



On predicting the coupled stratosphere-troposphere response to planetary wave forcing.

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Large natural variability in the winter polar stratosphere makes it difficult to predict whether the stratosphere and troposphere will couple in response to planetary wave forcing. Often the same wave forcing can produce different responses depending on the state of the polar vortex at the initialisation time. We conducted an 80-member ensemble of autumn-winter seasonal integrations using the Geophysical Fluid Dynamics Laboratory Atmosphere/Land model AM2/LM2. The forcing is a prescribed regional snow mass anomaly over Siberia, which results in the generation of planetary wave activity. On seasonal timescales we demonstrate that initially weak polar vortex states increase the number of stratospheric warming responses to the forcing and the number of warmings that couple to the surface. But strikingly, for initially strong vortex states the frequency of warmings and coupling is unchanged. These results imply that autumn-winter seasonal predictability could be augmented in cases where the polar vortex is initially weak.