



Extreme conditions over Europe and North America: role of the Atlantic Multidecadal Variability

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The Atlantic Multidecadal Variability (AMV) is the result and possibly the source of marked modulations of the climate over many areas of the globe. For instance, the relatively warm and dry climate of North America throughout the 30-yr interval of 1931-60, during which the Dust Bowl and the 1950's drought occurred, has been linked to the concomitant warm phase of the AMV. During this period relative warm and wet conditions prevailed over Europe. After 1960, the Atlantic began to cool, and for almost three decades the North American climate turned wetter and cooler whereas Europe experienced cooler and dryer conditions. However, the shortness of the historical observations compared to the AMV period suggested by longer proxy (~60-80yr) does not allow to firmly conclude on the causal effect of the AMV. We use a model approach to isolate the causal role of the AMV on the occurrence of extreme events over Europe and North America. We present experiments based on two GFDL global climate models, a low resolution version, CM2.1 and a higher resolution model for the atmospheric component, FLOR. In both model experiments sea surface temperatures in the North Atlantic sector are restored to the observed AMV pattern, while the other basins are left fully coupled. In order to explore and robustly isolate the AMV impacts on extreme events, we use large ensemble simulations (100 members for CM2.1 and 50 for FLOR) that we run for 20 years. We find that a positive phase of the AMV increases the frequency of occurrence of drought over North America and of extremely cold/warm conditions over Northern/Central Europe during winter/summer. Interestingly, we find that the AMV impacts on these extreme conditions are modulated by the Pacific response to the AMV itself. Members that develop a weak Pacific response show more extreme events over Europe whereas those that develop a strong Pacific response show more extreme events over North America.