

**Lagged Correlation between the NAO and the 11-year Solar Cycle: Forced response or internal variability?**

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Very recently, the North Atlantic Oscillation has been suggested to respond to the 11-year solar cycle with a lag of a few years. The solar/NAO relationship provides a potential pathway for solar activity to modulate surface climate. However, a short observational record paired with strong intrinsic variability of the NAO raise questions about the robustness of the claimed solar/NAO relationship. For the first time, we investigate the robustness of the solar/NAO signal in four different reanalysis data sets, and long integrations from an ocean-coupled chemistry-climate model forced with the 11-year solar cycle. The signal appears to be robust in the different reanalysis datasets. We also show, for the first time, that many features of the observed signal, such as amplitude, spatial pattern, and lag of 2/3 years can be accurately reproduced in our model simulations. However, in both the reanalysis and model simulations, we find that this signal is non-stationary. Most importantly, a lagged NAO/solar signal can also be reproduced in two sets of model integrations without the 11-year solar cycle. We find that this sporadic signal in models and observations is due to internal decadal variability in the NAO, and is not a response to the solar cycle. This has implications towards the interpretation of surface solar signals in observational data.