POTENTIAL PREDICTABILITY OF THE OBSERVED EURO-ATLANTIC ATMOSPHERIC VARIABILITY BASED ON SST FORCED GCM SIMULATIONS

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Our study aims at identifying the interannual to decadal predictability of the Euro-Atlantic atmospheric variability by comparing the NCEP reanalysis with ECHAM4-T42 ensemble simulations forced with observed sea surface temperature (SST) and sea-ice boundaries (GISST2.2) for 1951-1994. To identify those observational patterns of variability that covary with the forced atmospheric modes in the GCM simulations we used the canonical correlation analysis.

The main predictability of the Euro-Atlantic 500 hPa geopotential height variability is due to remote forcing by tropical Pacific SST from late autumn to spring. While the model response shows little seasonal variation, the observational signal changes seasonally and most strongly affects the European climate between autumn and late winter. The best agreement between modelled and observed variability is obtained in late winter, when ENSO tends to modulate the North Atlantic Oscillation (NAO) variability. A marginally significant predictability in late spring and summer is also linked to tropical North Atlantic SST.

The sea level pressure (SLP) variability over the Euro-Atlantic region seems to be much less sensitive to remote ENSO forcing, although traces of the above-mentioned influence can be detected in late winter. On the other hand, a highly significant covariability is found between model and observed SLP anomalies in summer and autumn, leading to significant predictability over North-Africa and central Europe from tropical and subtropical SST anomalies in the North-Atlantic. Again the model shows some deficiencies since the SLP over the Golf of Mexico responds too strongly to tropical Atlantic SST.

The model fails to simulate the observed decadal variability of the NAO in winter for 1951-1994. However, it shows better skill when the analysis is limited to 1975-1994.