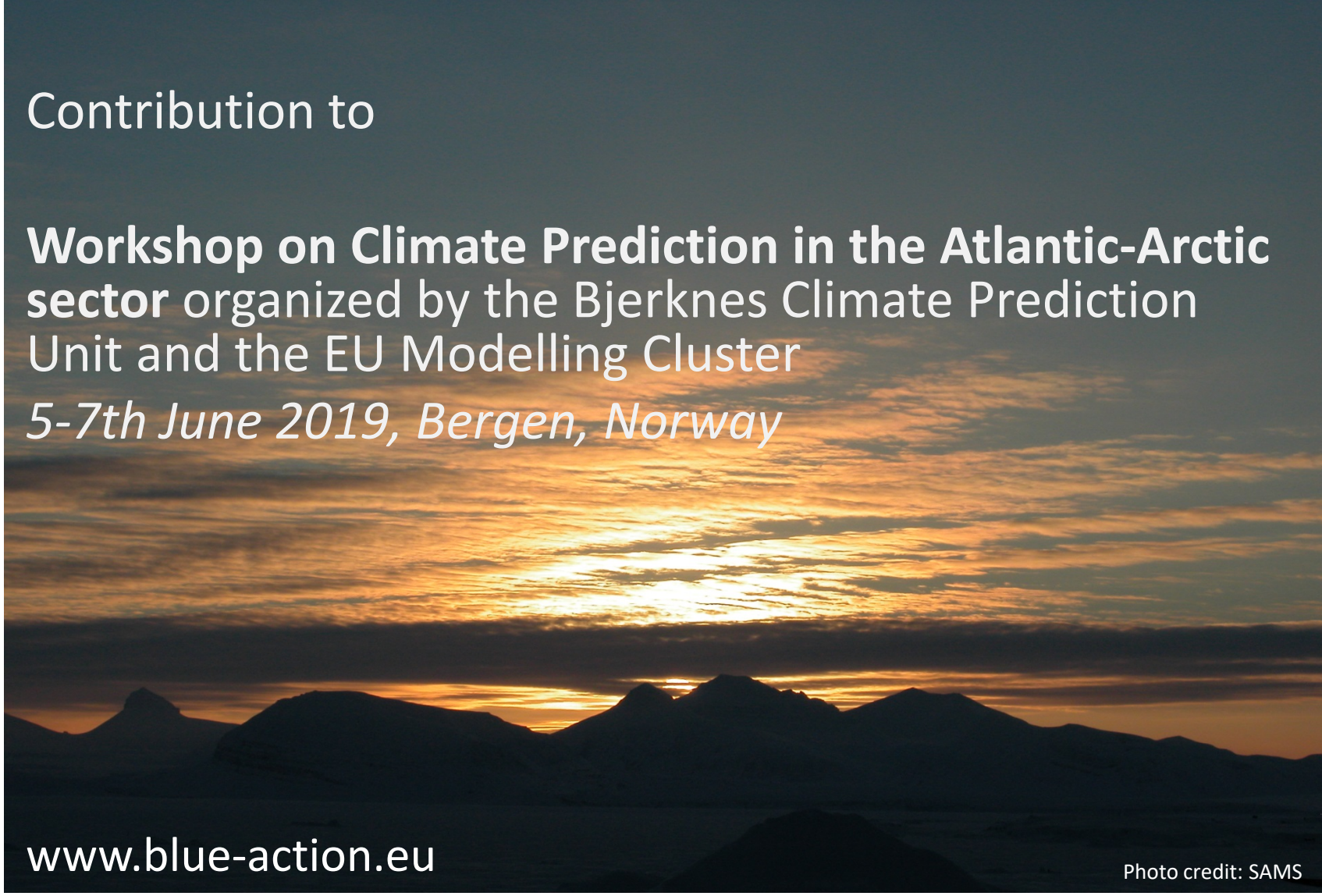
BLUE ACTION

Contribution to

Workshop on Climate Prediction in the Atlantic-Arctic sector organized by the Bjerknes Climate Prediction Unit and the EU Modelling Cluster

5-7th June 2019, Bergen, Norway



www.blue-action.eu

Photo credit: SAMS

Abstract

PRECONDITIONS FOR COLD AIR OUTBREAKS AND PREDICTION SKILL

Iuliia Polkova[1], Johanna Baehr[1], Hilla Gerstman Afargan[2], Daniela Domeisen[2], Paolo Ruggieri[3], Panos Athanasiadis[3], Martin King[4] and Erik Kolstad[4]

[1] Institute of Oceanography, Universität Hamburg, Hamburg, Germany

[2] Institute for Atmospheric and Climate Science, ETH Zürich, Zurich, Switzerland

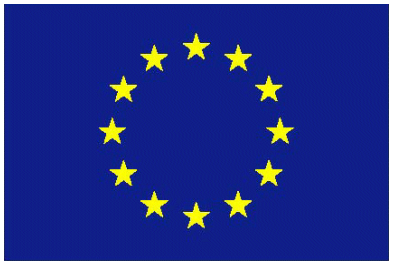
[3] Euro-Mediterranean Center on Climate Change - CMCC, Bologna, Italy

[4] NORCE Climate, and Bjerknes Centre for Climate Research, Bergen, Norway

Cold air outbreaks (CAOs) are events during the winter months in which cold air masses rapidly propagate into the middle or lower latitudes. CAOs create favorable conditions for a development of extreme weather over land and open ocean, in particular storms known as polar lows. Ability to directly forecast polar lows is limited; however, there are indications that conditions in which such events emerge and evolve might in fact be predictable. A marine CAO index is the large-scale measure of polar lows. In our study, we explore predictability of individual marine CAO events as well as their statistics. To this end, we analyze the ERA-Interim reanalysis and a 30-member ensemble of seasonal predictions available from the seasonal prediction system that is based on the Max Planck Institute for Meteorology Earth System Model with mixed resolution (MPI-ESM-MR).

The MPI-ESM-MR shows spatial and temporal features of marine CAOs comparable to those found in the ERA-Interim atmospheric reanalysis. In the first 2-3 weeks after initialization, the ensemble predictions for marine CAOs, though being overconfident, show high prediction skill. Sea level pressure and temperature show prediction skill beyond that of the marine CAO index. This motivates us to identify CAO-proxies that might improve predictability of marine CAOs.

Further variables in literature are reported to show a connection to marine CAOs. It is necessary to analyze multicolinearity in different predictors and identify causalities of processes involved. The casual effect network algorithm allows investigating the latter. Subsampling ensemble members according to their ability of capturing necessary preconditions might allow to further improving predictability of marine CAOs. First results of the causal discovery analysis are presented at the workshop.



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

We support the Blue Growth!
Visit us on: www.blue-action.eu
Follow us on Twitter: @BG10Blueaction