

Nonlinear Response of the Stratosphere and the North Atlantic-European Climate to Global Warming

Elisa MANZINI¹, Alexey Yu. KARPECHKO², Luis KORNBLUEH¹

¹*Max-Planck-Institut für Meteorologie, Hamburg, Germany*

²*Finnish Meteorological Institute, Helsinki, Finland*

The response of the Northern winter atmospheric circulation for two consecutive global warming periods of 2K is examined in a grand ensemble (68 members) of idealized CO₂ increase experiments performed with the same climate model. The comparison of the atmospheric responses for the two periods shows remarkable differences, indicating the nonlinearity of the response. The nonlinear signature of the atmospheric and surface responses is reminiscent of the positive phase of the annular mode of variability. The stratospheric vortex response shifts from an easterly wind change for the first 2K to a westerly wind change for the second 2K. The North Atlantic storm track shifts poleward only in the second period. A weaker November Arctic amplification during the second period suggests that differences in Arctic sea ice changes can act to trigger the atmospheric nonlinear response. Stratosphere-troposphere coupling thereafter can provide for the persistence of this nonlinearity throughout the winter.

Key words: stratosphere-troposphere-coupling, storm tracks, sea-ice, climate change

References

Manzini, E., A. Yu. Karpechko, and L. Kornblueh (2018) Nonlinear Response of the Stratosphere and the North Atlantic-European Climate to Global Warming, *Geophysical Research Letters* (accepted).