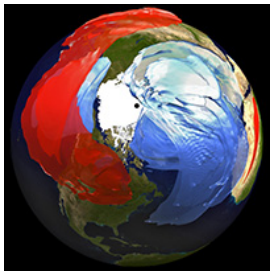

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# ENSO influence on the North Atlantic: Quantifying nonlinearity and relative role of the stratospheric and the tropospheric pathways

El Niño Southern Oscillation (ENSO) can exert a remote impact on North Atlantic and European (NAE) winter climate. This teleconnection is influenced by the superposition and interaction of different pathways. In this study, we focus on the stratospheric and tropospheric pathways through the North Pacific. Due to potential non-linear and non-stationary behavior and due to the limited time period covered by reanalysis datasets, the dynamical mechanisms that drive this teleconnection are still not fully understood. In order to resolve this question, we use a simplified physics atmospheric model forced with seasonally varying prescribed sea surface temperature (SST) following the evolution of different ENSO phases. In order to isolate the contribution of the tropospheric pathway, we also perform simulations where stratospheric winds are nudged towards climatological conditions. In these simulations, i.e. when the stratospheric pathway is shut down, the strongest tropospheric pathway is achieved for the strong El Niño forcing, which tends to lead to a negative NAO phase. The tropospheric pathway to the North Atlantic exhibits a significant nonlinearity with respect to the tropical SST forcing, in particular for strong ENSO forcings. Our experiments also show a strong decrease in the interannual NAO variability when the stratospheric winds are nudged to climatological conditions, thereby weakening the dynamical link between the North Pacific and North Atlantic circulation. These findings may have important consequences for long-range prediction and for potential changes in the diversity and strength of ENSO with climate change.

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