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The dynamical influence of the Atlantic Multidecadal Oscillation on continental climate

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The Atlantic Multidecadal Oscillation (AMO) in sea surface temperature (SST) has been shown to influence the climate of the surrounding continents. However, it is unclear to what extent the observed impact of the AMO is related to the direct thermodynamical influence of the SST variability or the more complex changes in large-scale atmospheric circulation. Here we use an analog method to decompose the observed impact of the AMO into dynamical and residual components of surface air temperature (SAT) and precipitation over the adjacent continents. Over Europe the decomposition exhibits strong seasonal dependence, with SAT anomalies being primarily dynamically driven in winter and spring, whereas in the summer the SAT anomalies are primarily thermodynamically driven. The overall precipitation response to the AMO is generally less significant than the SAT but is mostly dynamically driven in all seasons. The decomposition is also applied to the North American summer and the Sahel rainy season. Both dynamical and residual influences on the anomalous precipitation over the Sahel are substantial, with the former dominating over the western Sahel region and the latter being largest over the eastern Sahel region. The results have implications for understanding the spread in AMO variability in coupled climate models and decadal prediction systems.