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Dependence of the seasonal hindcast skill on different mechanisms influencing European summers during the 20th century

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Hindcast skill for seasonal predictions of European climate is still very limited in current state-of-the-art prediction systems, especially for the summer season, since various different mechanisms are influencing the seasonal variability of European summer climate. Here, we focus on the first two modes of seasonal climate variability in the North-Atlantic-European sector and analyse their variability throughout the entire 20th century.
With a pattern adopting cluster analysis that allows for the pattern to vary over time, we identify the North Atlantic Oscillation, a meridional pressure difference, and the East Atlantic pattern, a zonal pressure difference. We investigate their positive and negative phases in the ERA-20C reanalysis for 1900-2010 and assign which phase of either mechanism is dominating a specific summer. With this method we find that the different phases influence different regions over the North-Atlantic-European sector.
We use this analysis to show in which region which domination mechanism influences hindcast skill. For this, we analyse the hindcast skill for 1900-2010 using 10 ensemble members generated by MPI-ESM-MR, starting every year in May. By identifying the different phases of the mechanisms in the individual ensemble members, we further find that the hindcast skill in the influenced regions varies strongly over time.