Geophysical Research Abstracts
Vol. 14, EGU2012-9891, 2012
EGU General Assembly 2012

On the role of external forcing for the Atlantic Multidecadal Oscillation.

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The Atlantic Multidecadal Oscillation (AMO) is an important mode of variability in the Atlantic region with impacts on the regional to hemispheric scale and links to various phenomena from Sahel drought to tropical hurricane frequencies. Whether the AMO is a persistent oscillatory phenomenon or to some some extent driven by external forcings is still under debate.
In the last years this question was assessed in a number of reconstruction and modeling studies. In general, two different approaches are applied: (1) methods which focus on the internal variability by decomposing the data into externally forced variations and a residuum (i.e. the AMO) and (2) methods which use the original data including the external signal. The former has the disadvantage that an attribution of AMO variations to external forcing is per definition no longer possible and the characteristics of the residuum may depend on the decomposition method.
For this study, we compare both methods and analyze the role of external forcing for the AMO variability using simulations with a coupled ocean-atmosphere-chemistry climate model (ECHAM5-SOCOL3-MPIOM and others) and proxy reconstructions.The analysis focuses on the last millennium and uses multiple external forcing datasets to assess the robustness of the decomposition methods.
Preliminary results from the coupled model simulations reveal an influence of the solar forcing on the Atlantic sea surface temperatures (SST). Therefore, the result of decomposition methods is sensitive to the TSI reconstruction used. Furthermore, we assess the assumption of linearity, that underlies most decomposition methods, by comparing the estimated residual variability of forced simulations with an unforced control simulation.