



North Atlantic Surface Response to the 11-year Solar Cycle

Rémi Thiéblemont (1), Katja Matthes (1), Nour-Eddine Omrani (1), and Kunihiro Koderu (2)

(1) GEOMAR Helmholtz Center for Oceanographic Research, Kiel, Germany (rthieblemont@geomar.de), (2) STEL., Nagoya University, Japan

Variability in solar irradiance is connected to changes in surface climate at regional scales. Observational and idealized modeling studies have shown a robust lagged solar response in the North Atlantic sector that resembles the North Atlantic Oscillation (NAO) arising from ocean-atmosphere coupling processes. In our study, we propose to investigate this mechanism in realistic simulations performed with NCAR's Community Earth System Model (CESM, version 1.0.2), a coupled model system including the Whole Atmosphere Community Climate Model (WACCM).

Two multidecadal experiments are performed by either (i) including, or (ii) suppressing the input solar irradiance variability. For each experiment, the anthropogenic forcing contribution is excluded by keeping constant greenhouse gases and ozone depleting substances at the 1960's level.

The results show a statistically significant NAO signature in response to solar variability. The cross-spectral analysis of the NAO and the F10.7 indices reveal a maximum coherency for the 11-years period lagged by two years which is significant at the 95% level. The mechanisms are discussed with respect to stratosphere/troposphere and ocean/atmosphere coupling processes.