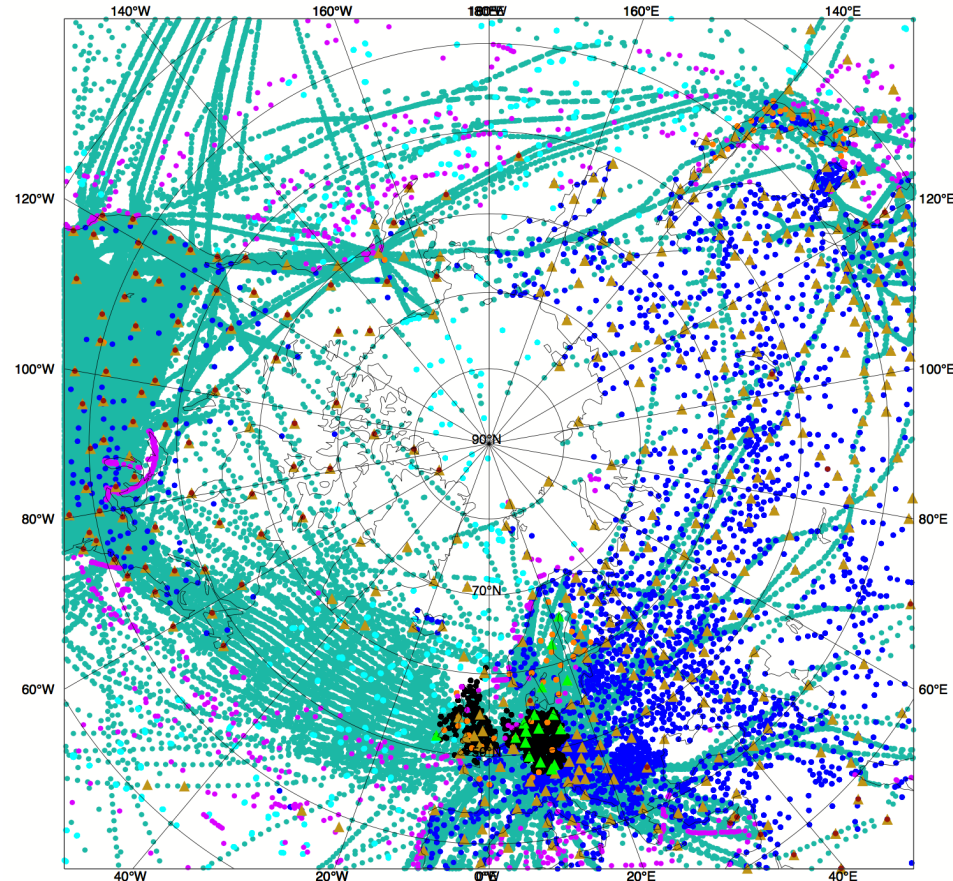
Enable a significant improvement in environmental prediction capabilities for the polar regions and beyond, by coordinating a period of intensive observing, modelling, prediction, verification, user-engagement and education activities.

Arctic amplification of climate change



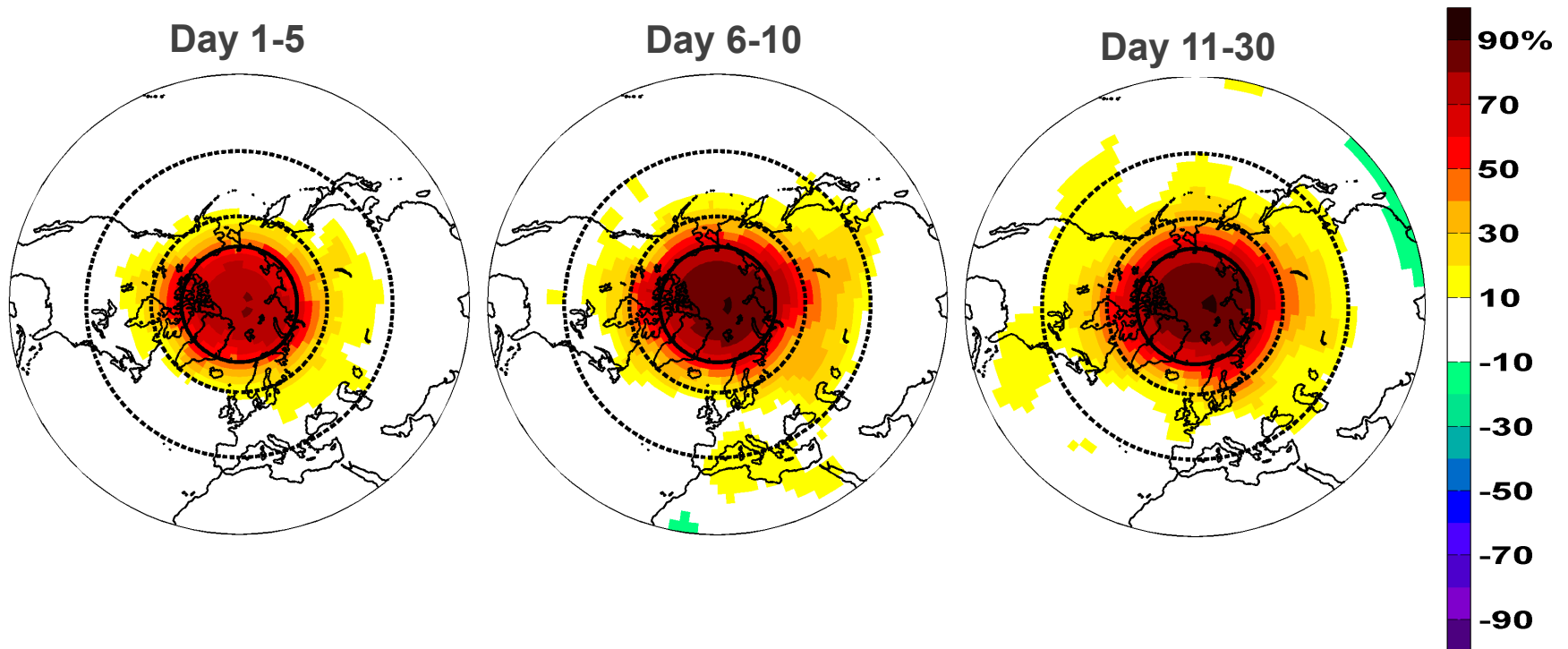
Relatively poor observational coverage

- Synop
- Ship
- Pilot
- ▲ Radiosonde
- ▲ Radiosonde
- Profiler
- Aircraft
- Drifting buoys
- Synop B

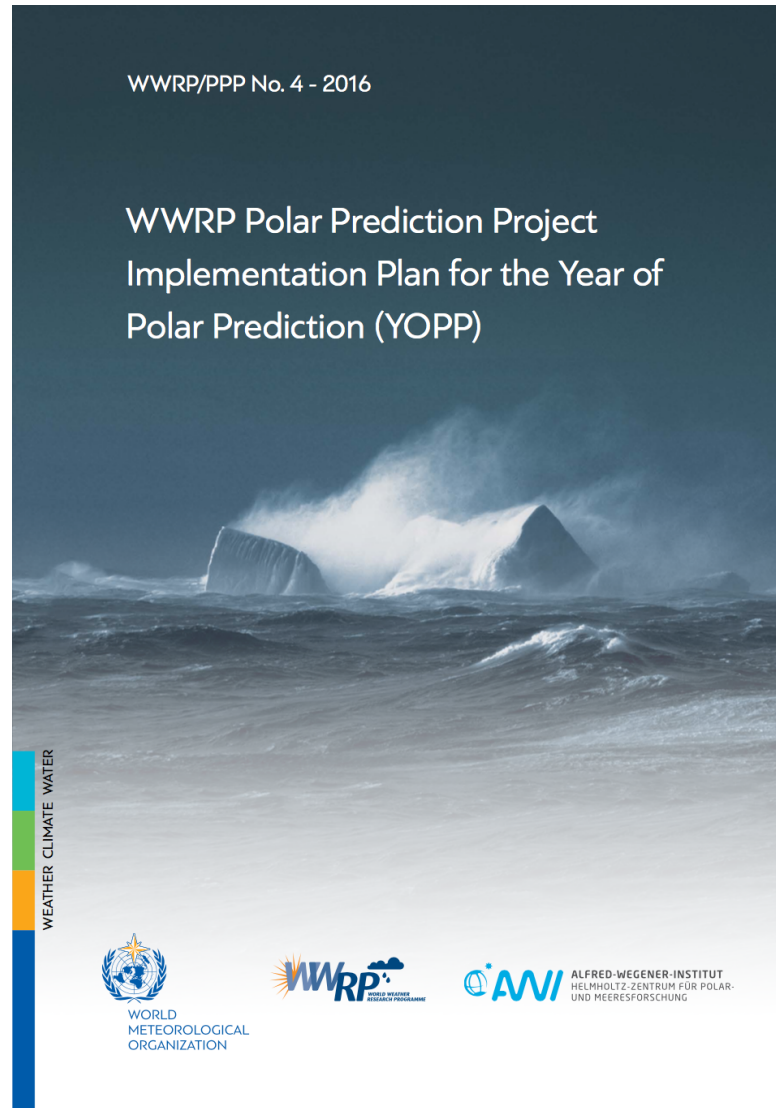


Polar data coverage of conventional observations in the ECMWF operational analysis on 15 April 2015

Implications for predictions in lower latitudes

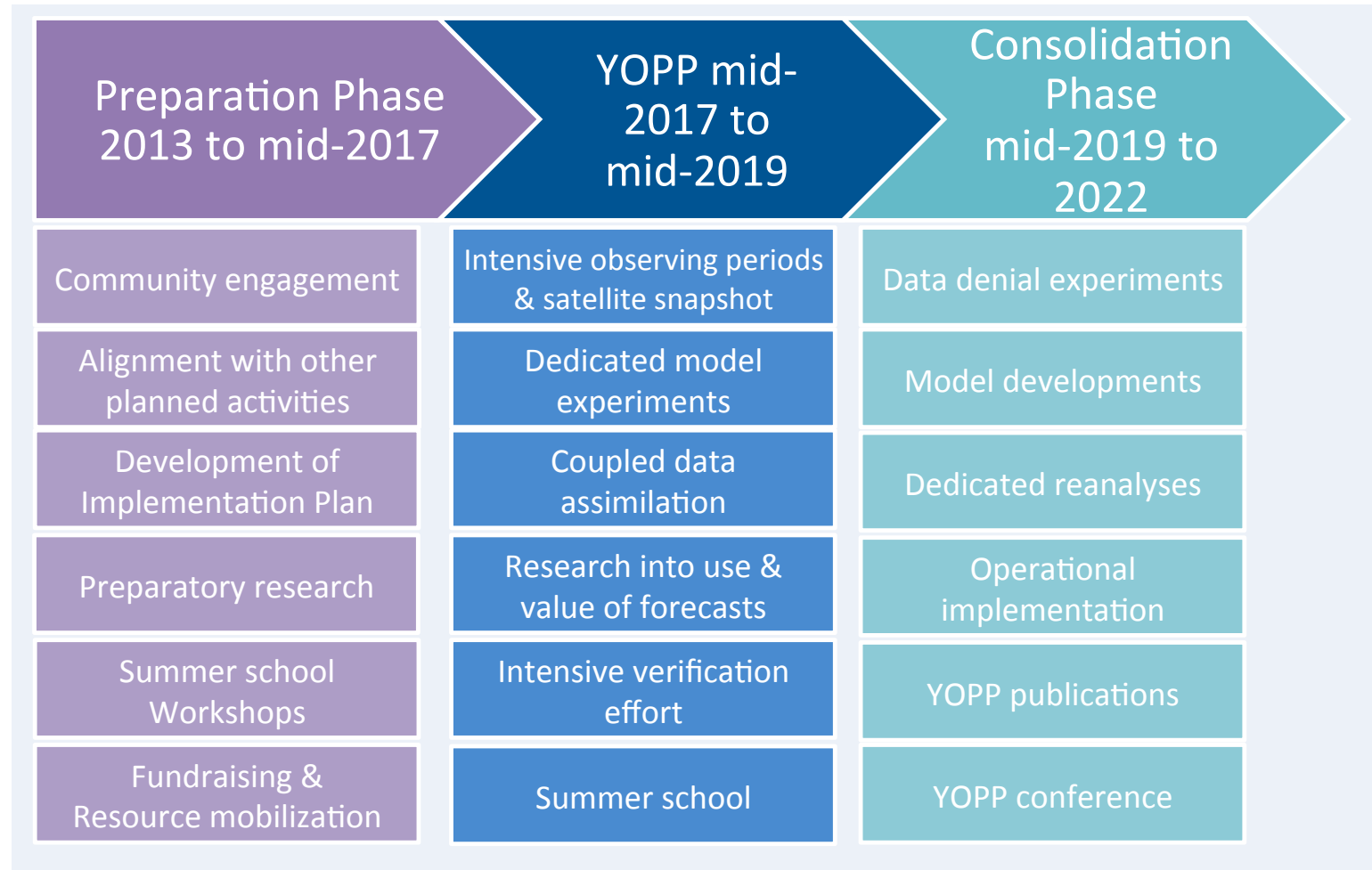


Jung et al. (2014), Geophys. Res. Lett.

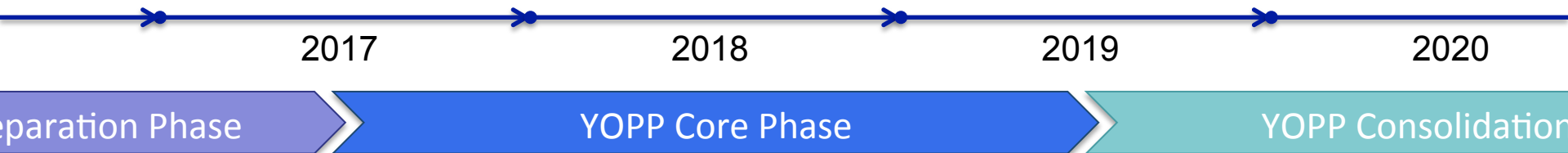
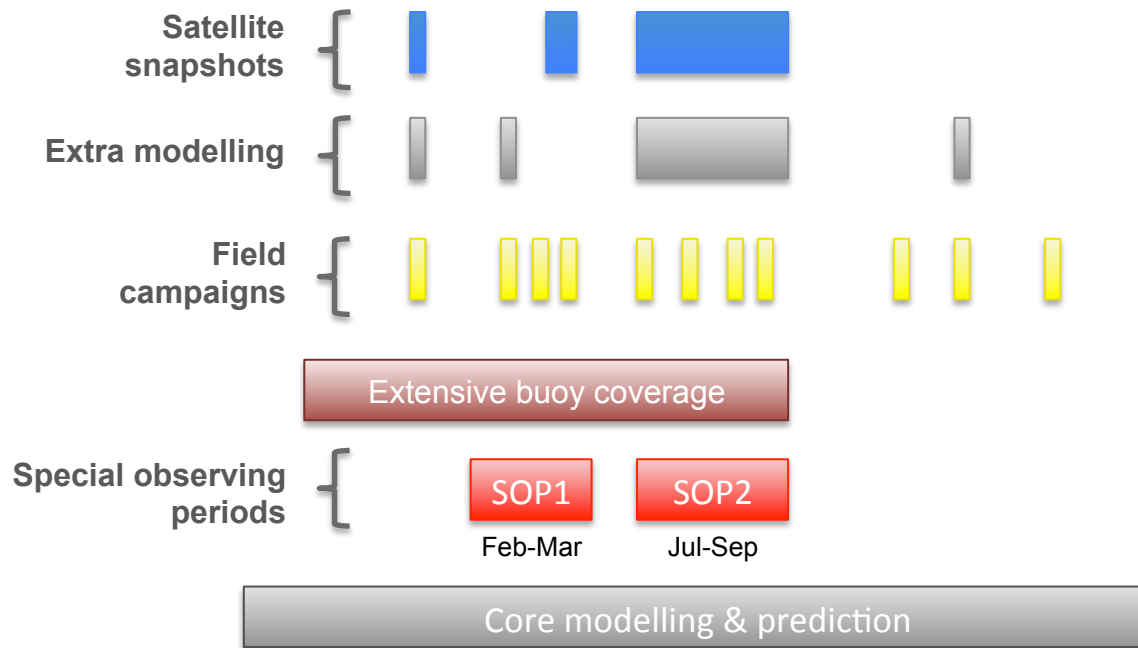


- Improve the polar observing system to provide better coverage of high-quality observations in a cost-effective manner.
- Gather additional observations through field programmes aimed at improving understanding of key polar processes.
- Improve representation of key-processes in uncoupled and coupled models used for prediction.
- Develop improved data assimilation systems that account for challenges in polar regions (e.g. sparse data, steep orography).
- Improve understanding of linkages between polar regions and lower latitudes and assess skill of models representing these.

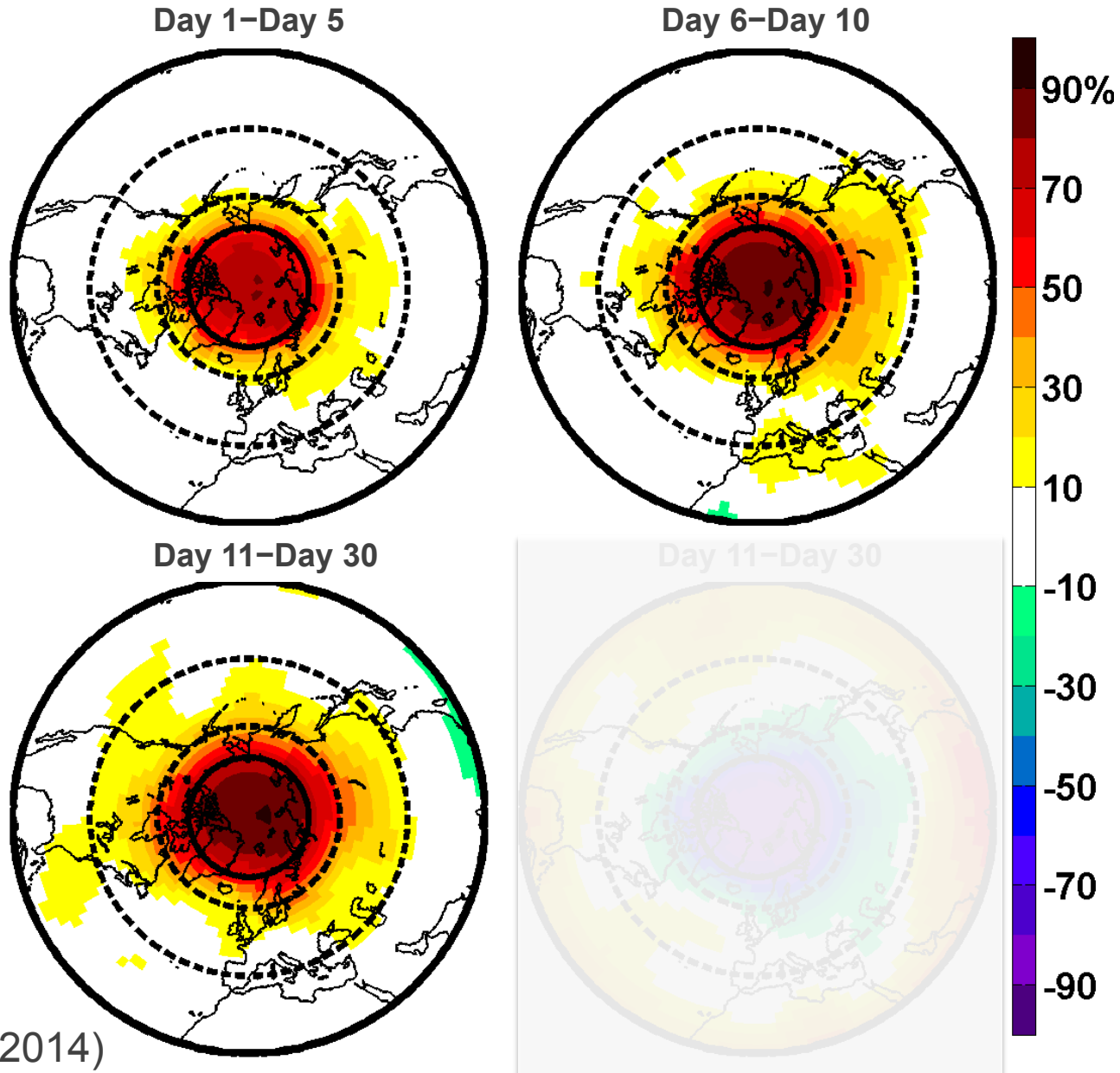
Year of Polar Prediction – Timeline



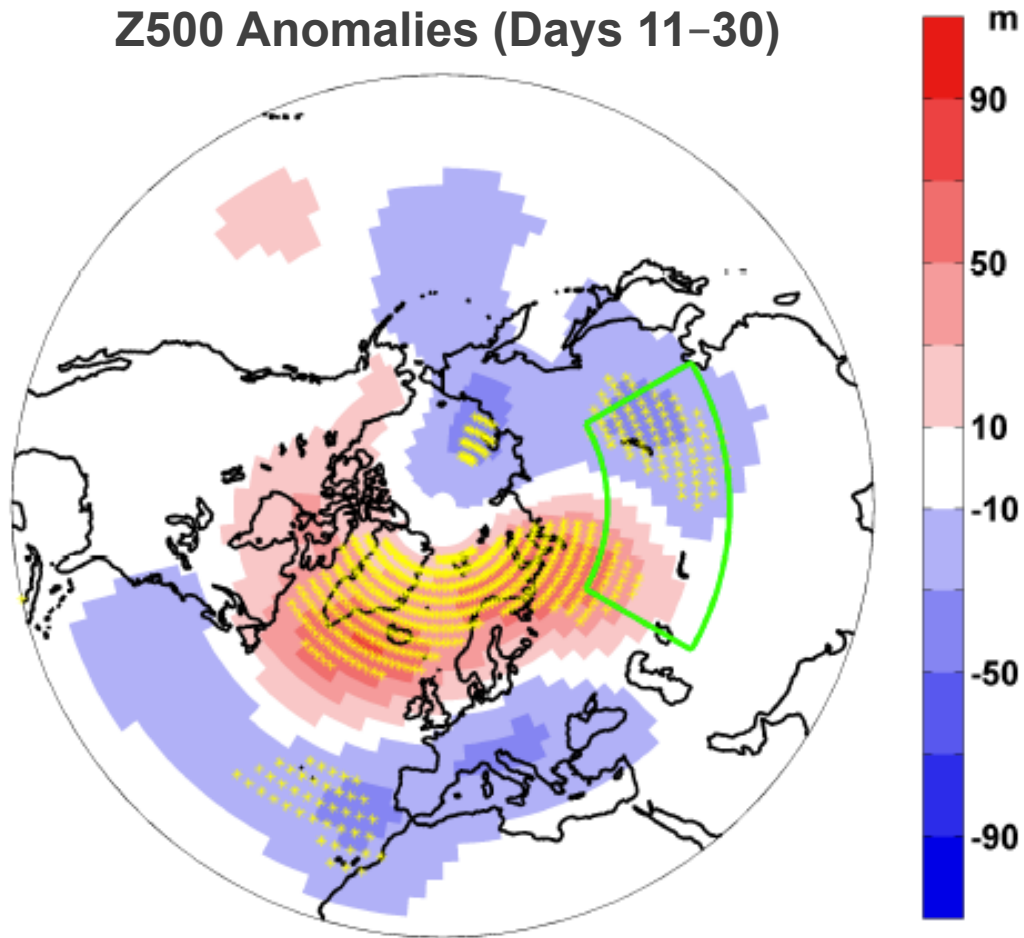
Year of Polar Prediction – Planning



Part II: Arctic-midlatitude linkages considered from a prediction perspective

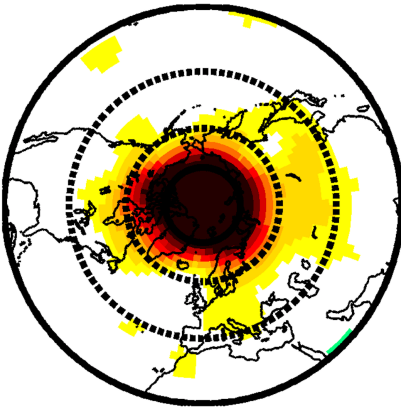


Z500 Anomalies (Days 11–30)

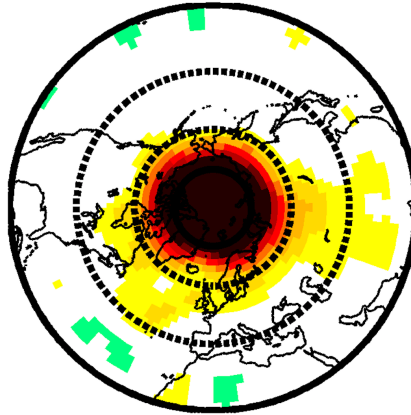


Z500 Forecast Error Reduction (D+8 – D+14)

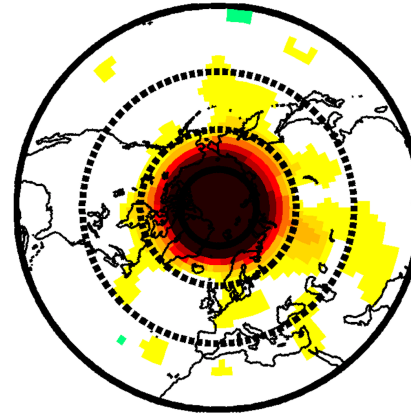
Winter



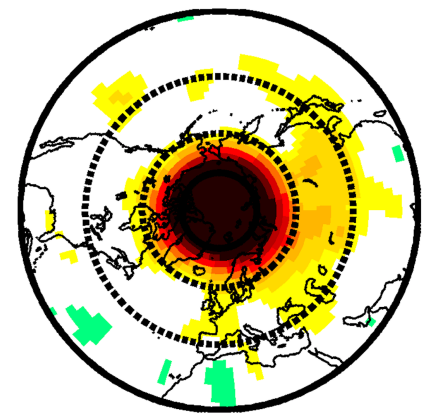
Spring



Summer

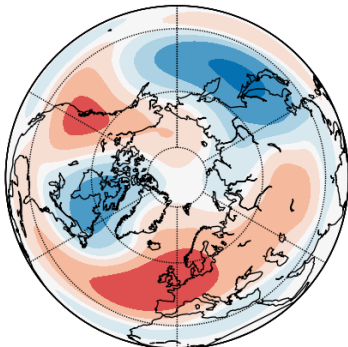


Autumn

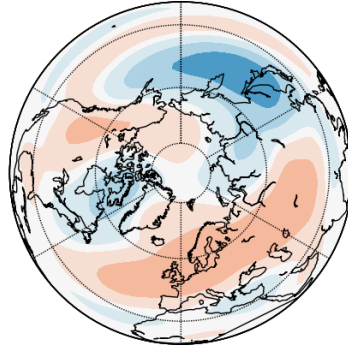


Stationary waves

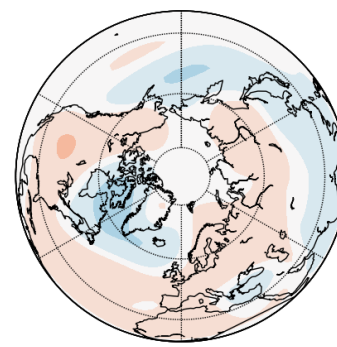
Winter



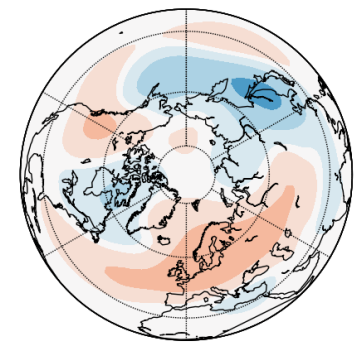
Spring

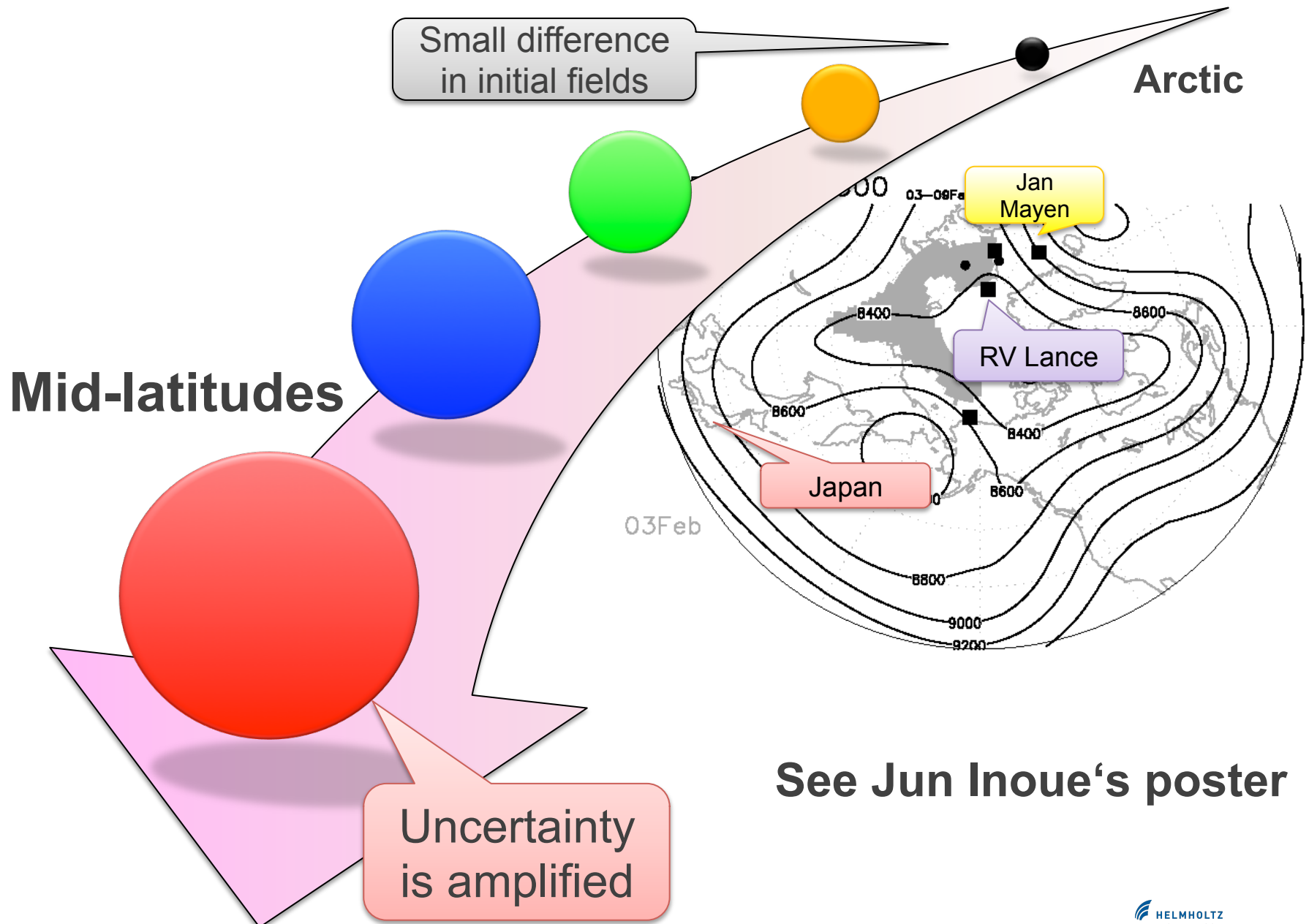


Summer

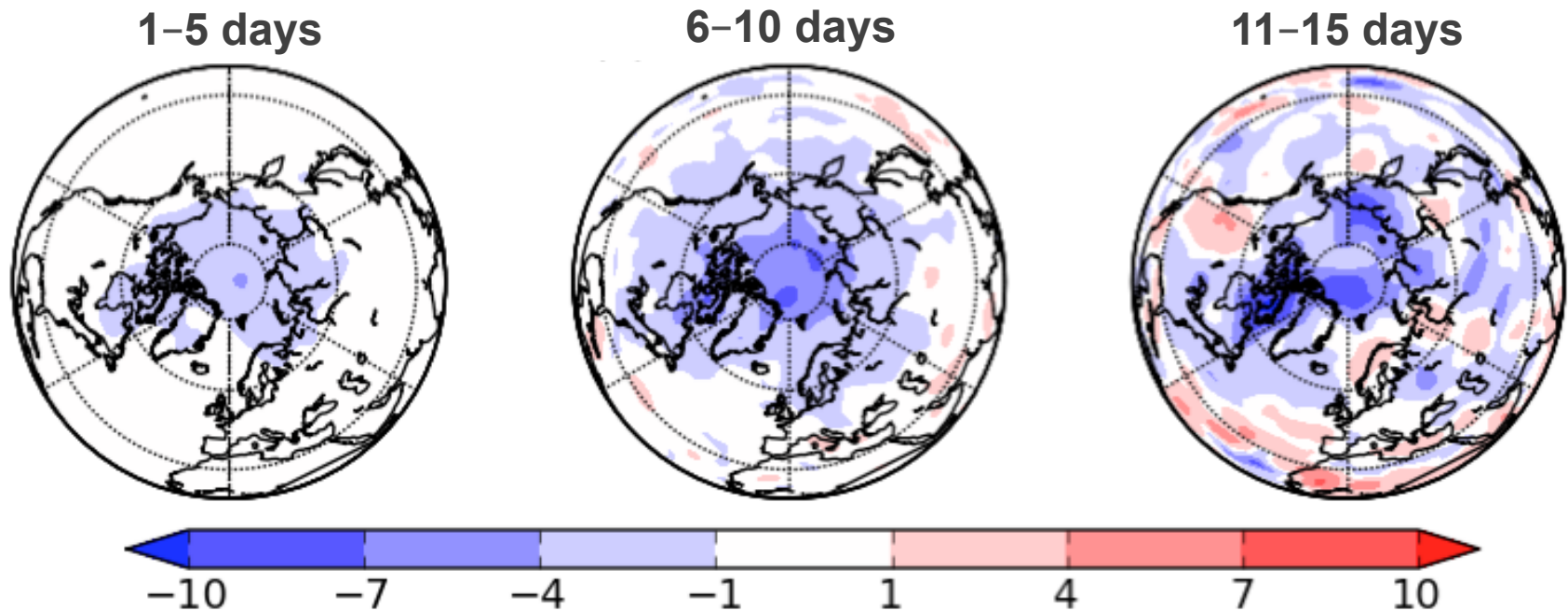


Autumn





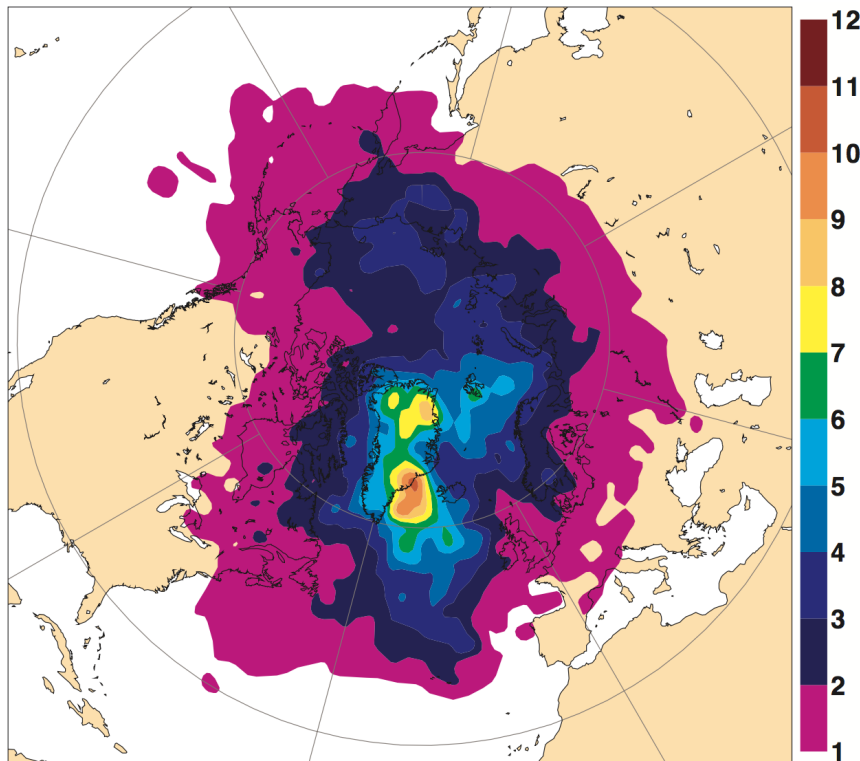
Fast response of synoptic activity to thinner Arctic sea ice



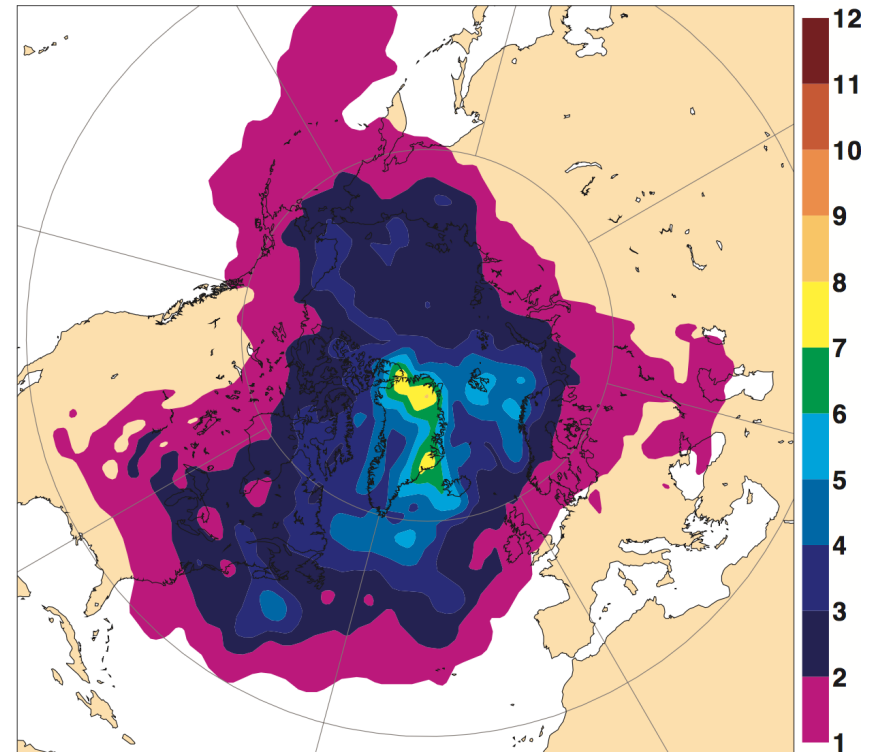
Semmler et al. (2016)

Sensitivity of D+2 forecast error in the Arctic to temperature perturbations of the initial conditions

Dec-Mar 2001/02



Dec-Mar 2004/05



- The Year of Polar Prediction will provide...
 - More and better data (e.g. coupled reanalysis), but not necessarily longer time series
 - Enhanced models
 - A framework for coordinated experimentation
- Prediction experiments provide alternative perspective
 - Focus on atmospheric teleconnections (verifiable)
 - Regional differences in Arctic-midlatitude linkages