

The influence of the Madden Julian Oscillation and the Quasi-Biennial Oscillation on the boreal winter Arctic Stratosphere in S2S subseasonal forecast models

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The effect of the Madden-Julian Oscillation (MJO) on the Northern Hemisphere wintertime stratospheric polar vortex is evaluated in operational subseasonal forecasting models. Reforecasts which simulate stronger MJO-related convection in the Tropical West Pacific also simulate enhanced heat flux in the lowermost stratosphere and a more realistic vortex evolution. The time scale on which vortex predictability is enhanced lies between 2 and 4 weeks for nearly all cases. Those stratospheric sudden warmings that were preceded by a strong MJO event are more predictable at ~20 day leads than stratospheric sudden warmings not preceded by a MJO event. Hence, knowledge of the MJO can contribute to enhanced predictability, at least in a probabilistic sense, of the Northern Hemisphere polar stratosphere.

The effect of the Quasi Biennial Oscillation on the vortex in these same models is also evaluated. The UK Met Office model, the ECMWF model, and the NCEP model all show a Holton Tan effect that is similar though weaker to that observed.

Key words: subseasonal prediction; MJO; QBO; Holton Tan effect;

References (if needed)

Garfinkel, C. I., & Schwartz, C. (2017). MJO-related tropical convection anomalies lead to more accurate stratospheric vortex variability in subseasonal forecast models. *Geophysical Research Letters*, 44, 10,054–10,062. <https://doi.org/10.1002/2017GL074470>