# Understanding Arctic's Connections to Weather and Climate across the Northern Hemisphere

# APPLICATE.eu

## What is APPLICATE?

- A four-year project started November 2016, funded by the EU's Horizon 2020 Research and Innovation programme with a budget of €8M
- A consortium of 15 partners from eight different countries

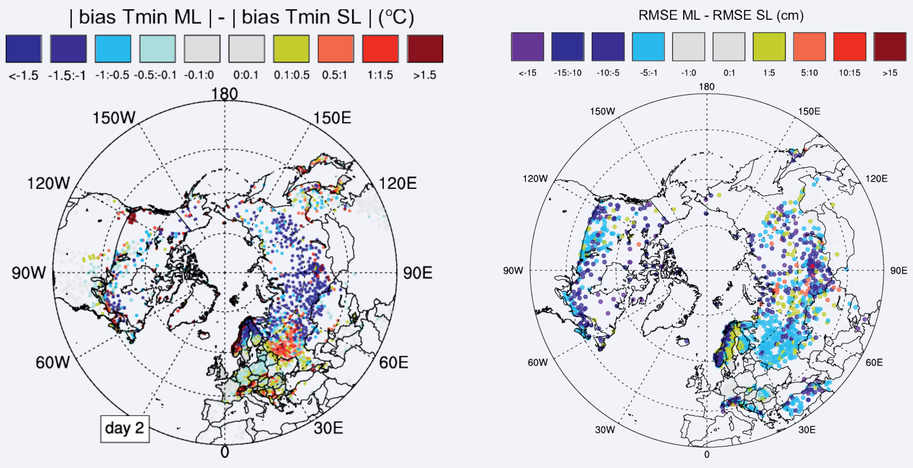
## Mission

- Develop enhanced predictive capacity for weather and climate in the Arctic and beyond
- Determine the influence of Arctic climate change on Northern Hemisphere mid-latitudes
- Create knowledge for the benefit of policy makers, businesses and society

# Activities

## Modelling

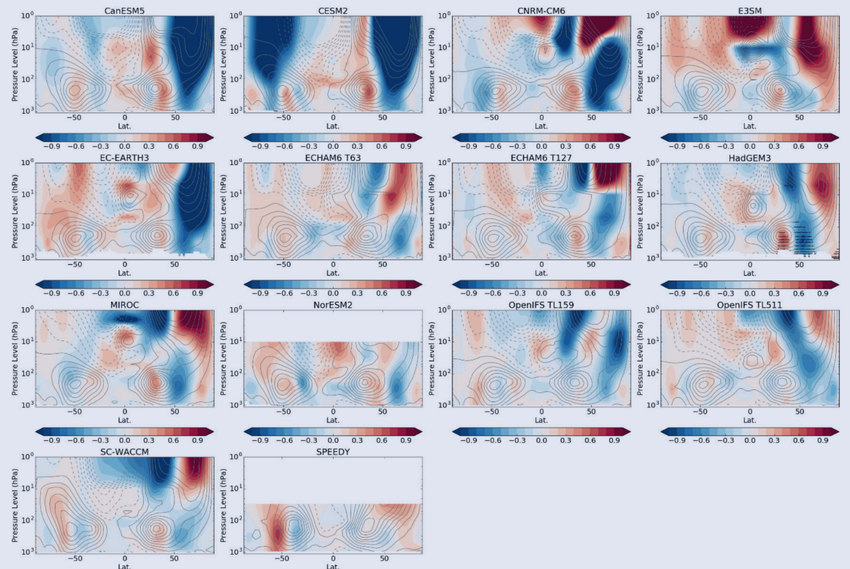
- Advance understanding of predictability mechanisms by analysing database for weather and climate prediction
- Enhance Arctic representation in models by improving process and feedback representation, and coupling methodologies
- Develop and implement metrics to facilitate Arctic-specific model assessment




The new multi-layer land snow scheme of the ECMWF IFS model improves the representation of the snow processes (melting, freezing and temperature change) and induces a bias reduction for several near surface weather parameters in coupled weather forecasts over snow covered regions.

## Linkages

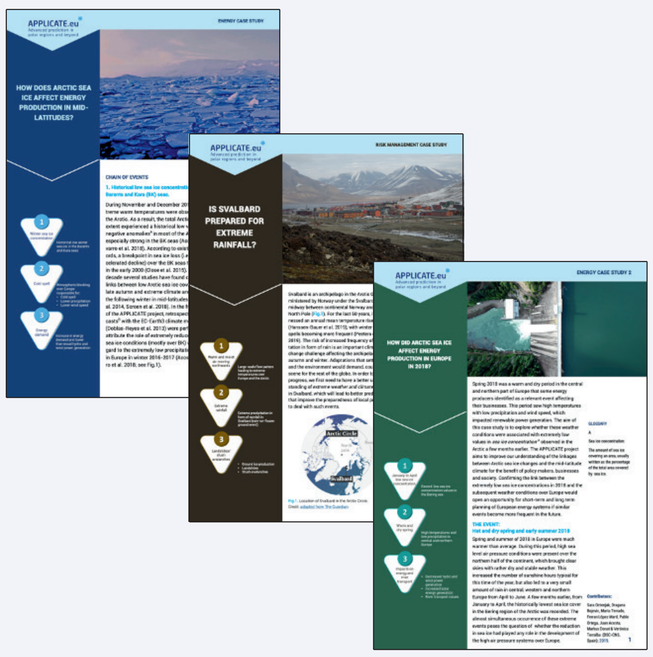
- Determine how changes in the Arctic system will impact weather events in mid-latitudes
- Advance our understanding of oceanic and atmospheric linkages by coordinating multi-model experiments (Polar Amplification Model Intercomparison Project, PAMIP)



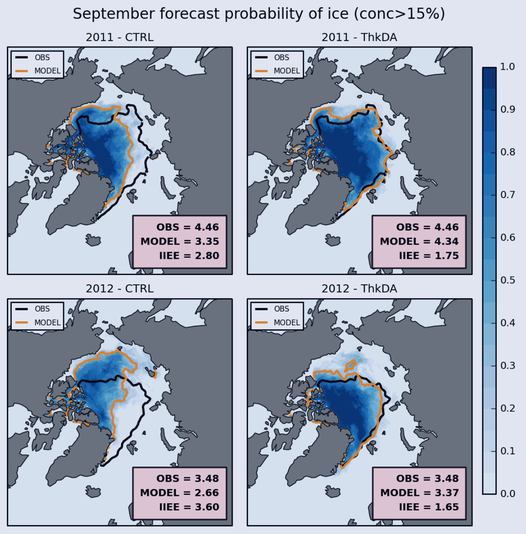

Multi-model results from 14 model simulations, following the PAMIP protocol, show a robust weakening and equatorward shift of the winter surface mid-latitude westerly winds in response to reduced Arctic sea ice (Figure 3.1), consistent with a negative North Atlantic Oscillation.

## User Engagement

- Collaborate with key users from targeted stakeholder groups
- Disseminate and communicate APPLICATE's work and apply scientific advancements to relevant socio and economic realms




The User Engagement Team produced three case studies to show the use of weather, climate and sea ice forecasts in the case of specific events with a significant impact on certain sectors or communities. The events analyzed in the case studies are selected together with users in User Group meetings, in thematic workshops, or through interviews.




## Observing System

- Assess the impact of observation assimilation in models
- Derive recommendations for the design of future observing system in the Arctic

September mean probability of sea ice for the control run (left) and our set of experiments introducing sea ice thickness initialisation (right). Comparing the seasonal evolution sea ice cover has revealed that the sea ice thickness initialisation has had a considerable impact on the skill of seasonal forecasts of Arctic summer sea ice. Biases in total Arctic extent are reduced as a whole with considerable improvements to the spatial distribution of sea ice and ice-edge location.

## More Highlights from APPLICATE:

- **CRISTO Framework for Model Evaluation**
  A list of criteria for good metrics to evaluate numerical models and their performance
- **Atmosphere-Ocean Single Column Model**
  A tool to help improve coupled models in the Arctic
- **"Advancing Predictive Capability of Northern Hemisphere Weather and Climate"**
  An online course from and for early career scientists and users of climate services
- **Active contributions to the activities of the EU Polar Cluster and other collaborations across the world**

DATA:
www.applicate.met.no

Our Polar Prediction Matters blog at:
blogs.helmholtz.de/polarpredictionmatters/

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