Climate Impacts of Solar Cycle and Quasi-Biennial Oscillation: From the Polar Area to Mid-latitude

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Oral

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Extratropical stratospheric interannual variability is compounded by the nonlinear effects of the Solar Cycle and the Quasi-Biennial Oscillation (QBO). Compared to the quiescent state (when the QBO is in the westerly phase and the 11-year Solar Cycle is at the minimum), the winter polar vortex is less stable, and hence may break and cause a major warming event in the late winter (Feb-Mar), when either the QBO is in the easterly phase or the Solar Cycle is at the maximum due to the enhanced convergence of planetary waves in the extratropics. Meanwhile, a planetary-scale cold anomaly in the stratosphere over North America is observed, indicating an exchange of airmass between the polar region and mid-latitudes during the major warming event. This cold anomaly extends downward to the surface in the southern US, leading to a temperature decrease of 0.5-1 K relative to the quiescent state. We examine the relationship between the cold anomaly and the movement of the polar jet stream.

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