EGU21-11134, updated on 13 Jun 2021
https://doi.org/10.5194/egusphere-egu21-11134
EGU General Assembly 2021

Seasonal Predictability of Wintertime mid-latitude Cyclonic Activity over the North Atlantic and Europe

Alvise Aranyossy[1,2], Sebastian Brune[2], Lara Hellmich[3,4], and Johanna Baehr[2]

[1]Faculty of Natural Sciences, Universität Hohenheim, Stuttgart, Germany (alvise.aranyossy@uni-hohenheim.de)
[2]Institute of Oceanography, CEN, Universität Hamburg, Hamburg, Germany
[3]Max Planck Institute for Meteorology, Hamburg, Germany
[4]International Max Planck Research School on Earth System Modelling, Hamburg, Germany

We analyse the connections between the wintertime North Atlantic Oscillation (NAO), the eddy-driven jet stream with the mid-latitude cyclonic activity over the North Atlantic and Europe. We investigate, through the comparison against ECMWF ERA5 and hindcast simulations from the Max Planck Institute Earth System Model (MPI-ESM), the potential for enhancement of the seasonal prediction skill of the Eddy Kinetic Energy (EKE) by accounting for the connections between large-scale climate and the regional cyclonic activity. Our analysis focuses on the wintertime months (December-March) in the 1979-2019 period, with seasonal predictions initialized every November 1st. We calculate EKE from wind speeds at 250 hPa, which we use as a proxy for cyclonic activity. The zonal and meridional wind speeds are bandpass filtered with a cut-off at 3-10 days to fit with the average lifespan of mid-latitude cyclones.

Preliminary results suggest that in ERA5, major positive anomalies in EKE, both in quantity and duration, are correlated with a northern position of the jet stream and a positive phase of the NAO. Apparently, a deepened Icelandic low-pressure system offers favourable conditions for mid-latitude cyclones in terms of growth and average lifespan. In contrast, negative anomalies in EKE over the North Atlantic and Central Europe are associated with a more equatorward jet stream, these are also linked to a negative phase of the NAO. Thus, in ERA5, the eddy-driven jet stream and the NAO play a significant role in the spatial and temporal distribution of wintertime mid-latitude cyclonic activity over the North Atlantic and Europe. We extend this connection to the MPI-ESM hindcast simulations and present an analysis of their predictive skill of EKE for wintertime months.