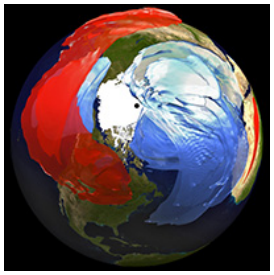

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Zonally asymmetric tropospheric signatures of polar vortex splits and displacements

Sudden Stratospheric Warming (SSW) events during the Northern Hemisphere winter and shoulder seasons are investigated using a 300-year run of the Whole Atmosphere Community Climate Model (WACCM). This model features relatively fine vertical resolution in key regions of the stratosphere, and the multi-century run provides far more SSW events than are seen in the observations, allowing for more statistically rigorous analysis. Lagged composites of wind, height, temperature, and wave activity flux fields are calculated for all SSW events at various pressure levels, as well as for the subset of polar vortex splits, and the subset of polar vortex displacements. The results are compared to observational data using ERA-Interim reanalysis.

Significant differences exist between the composites of splits and displacements, especially over the Atlantic storm track region and the North Pacific. These are reflected in differences in the location of the Pacific and Atlantic jets following splits and displacements. Composite Plumb Flux vectors in the upper troposphere leading up to the SSW events show substantial differences between splits and displacements near the Aleutian Islands, potentially suggesting a dynamical mechanism for some of the differences described. The influence of both kinds of SSWs on the Greenland tip jet, associated with changes in the Northern Annular Mode (NAM), is particularly investigated.

These calculations aim to further our dynamical understanding of the complex atmospheric system, and may additionally have implications both for subseasonal to seasonal forecasting, and for understanding future climate change.

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