The influence of the Atlantic Multidecadal Oscillation on the observed Northern Hemisphere atmospheric circulation

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Abstract

The AMOC likely contributes substantially to the 50 to 70-year variability of the SST over the North Atlantic Ocean, known as the Atlantic Multidecadal Oscillation (AMO). The influence of the AMO on the North American and European region is investigated using the 20th century reanalysis ensemble from 1900 to 2010 and SST observations, after removing the tendency due to global warming and the influence of the interannual variability of the tropical Pacific Ocean. In summer and spring, the tropical SST anomalies associated with the AMO are shown to cause a shift of the ITCZ in the Caribbean basin, which also affects the atmospheric circulation patterns in the midlatitudes. In fall, the AMO causes weak Z500 anomalies that resemble a negative NAO pattern for a positive AMO and seem to be primarily driven by the midlatitude SSTs. The latter AMO influence corresponds to that of the so-called North Atlantic horseshoe SST anomaly, which was shown to lead the NAO by few months in fall and early winter. Finally, the climatic impacts of the AMO are documented for air temperature and precipitation, in relation to its influence on the atmospheric circulation.