



APPLICATE

www.applycate.eu

Advanced prediction in Polar regions and beyond

APPLICATE:

A project within the EU Arctic cluster for advanced prediction in Polar regions and beyond

Marta Terrado, Dragana Bojovic, Isadora Christel, Francisco J. Doblás-Reyes, Halldor Johannsson, Gerlis Fugmann, Peter Bauer, Luisa Cristini, Thomas Jung



APPLICATE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727862.

The content of the document is the sole responsibility of the organizer and it does not represent the opinion of the European Commission and the Commission is not responsible for any use that might be made of the information contained.

www.applycate.eu

The project



Advanced prediction in Polar regions and beyond: modelling, observing system design, and linkages associated with a changing Arctic climate

- EU H2020 Research and Innovation Program
- 4 years: 1 Nov 2016 – 31 Oct 2020
- 16 partners from 9 countries



... and many collaborators!

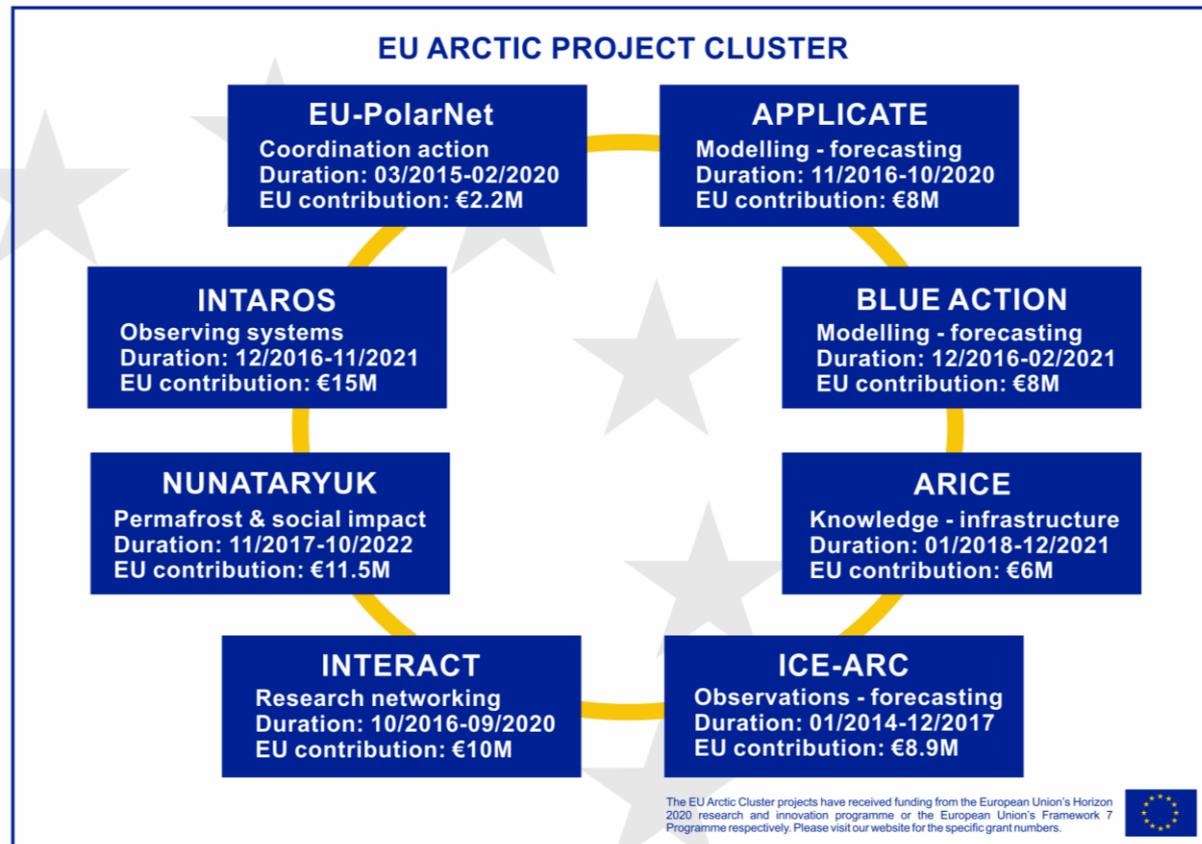


The project within the EU Arctic cluster



THE EU ARCTIC CLUSTER

PROVIDING ANSWERS FOR A CHANGING ARCTIC



Mission statement



„Develop enhanced predictive capacity for weather and climate in the Arctic and beyond, and determine the influence of Arctic climate change on Northern Hemisphere mid-latitudes, for the benefit of policy makers, businesses and society.“



Objectives



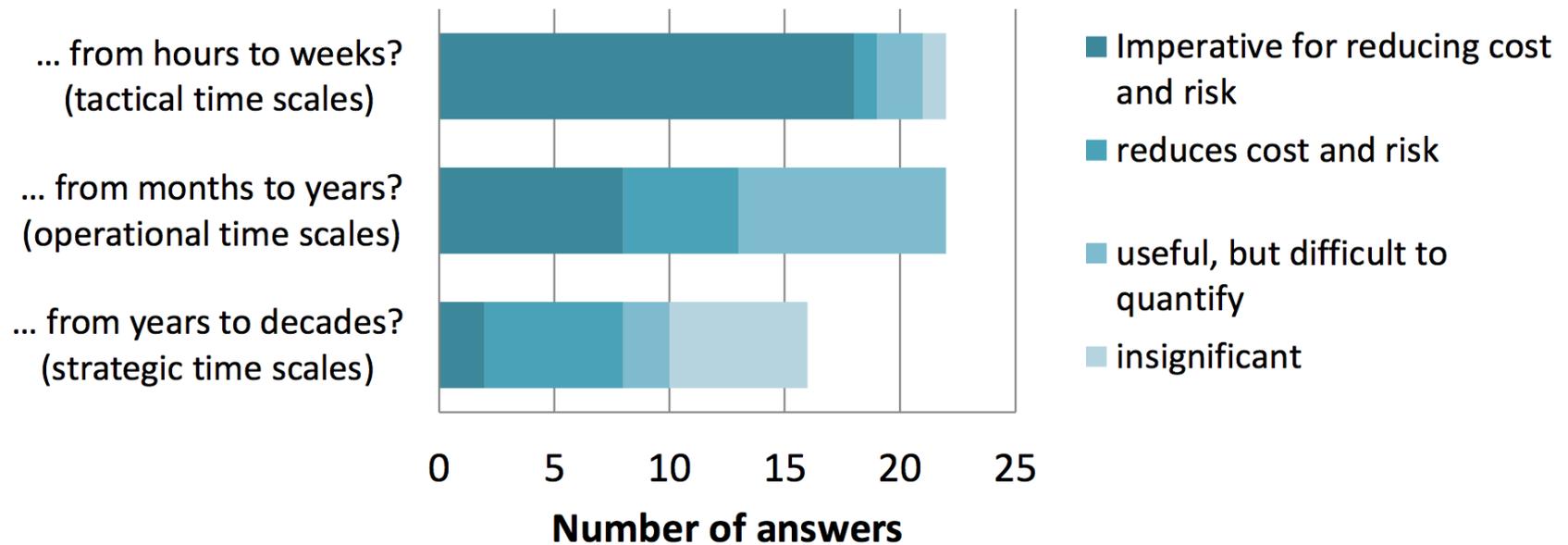
- **Advance predictive capacity in polar regions & beyond**
- **Enhance our understanding of Arctic – midlatitude linkages**
- **Bring different communities close together**
- **Work closely with users and stakeholders**
- **Contribute to the education of the next generation of scientists**
- **Foster international collaboration**

benefits from European and international collaboration

Importance of Arctic predictions



How important are Arctic predictions...



Results of an Arctic survey of marine operators. EC-PHORS Services Task Team

Bring different communities together



- Bring together weather and climate prediction communities
- Involve experts on the Arctic and midlatitudes
- Engage operational centres, universities and research institutes for maximizing impact
- Effectively combine models and observations (YOPP, MOISAIC - Int. Arctic Expedition, INTAROS project...)

Work closely with users and stakeholders



Information & activities shaped around **3 stakeholder groups**:

- **Scientific community and international organisations**
advanced data users that can indicate the gaps in the scientific knowledge
- **Public and private sector**
can benefit from enhanced operational predictive capacity across time scales
- **Society at large**
Includes the general public and communities who possess local knowledge

Work closely with users and stakeholders



USER GROUP

Aim

- Provide feedback to the project's research
- Help shaping climate data into relevant information and services

Challenges

- Activating and engaging participants
- Gender balance
- Dynamics (dealing with different nationalities, cultural backgrounds, economic sectors, etc.)

Meetings

- Every 3-4 months (virtual or life)
- 1st virtual & 2nd at the Arctic Circle Assembly - Next: APPLICATE GA, Barcelona Jan 2018



Work closely with users and stakeholders



POLAR PREDICTION MATTERS

<https://blogs.helmholtz.de/polarpredictionmatters/>



Breaking the Ice

 Polar Prediction Matters
1. September 2017

Aspects of Practical Planning and Management of an Ice Passage
About the Author: Captain Uwe Pahl was the master of the German research icebreaker RV Polarstern from 1996 until 2014. Since 2014, he has been the team leader of the construction supervision team of Reederei F. Laeisz for the new ... [\[Read more\]](#)

Category: [Forecast Users](#) Tags: [captain](#), [ice](#), [icebreaker](#), [navigation](#), [polarstern](#), [sea ice chart](#), [user](#) Comments: [2 Comments](#)

Aim

- Engage with users
- Gather information that helps define user-relevant metrics
- Become a discussion forum

Challenges

- Participation:
we encourage contributions from stakeholders!



USER-RELEVANT METRICS

Aim

- Co-develop metrics: scientists from different WPs (internal) and the User Group (external)
- Ensure that metrics are useful for decision-making

Some preliminary metrics...

Sector	User-relevant metrics	Metrics definition
Shipping	Sea ice free regions	<ul style="list-style-type: none">• Sea ice edge• Integrated ice-edge error
Fishing	Ocean temperatures	<ul style="list-style-type: none">• Monthly average, minimum and maximum temperature & salinity in certain depth ranges• Thermal/salinity habitat availability
Renewable energy	Wind power capacity	<ul style="list-style-type: none">• Optimal range of wind speed

Contribute to the education of scientists



APECS-APPLICATE webinars

<https://www.apecs.is/career-resources/webinars/webinar-archive/>

- Introduction to the APPLICATE project
- Enhancing weather & climate models
- **Upcoming:** Atmospheric-ocean interactions



Polar Prediction School 2018

- 30 early-career scientists
- Abisko Scientific Research station in Sweden
- Strong interest and high number of applications



European partners: EU ARCTIC CLUSTER

Aim

- Effective coordination between projects (periodic meetings organized)
- Exploit synergies
- Avoid user fatigue
- Joint organisation of (side) events
- Joint organisation of training activities

Task groups





North American Partners

- Partners contributing to the Transatlantic Ocean Research Alliance (Sea Ice Prediction Network, US CLIVAR working group, Environment and Climate Change Canada)
- Coordination experiments related to Polar Amplification (PA)-MIP

International Partners

- WMO Polar Prediction Project
- Belmont Forum
- MOSAIC
- GEWEX GASS
- S2S Prediction project

Conclusions



- APPLICATE will **make science relevant** by addressing two very important topics: weather and climate prediction in the Arctic and the impact of the Arctic on midlatitudes' weather and climate
- The project **benefits from and contributes to the synergies created in the EU Arctic Cluster**, aimed at improving the coordination among the recently funded Arctic European projects (blog, trainings, joint attendance at relevant events)
- **International clustering and collaboration** with projects and initiatives outside Europe allows a more efficient exchange of data and information for advancing prediction in Polar regions and helps to understand changes in the Arctic and their far-reaching impacts



THANK YOU!

For more information, contact me at:

marta.terrado@bsc.es

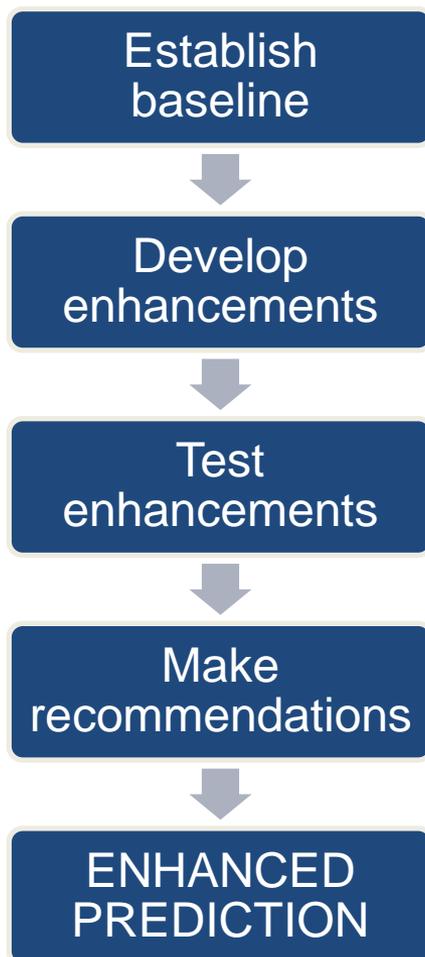


www.apply.eu



ADDITIONAL SLIDES

Advance predictive capacity in polar regions & beyond



Understanding of Arctic-midlatitude linkages

- Coordinated multi-model approach (PA-MIP)
- Employ atmosphere-only *and* coupled models
- Repeat with enhanced models

Participating climate models



Climate Models					
Model	AWI-CM	EC-Earth	CNRM-CM	NorESM	HadGEM
Partner	AWI	BSC, UCL, SU	CNRS-GAME, CERFACS	UiB, UR, Met.no	MO, UREAD
Atmosphere	ECHAM6 T127 L95	IFS T255/T511 L91	ARPEGE-Climat T127/T359 L91	CAM-OSLO 1°×1° L32 / L46	MetUM N216/N96 L85
Ocean	FESOM Unstruct. mesh 15-100 km L41 4.5-80 km L41	NEMO 1° , 0.25° L75	NEMO 1° , 0.25° L75	NorESM-O (extended MICOM) 1° , 0.25° L75	NEMO 1°×1° L75 0.25°×0.25° L75
Sea ice	FESIM	LIM3	GELATO	CICE	CICE
Surface	JSBACH	HTESSEL	SURFEX	SURFEX	JULES
CMIP6	Yes	Yes	Yes	Yes	Yes



Participating S2S models



Subseasonal to Seasonal Prediction Systems

Model	EC-Earth	CNRM-CM	IFS	HadGEM/GloSea
Partner	BSC, UCL, AWI	CNRS-GAME	ECMWF	MO, UREAD
Atmosphere	IFS T255/T511 L91	ARPEGE Climat T255/T359 L91	IFS T511-T319 L91	MetUM N216 L85
Ocean	NEMO 1°/0.25° L75	NEMO 1°/0.25°, L75	NEMO 1°, L75	NEMO 0.25°x0.25° L75
Sea ice	LIM3	GELATO	LIM2/3	CICE
Land	HTESSEL	SURFEX	HTESSEL	JULES
Data assimilation	Ensemble Kalman filter	Extended Kalman Filter SAM2	4D-Var	4D-Var, NEMOVAR 3D-Var FGAT



Participating NWP models



Numerical Weather Prediction Systems

Model	ARPEGE	AROME	IFS	AROME-Arctic
Partner	CNRS-GAME	CNRS-GAME	ECMWF	Met.no
Atmosphere	ARPEGE T1198, stretched HR (7.5km on grid pole), L105	AROME 1.3km / 500m, 90 vertical levels	IFS T1279 L137	AROME 2.5 km L65
Ocean	N/A	N/A	N/A	N/A
Sea ice	GELATO	GELATO	N/A	SICE
Land	SURFEX	SURFEX	HTESSEL	SURFEX
Data assimilation	4D-Var	dynamical adaptation	4D-Var	3D-Var

