

Decadal variability and its relation to the solar cycle and internal variability

Katja MATTHES^{1,2}

¹ *GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel, Germany*

² *Christian-Albrechts-Universität zu Kiel, Kiel, Germany*

Quasi-decadal variability in solar irradiance has been suggested to have substantial effects on Earth's climate at regional scales. In the North Atlantic sector, the 11-year solar signal has been proposed to project onto a pattern resembling the Arctic Oscillation/North Atlantic Oscillation which maximizes by a lag of a few years due to ocean-atmosphere coupling processes. However this relationship has not yet been supported by climate model simulations with realistic observed forcings. Its detection is further complicated since quasi-decadal fluctuations of the North Atlantic Oscillation can be intrinsically generated by the coupled ocean-atmosphere system.

Atmospheric dynamical investigations further suggest that the 11-year solar cycle synchronizes the internally generated quasi-decadal North Atlantic Oscillation variability through the downward propagation of the solar signal from the upper stratosphere to the surface. The results point out that both solar UV forcing as well as air-sea interaction processes are key influencing factors of quasi-decadal natural climate variability. In addition decadal variability in tropopause temperatures related to the Pacific Decadal Oscillation will be presented.

Key words: solar influence on climate, decadal climate variability, climate modeling, stratosphere-troposphere-ocean coupling