



# Blue-Action project

**Yongqi Gao**

HiMAC 2017 - 2017 International Workshop on Observations and  
Understanding of Changes in High Mountain and Cold Regions

3-4 March 2017

Beijing (China)

# H2020 Blue-Action: Arctic Impact on Weather and Climate



## What?

- Blue-Action successfully responded to the BG-10-2016 Arctic call
- Blue-Action builds in part on the legacy of **NACLIM**



## Why?

- To actively improve our ability to describe, model, and predict Arctic climate change and its impact on Northern Hemisphere climate, weather and their extremes.
- To deliver valuated climate services of societal benefit.
- To make a significant contribution to YOPP and AR6.



## How?

- Through synthesising observations, assessing model performance, performing coordinated multi-model sensitivity experiments, developing innovative initialization techniques.

## Who are we?

- We are 40 partners representing science and industry.
- Blue-Action is coordinated by *Steffen M. Olsen* (DMI) and *Daniela Matei* (MPI, co-lead).

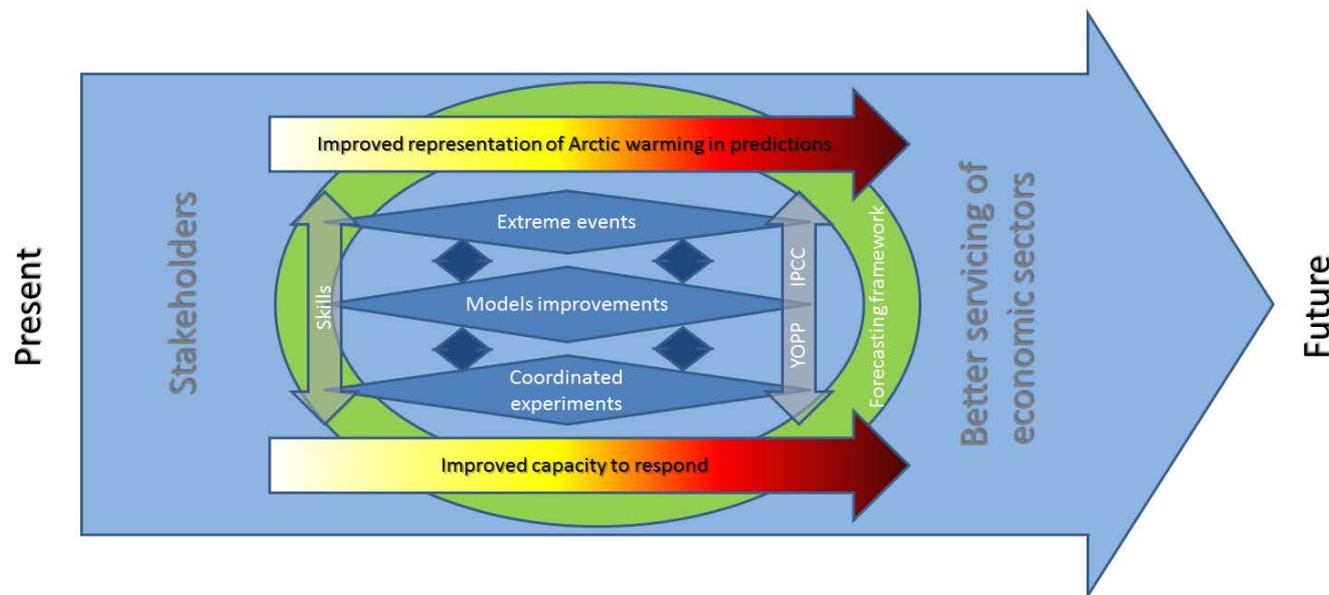
## When?

- Start date 1 December 2016, duration 51 months.
- Kick-off, Harnack-Haus, Berlin 18-20 January 2017!

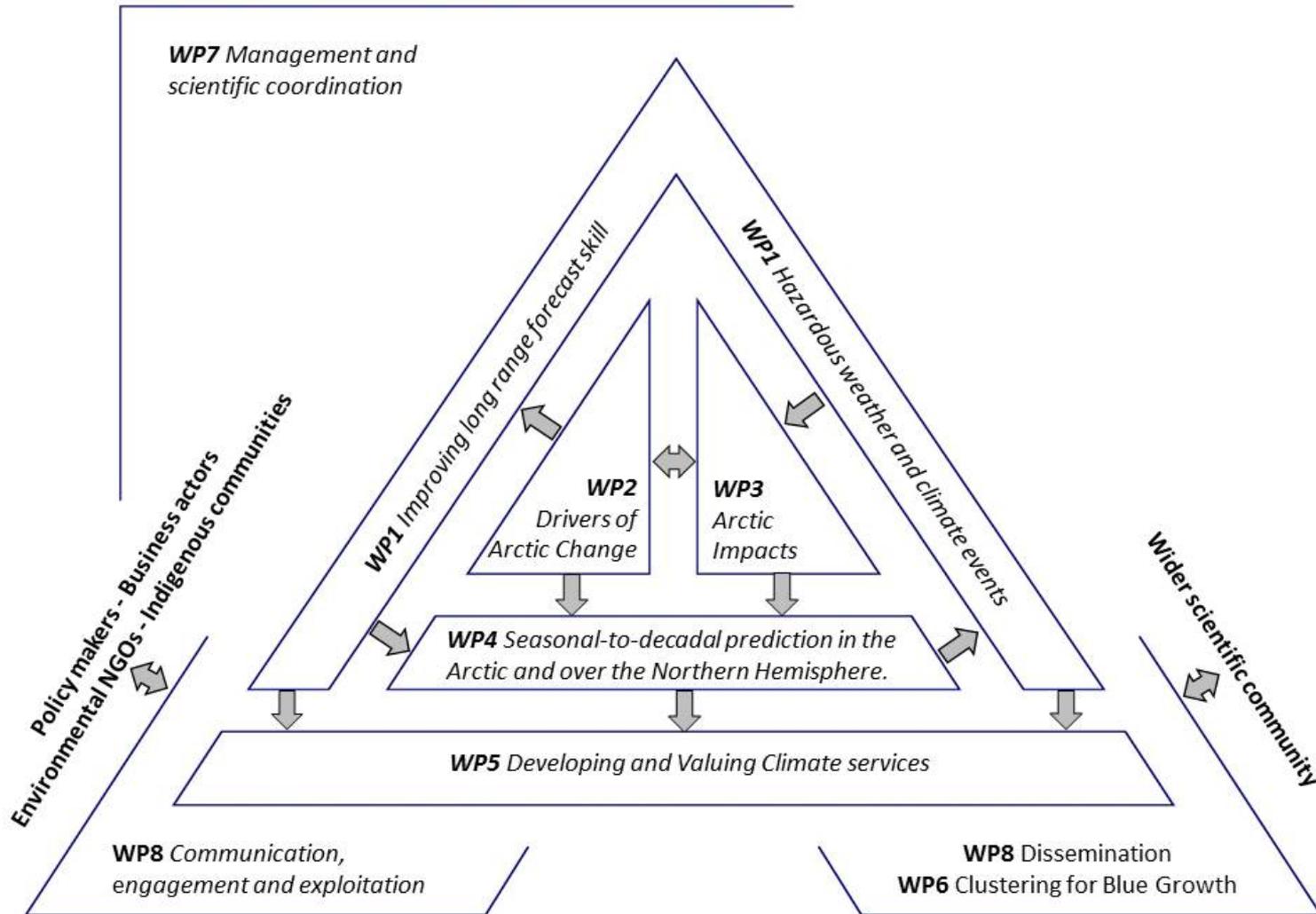
# Overarching Objective

## - The concept

To actively improve our ability to describe, model, and predict Arctic climate change and its impact on Northern Hemisphere climate, weather and their extremes, and to deliver valued climate services of societal benefit.



# Project Structure



## Specific Objectives

- Improving long range forecast skill for high impact weather and climate events
- Enhancing the predictive capacity beyond seasons in the Arctic and the Northern Hemisphere
- Quantifying the impact of recent rapid changes in the Arctic on Northern Hemisphere climate and weather extremes
- Improving the description of key processes controlling the impact of the polar amplification of global warming in prediction systems
- Optimizing observational systems for predictions
- Reducing and evaluating the uncertainty in prediction systems
- Fostering the capacity of key stakeholders to adapt and respond to climate change and boosting their economic growth
- Transferring knowledge to a wide range of interested key stakeholders

# WP1: Improving seasonal long range forecast skill of risks for hazardous weather and climate events

Johanna Baehr, Jens Hesselbjerg Christensen  
Universitaet Hamburg, Danish Meteorological Institute

**Methodology:** To develop and apply novel statistical and dynamical approaches to quantify predictability of weather and climate extremes

## Motivation:

- Extreme or hazardous weather events themselves have low predictability, but the conditions in which they form might be predictable at sub-seasonal-to-seasonal time scales
- ... and these conditions are identifiable in global climate models (e.g., Ramos et al., 2015).
- In addition, future Arctic warming may drive atmospheric and oceanic teleconnections that precondition the occurrence of such extremes providing a degree of predictability (Yang and Christensen, 2012).
- Process-based (seasonal) prediction studies can enhance not only our understanding but also yield higher predictability (Domeisen et al., 2015).

## WP2: Lower latitude drivers of Arctic changes

Karin Margretha H. Larsen, HAV & Gerard McCarthy, NERC/NOC

### Objectives

- Enhancing the predictive capacity beyond seasons
- Assessment of Oceanic anomalies of predictive potential
- Reanalysis to serve as input to WP4 (Enhancing the capacity of s2d prediction)
- Optimizing observational systems
- Near real time data access from TMAs (NAACLIM, AtlantOS, NERC)
- Integrate New Earth Obs. to inflow arrays
  
- Reducing and evaluating the uncertainty in prediction systems
  - Improve simulations of poleward flow (model development)
  - Observations and newest reanalyses products to be compared with climate models

## WP3: Linkages of Arctic climate changes to lower latitudes

Yongqi Gao (NERSC) and Guillaume Gastineau (CNRS)

### Objective:

To investigate the Arctic warming impacts and its modulation by the Atlantic Multi-decadal Oscillation (AMO) and Inter-decadal Pacific Oscillation (IPO) since 1979 using **specifically-designed coordinated multi-model experiments**

**An experimental protocol has been developed for both Atmosphere General Circulation Models and Coupled Climate Models.**

# WP4: Enhancing the capacity of seasonal-to-decadal predictions in the Arctic and over the Northern Hemisphere

Daniela Matei (MPI) and Noel Keenlyside (UiB)

## Motivation:

Observations and ocean, atmosphere, and coupled modelling studies indicate a two-way link between the North Atlantic and Nordic Seas/Arctic that implies:

- a potential for skillful prediction in Nordic Seas and the Arctic
- a potential for enhanced prediction skill in the North Atlantic, and
- a potential for enhanced prediction skill of climate over adjacent continental regions and the Northern Hemisphere on seasonal-to-decadal timescales by better capturing variations in the oceans in both regions and in sea ice.

This apparent prediction potential of Arctic-lower latitude linkages has yet to be explored in a coordinated manner within the **state-of-art multi-model ensemble predictions**.

# WP4: Enhancing the capacity of seasonal-to-decadal predictions in the Arctic and over the Northern Hemisphere

## Goal

- To identify the current limitations in predicting Arctic climate (and its link to NH climate) and
- to develop improved models and methodologies to enhance the skill of initialized climate predictions in the Arctic and over the NH.

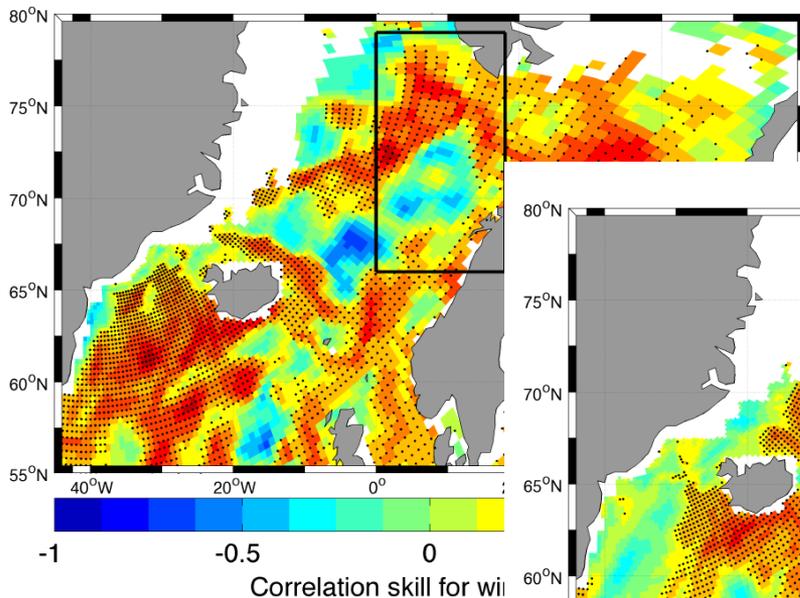
An updated forecast ensemble will be performed with the improved systems and delivered to selected impact case studies.

## Approach

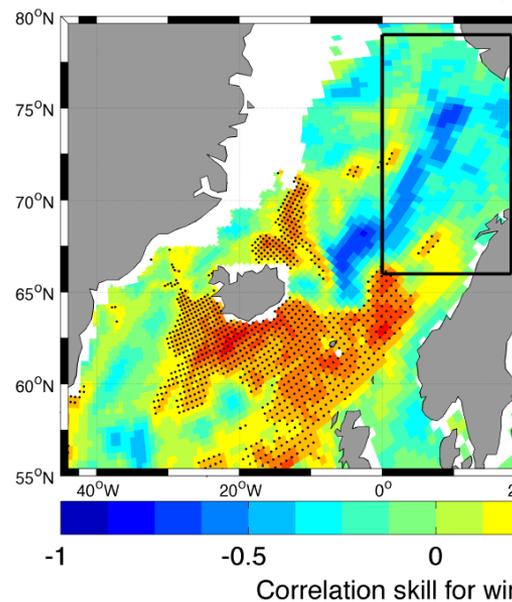
- skill assessment - coordinated experiments - improved model configurations and, - innovative initialization techniques

# Any predictive skill for of winter SST in the Nordic Seas and Barents Sea?

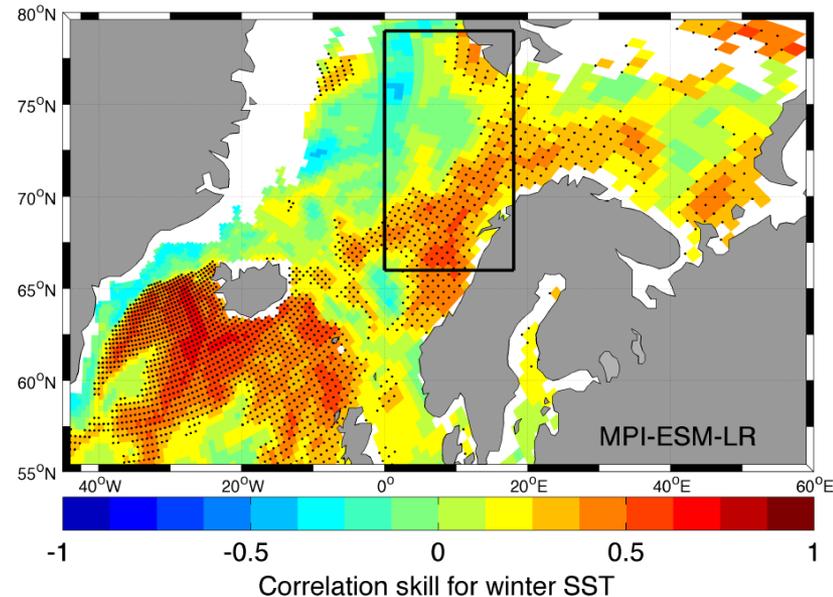
Lead time 1 - 3yrs



Lead time 3 - 5yrs



Lead time 6 - 8yrs



Langehaug et al. (2016)

Yes! – but the predictive skill and representation of mechanisms differ widely among models!

# Belmont/JPI InterDec (2016.08-2020.02)

- The potential of seasonal-to-decadal-scale inter-regional linkages to advance climate predictions



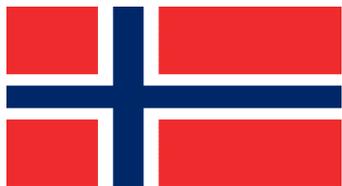
NZC/IAP



MPIM  
GEOMAR



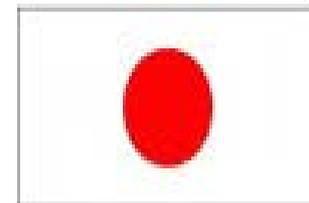
ECMWF  
UoR



NERSC  
UoB



SMHI



UoT  
NU



The Blue-Action project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727852