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Emergent constraints to understand CMIP5 model diversity in simulating the teleconnection between Atlantic Multidecadal Variability and European temperature

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Properties of the Atlantic Multidecadal Variability (AMV) and its teleconnection with summer temperature over Europe are studied in an ensemble of climate simulations. Model results are compared to observations, factoring the large uncertainties associated with the shortness of the observational record when dealing with multi-decadal properties, and the estimation of the forced signal. A very large inter-model spread of AMV properties is found and many models are not compatible with the observations. The causes of this spread are then studied. The strength of modeled teleconnections is found to depend on the correlation between subpolar gyre and tropical North-Atlantic sea surface temperatures. Additionally, models with more persistent AMV have stronger teleconnections. Our results also suggest that the strength of the teleconnections depends on the ratio between climatological oceanic and atmospheric meridional energy transport. Overall, our results underline the need to be cautious when dealing with decadal properties in climate models.