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Global Climate Impacts of the Atlantic Multidecadal Variability: a model-based approach

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The Atlantic Multidecadal Variability (AMV) has been linked to world-wide climate changes: surface air temperature, tropical rainfall, drought, Atlantic hurricane activity and Arctic Sea-Ice. Both the low-frequency occurrence of the phenomenon and the short observational record highlight the crucial role of climate models for detecting and investigating the numerous teleconnections related to the AMV. In this study, we follow the experimental framework outlined in the CMIP6 Decadal Climate Predictions Project (DCPP – Component C1) protocol, using the CMCC climate model CMCC-CM2-SR. The sea surface temperature in the North Atlantic is restored to a positive (negative) time-independent AMV anomaly to simulate the warm (cold) phase, while the ocean can freely evolve outside of the nudging region. The model setup is complaint with CMIP6 experimental design and the climate components have one-degree horizontal resolutions. All the experiments include 10 ensemble members, where the external forcings are set at the pre-industrial values (constant at 1850's levels) to get just the internal variability effects. We focus on the differences between the simulated positive and negative phases in order to capture the linear climate response to the AMV. Our preliminary results show global warm temperature anomalies, in particular over the European and Mediterranean regions, as well as Northern Africa, Middle East and Arabian Peninsula. Even Central America and Siberia are connected to the AMV, displaying enhanced warming in response to a positive phase. Precipitation field presents a northward shift of the Inter-Tropical Convergence Zone (ITCZ) with increased rainfall over the whole tropical belt, from Saharan Africa to Central America. Wetter conditions are found also over the Maritime continent suggesting a linkage between the AMV and the Indian Summer Monsoon Rainfall. On the other hand, reduced precipitation involves US West Coast and Amazonian regions in agreement with literature data.