BLUE ACTION

UNDERSTANDING THE IMPACT OF A CHANGING ARCTIC ON NORTHERN HEMISPHERE WEATHER AND CLIMATE

APPLICATE GA 28 January 2019 @ ECMWF Reading UK

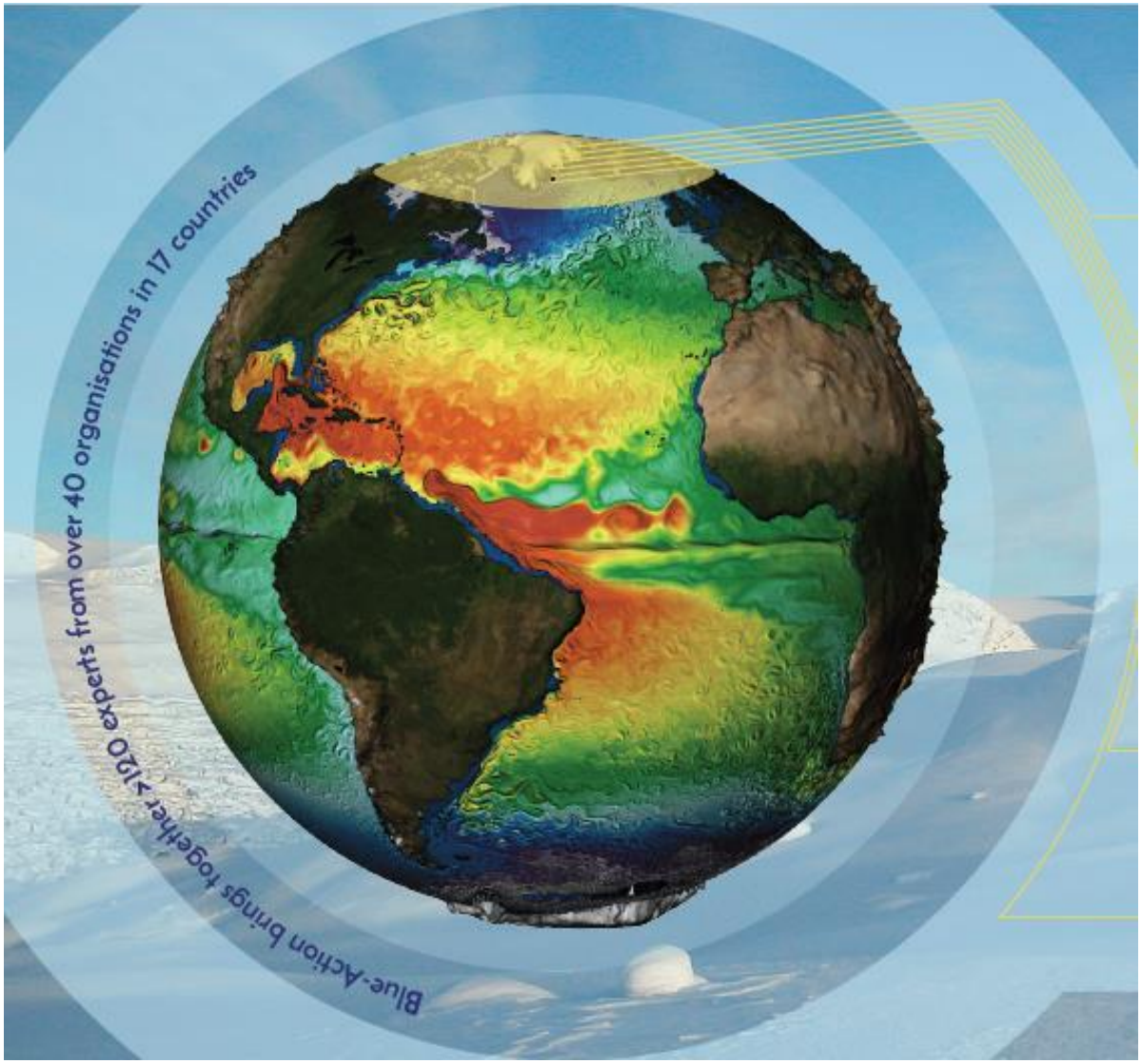
Presented by Steffen M. Olsen

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

www.blue-action.eu

@BG10BlueAction

Blue-Action: An Arctic H2020 Blue Growth RIA



2016-2020

Coordination

Steffen M. Olsen

DMI (lead)

Daniela Matei

MPI (co-lead)

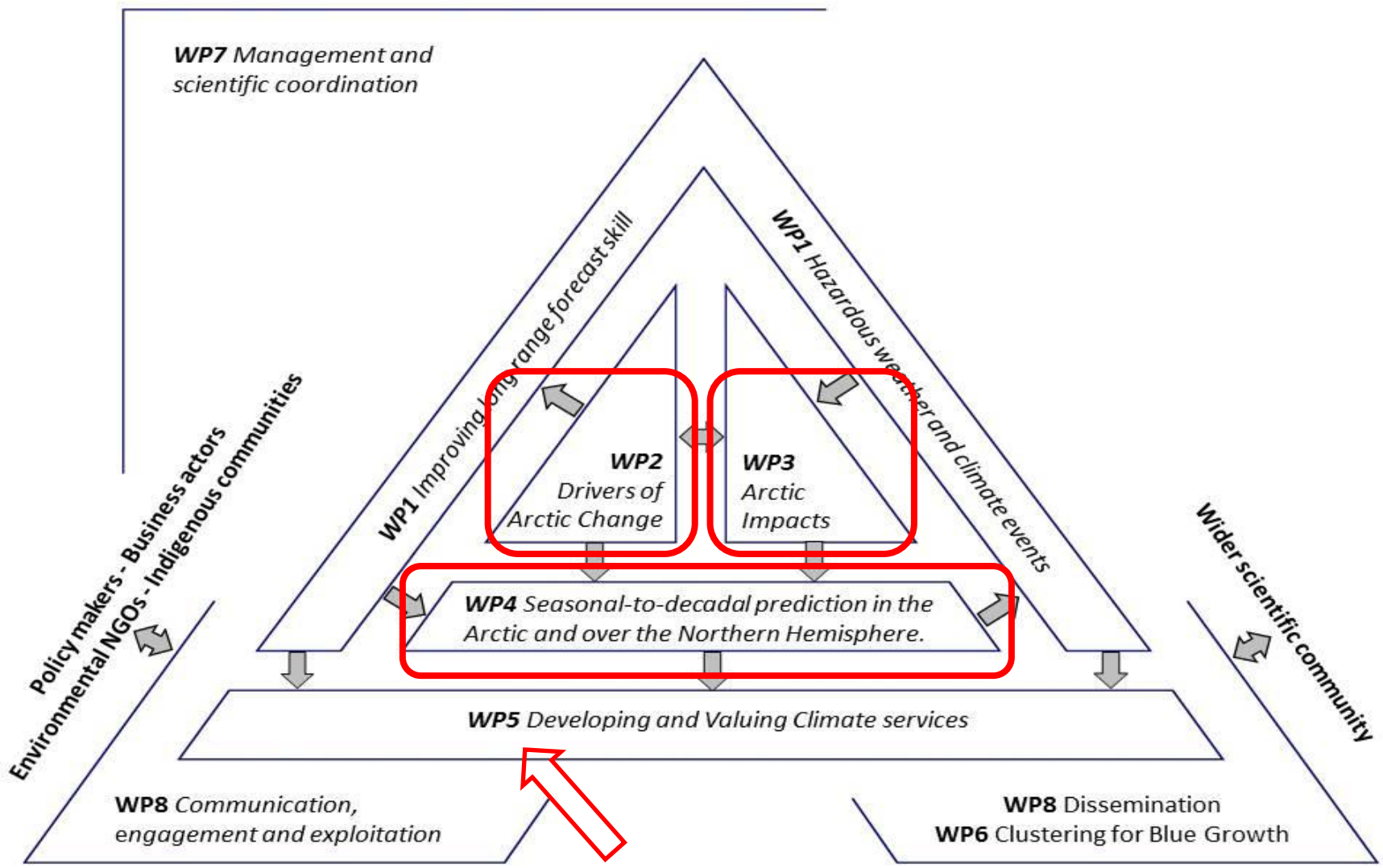
40+ Partners

Science, industry, organizations

Non-EU:

USA, Canada, Russia, China, Korea

Blue-Action project structure



Wednesday, Mark Payne on WP5-WP1

WP4 Research focus 2019-20

Lead: Daniela Matei and Noel Keenlyside

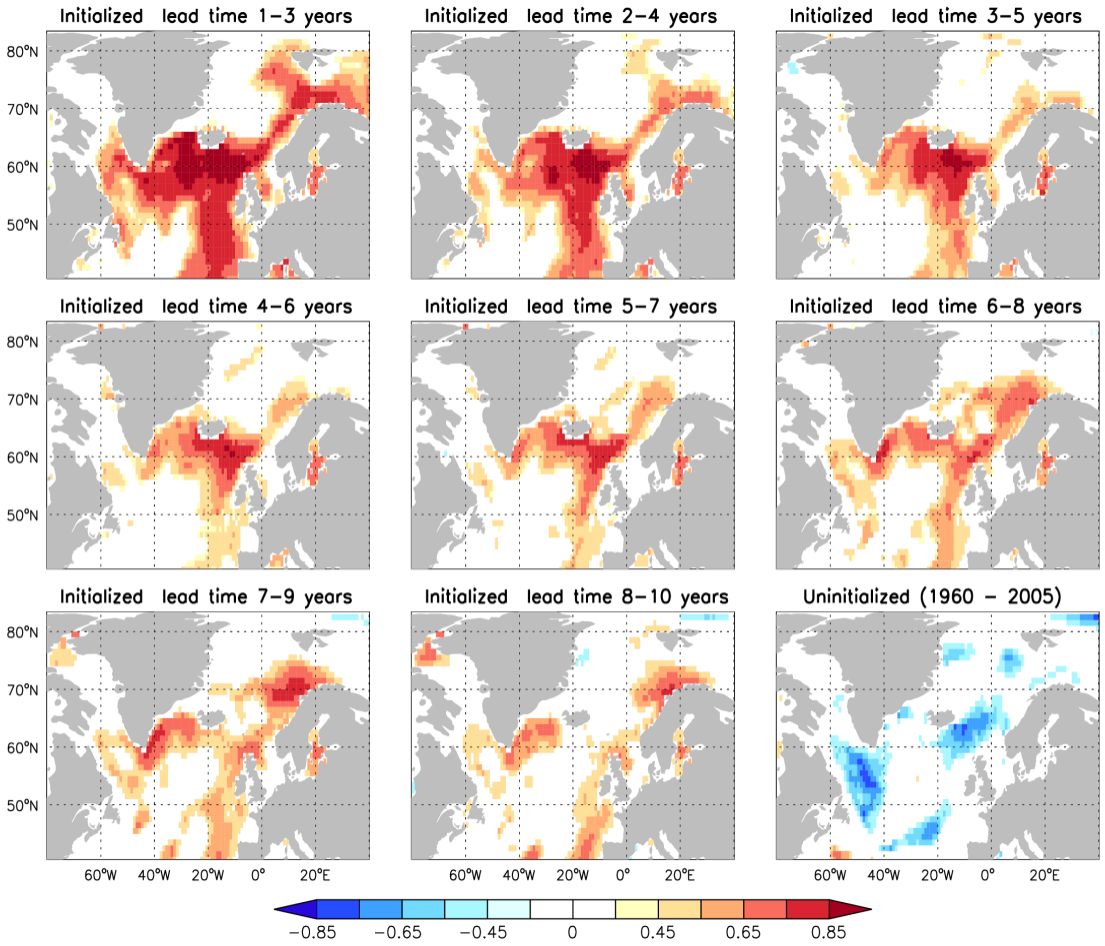
Focus on high-impact climate events on seasonal, interannual to decadal timescales to form multi-model joint predictability studies and pacemaker prediction experiments:

- Case1: Propagation of thermohaline anomalies along the Atlantic water pathway to the Arctic

- Case 2: The 2015 record Cold Blob Anomaly in the North Atlantic SPG region

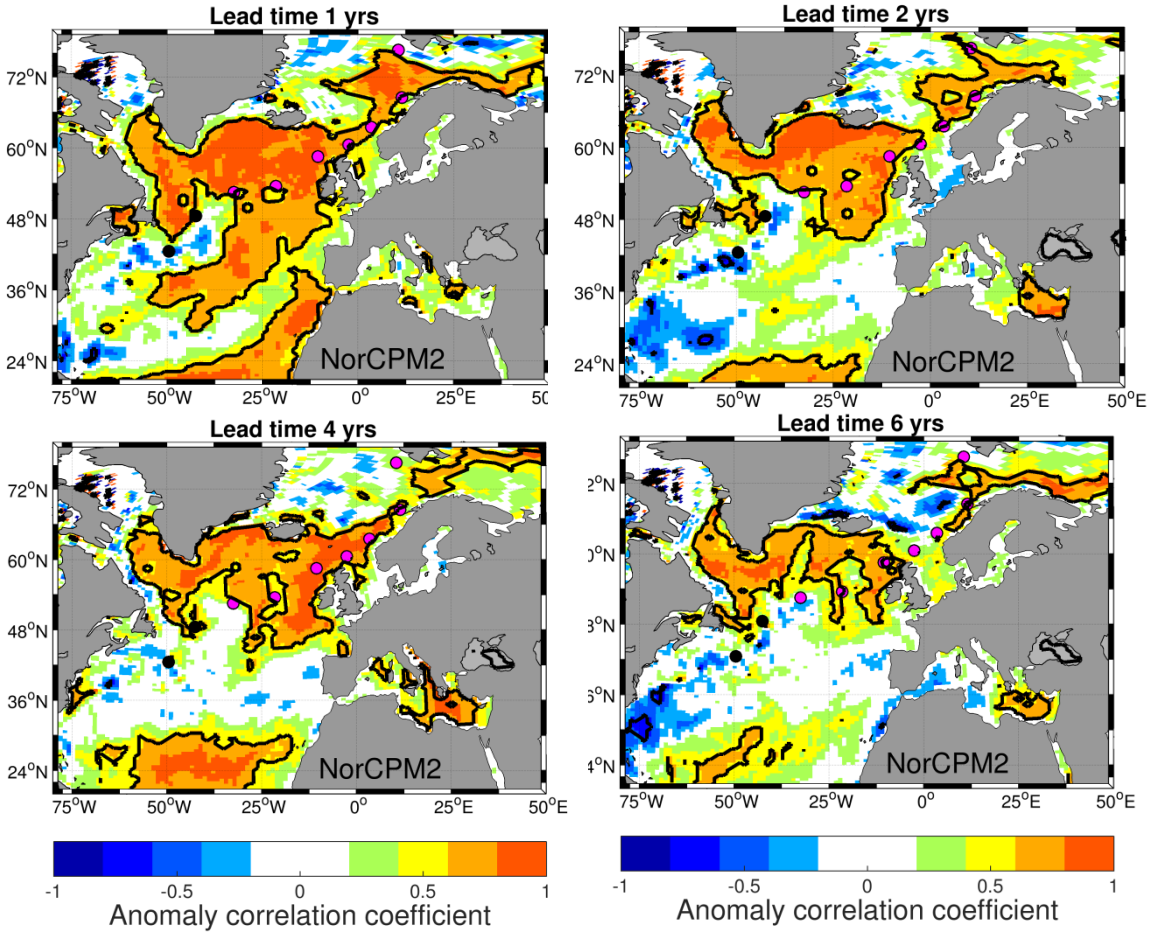
- Case 3: Arctic impacts on atmospheric seasonal variability and predictability

Case 1: Decadal scale predictability of upper-ocean salinity from the North Atlantic SPG into the Barents Sea in the CMIP5 MME



Initialization of ocean circulation key in achieving such an extended predictive capacity (Lohmann et al., 2018)

Decadal predictive skill of temperature along Atlantic water pathway in SPG and Nordic Seas

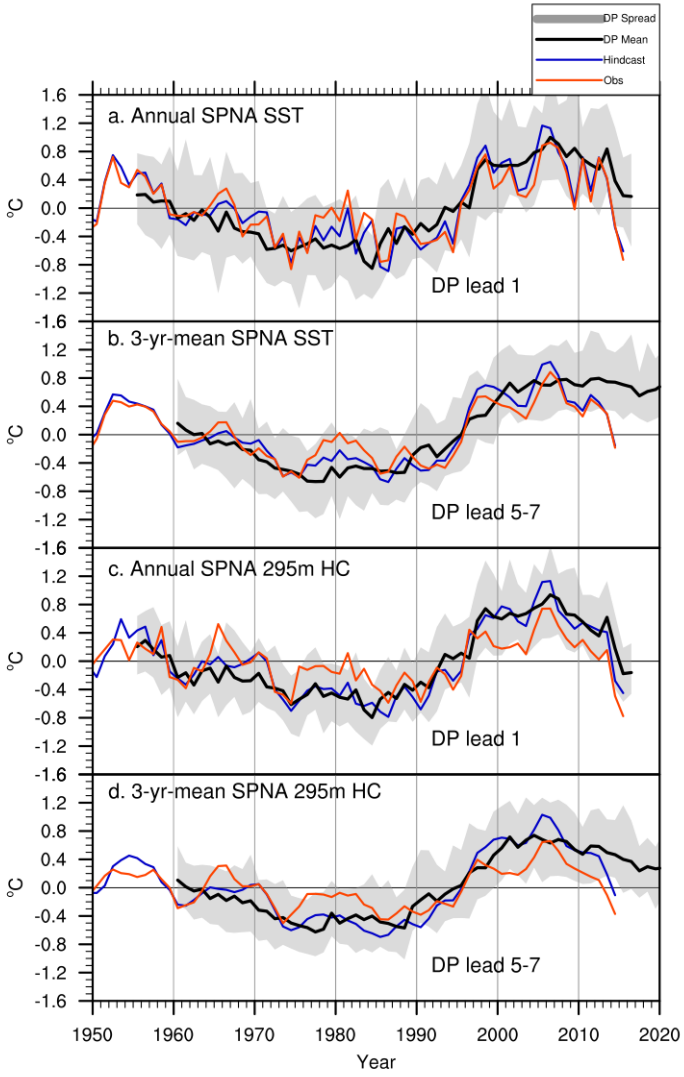


- Langehaug et al. 2019, in prep
- Supporting observational evidences (WP2, Årthun et al., 2017)

Case 2: The case study of 2015 North Atlantic Cold Blob

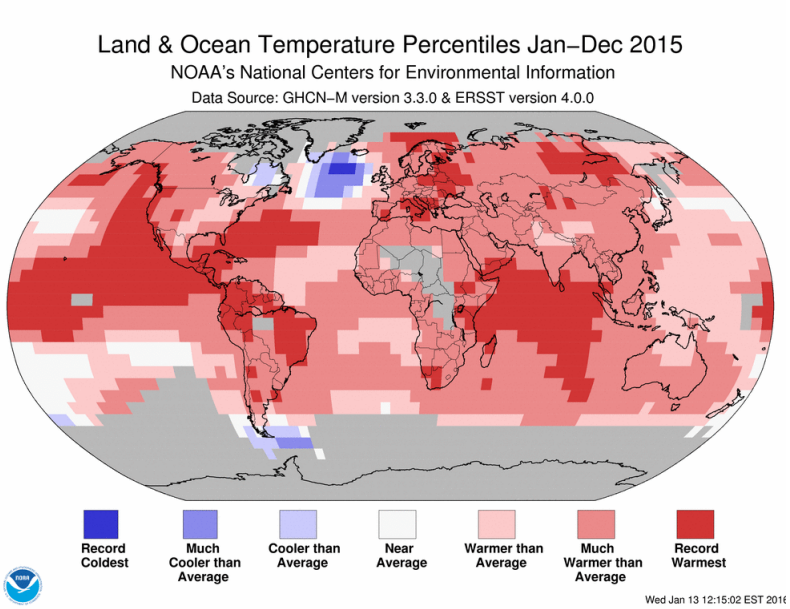
- Explore the seasonal-to-multiyear predictability of such an extreme climate event and its associated potential impacts in a large MME framework
- Perform coordinated Pacemaker Prediction experiments to underpin the predictability drivers of North Atlantic Cold Blob

North Atlantic Sub-polar Gyre (SPG) – most predictable oceanic region at decadal timescale



Yeager et al. 2018

However,
was the record Atlantic Cold Blob of 2015 predictable?



Cooling tendency, yes.
Amplitude, no! Not even in a 40 member ensemble forecast

Future work

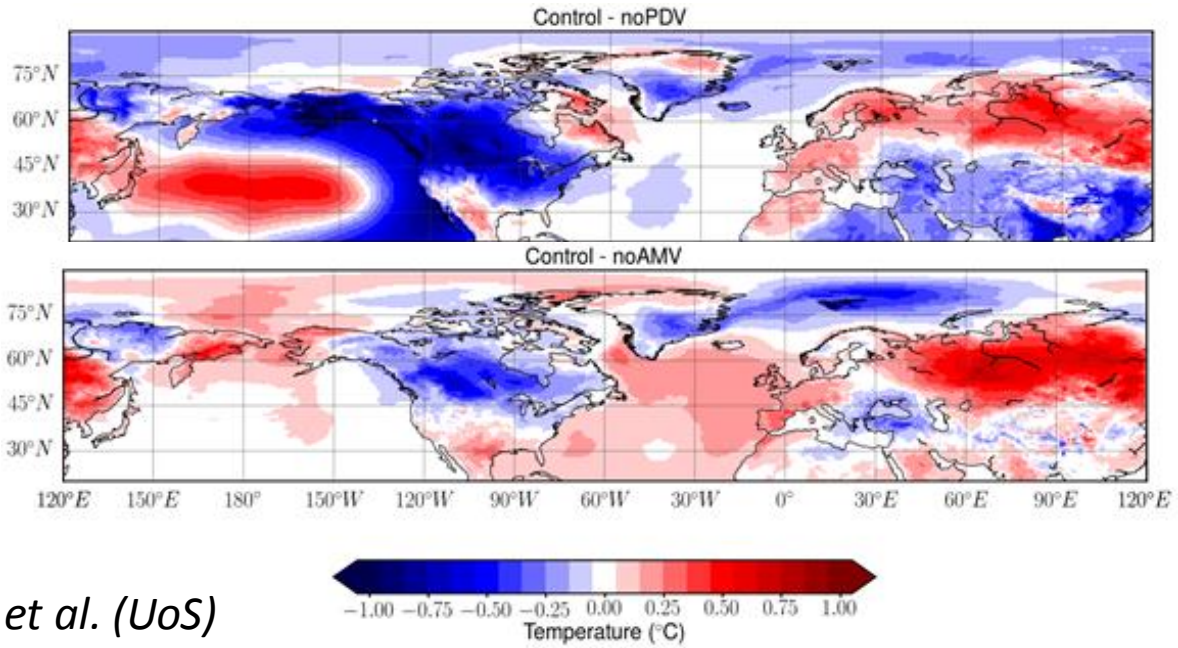
New methodological developments

- Further development of coupled data assimilation procedures
- In collaboration with WP3, the impact of an updated Greenland ice-sheet freshwater forcing will be investigated in a subset of initialised decadal re-forecasts
- Advancing towards high resolution (“eddy permitting” to “eddy resolving”) multi-year prediction capacities

WP3 Linkages of Arctic climate changes to lower latitudes

Lead: Yongqi Gao and Guillaume Gastineau

Objective: To investigate the Arctic warming impact and its modulation by the Atlantic Multidecadal Oscillation (AMO) and Interdecadal Pacific Oscillation (IPO) on the Arctic warming impact since 1979 by using specifically-designed coordinated multi-model experiments



Credits: J. Mecking et al. (UoS)

Coordinated AGCM Experiments (7 partners)

1. **Exp1**: Daily SIC and SST from 1979 to present
2. **Exp2:** Daily SIC climatology in Arctic and daily-varying SST: **Arctic warming impact =Exp1 minus Exp2**
3. **Exp3**: Daily-varying SIC and time-varied daily SST with PDO signal removed in Pacific: **Impact of PDO =Exp1-Exp3**
4. **Exp4:** Daily-varying SIC and time-varied daily SST with AMO signal removed in North Atlantic: **Impact of AMO=Exp1-Exp4**

Coordinated AOGCM Experiments (3+ partners)

Plan to perform/in progress

- **AO-EXP1** : sea ice constrained to present day value (exp. 6.1 PAMIP)
- **AO-EXP2** : sea ice constrained +2°C value (exp. 6.2 PAMIP)

Planned joint analysis

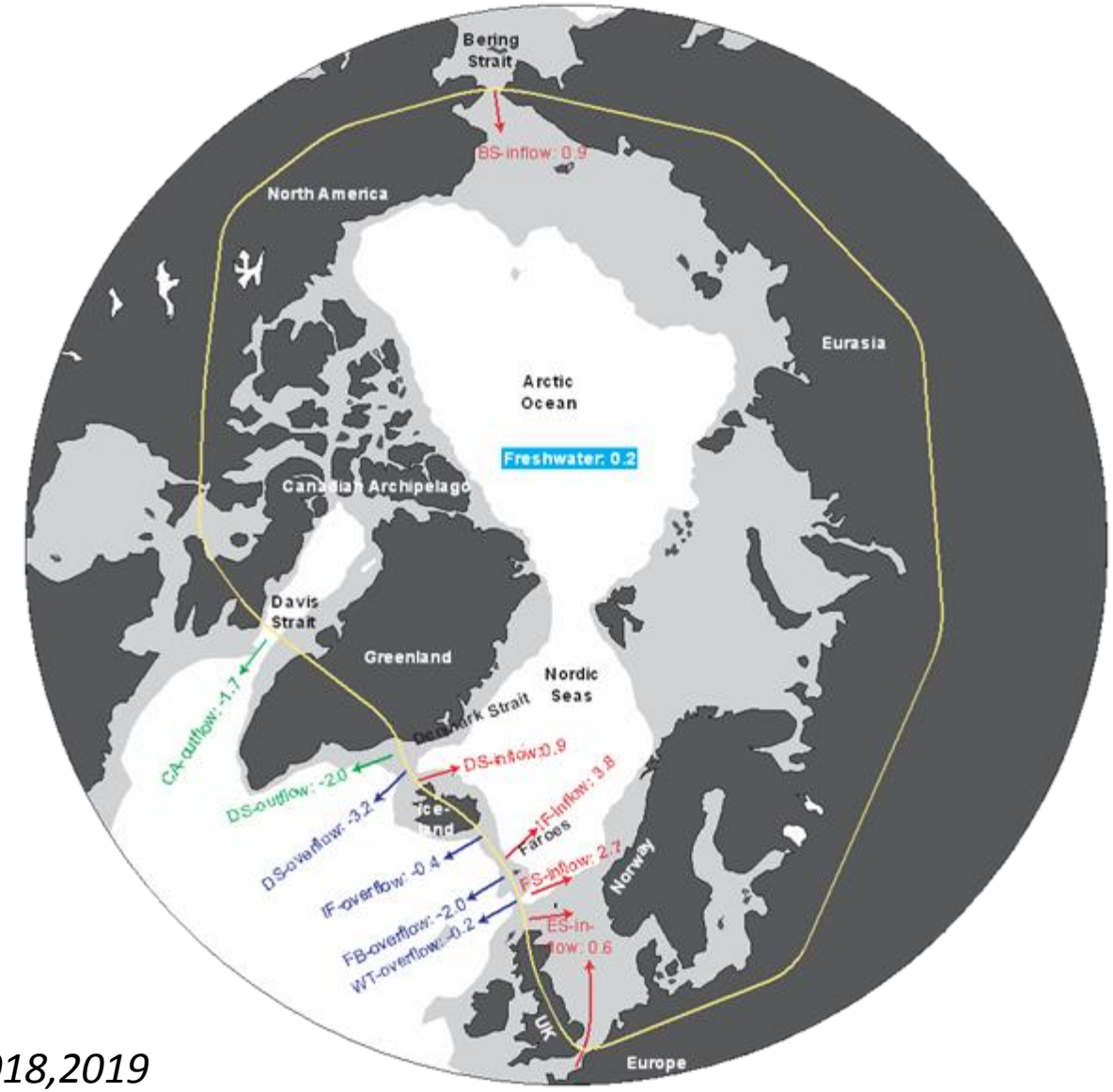
1. **Arctic warming and its modulation by IPV and AMV (Lingling Suo, NERSC)**
2. **Atmospheric response to Arctic SIC/SST variability at interannual to decadal time scales (Young-Oh Kwon, WHOI)**
3. **Systematic comparison of hi-top vs. lo-top simulations for the atmospheric response to Arctic SIC/SST change (Young-Oh Kwon/Lingling Suo, WHOI-NCAR & NERSC)**
4. **Impact of Arctic sea-ice loss in the Northern Hemisphere atmospheric circulation: A multi-model comparison (Annalisa Cherchi, CMCC)**

Planned joint analysis

5. **Autumn and Winter atmospheric response to Arctic sea ice change (Paolo Ruggieri, CMCC)**
6. **Meridional energy transport from midlatitudes to Arctic (Yang Liu, NLeSC)**
7. **Variability of snow cover and atmospheric impacts (Guillaume Gastineau, CNRS)**
8. **The evolution of Eurasian winter under different boundary forcing (Rohit Ghosh, MPI-M)**
9. **Origin of the Global Warming Hiatus (Bo Christiansen, DMI)**
10. **Forced and internal variability of atmospheric circulation modes over the North Atlantic – Eurasian region (Shuting Yang, DMI)**

WP2: Synthesizing Arctic Mediterranean exchanges

Lead: Karin M. Larsen and Gerard McCarthy



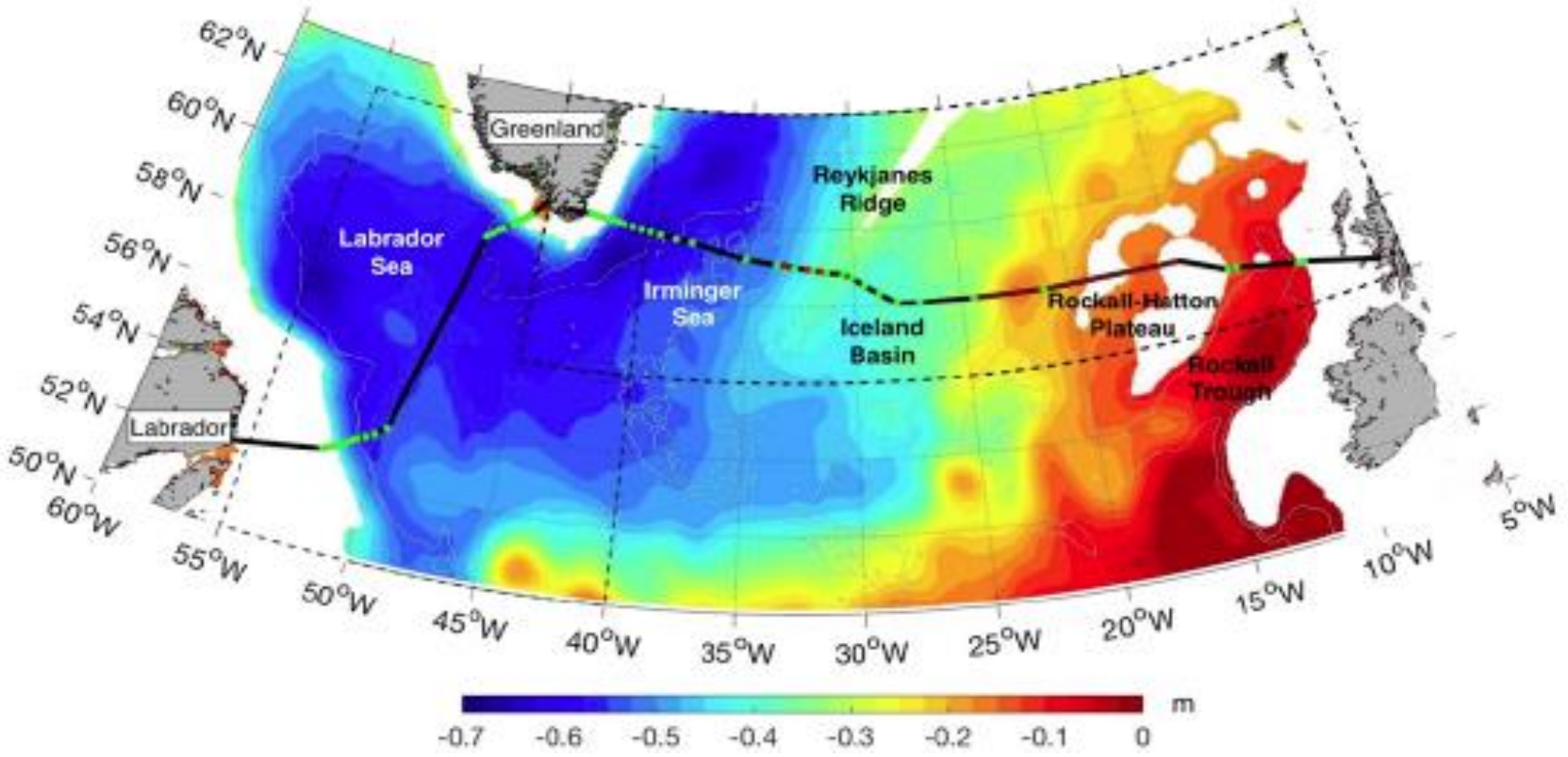
Østerhus et al., 2018,2019

Conclusions

- AM-exchanges as a whole are **not** likely to have weakened during the two decades from the mid-1990s to the mid-2010s
- Certainly, the combined transport of the two main overflow branches did **not** weaken and they account for almost 90 % of the total overflow
- The overflow is a key component of the AMOC, any weakening of the AMOC during this period cannot have been caused by weakened overflow or weakened overturning in the AM

A science-policy breakfast discussion on the topic "**The slowing Gulf Stream?** " was held on 4 September 2018 at the European Parliament Brussels

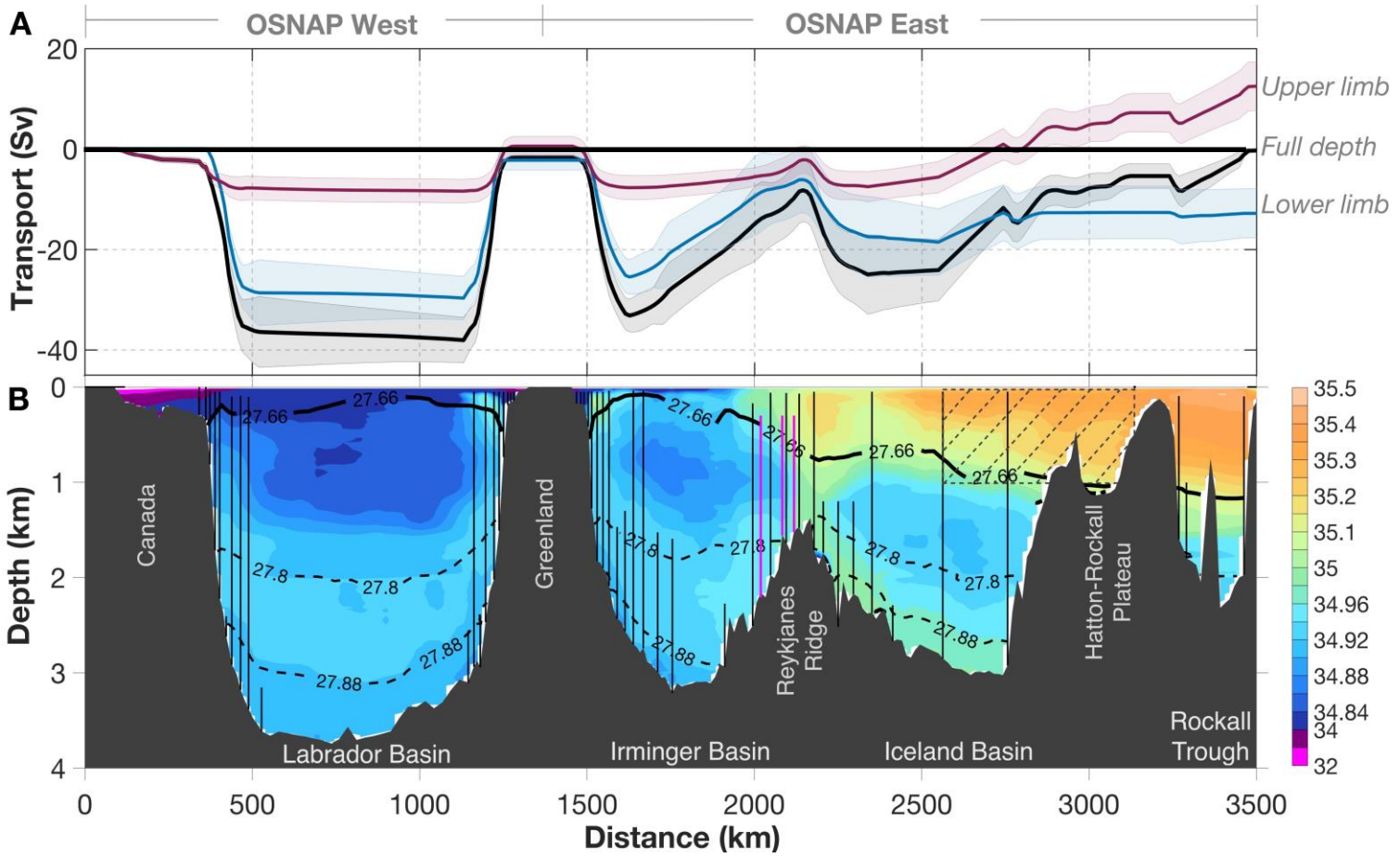
WP2 contribution to the first synthesis of the OSNAP Observing System



Authors: M.S. Lozier, Feili Li, S. Bacon, F. Bahr, A. Bower, **S. Cunningham, F. de Jong, L. de Steur, B. DeYoung, J**. Fischer, S. Gary, B. Greenan, N.P. Holliday, A. Houk, L. Houpert, M. Inall, W. Johns, H. Johnson, C. Johnson, **J. Karstensen**, G. Koman, I. LeBras, X. Lin, N. Mackay, D. Marshall, H. Mercier, **M. Oltmanns**, R.S. Pickart, A. Ramsey, D. Rayner, F. Straneo, V. Thierry, D.J. Torres, R.G. Williams, C. Wilson, J. Yang, I. Yashayaev, J. Zhao

OSNAP: A change in our view of overturning

- first results from the Overturning in the Subpolar North Atlantic Program: *AMOC, Heat & Freshwater Transport*



2nd EU Model Cluster Workshop Bergen June 2019!

Workshop on predictability of the Atlantic-Arctic sector. It will cover topics related to:

- Initialization and subsampling strategies
- ocean-atmosphere interaction
- Signal-to-noise issues in climate modelling
- The case of the predictability of the cold blob

Contact: Noel Keenlyside/Blue-Action

ASOF 2019 Copenhagen 24-26 April 2019

ASOF stands for Arctic and Subarctic Ocean Fluxes, ASOF is an international program on the oceanography of the Arctic and Subarctic seas and their role in climate.

- Representativeness of ocean observations
- Flux calculations

www.asof.awi.de

BLUE ACTION

Project Coordinators: Steffen M. Olsen, Danish Meteorological Institute, smo@dmi.dk and Daniela Matei, Max Planck Institute for Meteorology, daniela.matei@mpimet.mpg.de
Project Office: Chiara Bearzotti, Danish Meteorological Institute, chb@dmi.dk
Communication, Dissemination, Engagement, and Exploitation officer: Hannah Grist, SRSL, Hannah.Grist@srsl.com

@BG10Blueaction

www.blue-action.eu

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