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The potential of air-sea interactions for improving summertime North Atlantic seasonal forecasts

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Delivering skillful summertime seasonal forecasts of the Northern Hemisphere (NH) mid-latitude climate is a key unresolved issue for the climate science community. Current climate models have some skill in forecasting the wintertime NH mid-latitude circulation but very limited skill during summertime. To explore the potential predictability of the summertime climate we analyze lagged correlation patterns between the SSTs and summer atmospheric circulation in the North Atlantic both in observations and climate model outputs.
We find observational evidence in the ERA-Interim (1979-2015) reanalysis and the HadSLP2 and HadISST data of an SST pattern forced by late winter atmospheric circulation persisting from winter to early summer that excites an anticyclonic summer SLP anomaly west of the British Isles. We show that the atmospheric response is driven through the action of turbulent heat fluxes and changes on the background baroclinicity. The lagged atmospheric response to the SSTs could be exploited for summertime predictability over Western Europe. We find a statistical significant correlation of over 0.6 between April-May North Atlantic SSTs and the June-August North Atlantic SLP anomaly.
The previous findings are further explored using 120 years of coupled ocean-atmosphere HadGEM3-GC2 model simulation. The climate model qualitatively reproduces the observed spatial relationship between the late winter and spring SSTs and summertime circulation, although the correlations are substantially weaker than observed.