Geophysical Research Abstracts
Vol. 21, EGU2019-14684, 2019
EGU General Assembly 2019

Addressing preconditions for cold air outbreaks with ensemble subsampling technique

Iuliia Polkova (1), Mikhail Dobrynin (1), Erik Kolstad (2), Daniela Domeisen (3), Hilla Afargan (3), and Johanna Baehr (1)

(1) Universität Hamburg, Institute of Oceanography, Hamburg, Germany (iuliia.polkova@uni-hamburg.de), (2) NORCE Climate, and Bjerknes Centre for Climate Research, Bergen, Norway, (3) Institute for Atmospheric and Climate Science, ETH Zurich, Zürich, Switzerland

Cold air outbreaks (CAOs) are events during the winter months in which cold air masses move from poles into middle or lower latitudes. In addition to being linked to unusual cold spells over land, CAOs create favorable conditions for development of extreme weather over the open ocean. The ability to directly forecast such events is limited; however, there are indications that the conditions in which CAOs evolve might in fact be predictable. Here we explore this idea by using an ensemble subsampling technique that was earlier designed and successfully tested on seasonal predictions of the North Atlantic Oscillation (NAO).

Similarly to CAOs, the seasonal hindcast skill of the NAO for the winter ahead tends to be rather poor. A recent study showed that by subsampling ensemble members for which the winter NAO state was in agreement with a statistical forecast based on the autumn NAO predictors, seasonal forecast skill of surface temperature, precipitation and sea level pressure was significantly enhanced over large areas of the Northern Hemisphere. Regional ocean surface temperature, sea ice volume, snow depth and stratospheric temperature changes served as the NAO predictors.

Here the subsampling technique is applied to CAOs by identifying autumn predictors and predictor regions for these events. The CAO index is defined in terms of European winter cold spells. Lagged temperature and geopotential height anomalies, which characterize Atlantic weather regimes favorable for CAOs, are considered as predictors. Similar to the NAO case, autumn (lagged) preconditions of sea ice and the stratosphere are investigated as well. The subsampling technique is applied to 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 at mixed resolution (MPI-ESM-MR).