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Exploring winter predictability in Europe using the ECMWF hindcasts

Daniele Mastrangelo¹, **Ignazio Giuntoli**^{1,2}, and Piero Malguzzi¹

¹CNR-ISAC, Bologna, Italy (d.mastrangelo@isac.cnr.it)

²School of Geography Earth and Environmental Sciences, University of Birmingham, UK

The accuracy and reliability in predicting winter anomalies, particularly high-impact events, is crucial for economic sectors like energy production and trade. Sub-seasonal predictions can provide a useful tool for early detection of these events. In this context, this study aims to target atmospheric patterns leading to skillful winter predictions at S2S lead times.

With a focus on Europe, we explore extended range predictability (up to 35 days) in the ECMWF hindcast dataset (1999-2018). This dataset provides a sizable sample for assessing the winter months predictive skill of the model and can be considered as a preparatory step to the use of the more comprehensive real-time ensemble forecasts.

The verification is performed on geopotential and temperature fields against the ERA5 reanalysis. We first identify the most skillful predictions both in terms of lead-time and period of initialization. Later we assess whether these skillful predictions correspond to high-impact events, especially cold spells. Finally, in the attempt to identify the potential drivers of improved predictability, we track back to the dominant Euro-Atlantic modes of variability present in the initial atmospheric states of the well predicted events.