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Scientific Theme: Atmospheric Dynamics

Simulations of Fall and Early Winter in the Stratosphere, G. L. Manney, W. A. Lahoz, J. L. Sabutis, A. O'Neill, and L. Steenman-Clark, *Q. J. Roy. Meteorol. Soc.*, **128**, 2205–2237, October 2002.

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Summary

Simulations of dynamics and transport in the fall and early winter (November-December in the northern hemisphere (NH), May-June in the southern hemisphere (SH)) stratosphere were done using the UK Universities' Global Atmospheric Modelling Project's Stratosphere Mesosphere Model (USMM) for six NH and six SH winters. The results show good agreement in patterns of interannual and interhemispheric variability and the overall characteristics of polar vortex development between the model and meteorological data based on observations. The simulations are used to examine interhemispheric differences in polar vortex development and the degree of interannual variability. In fall and early winter, the behavior in the NH and SH is qualitatively similar, with similar structure and timing of "stratospheric minor warmings" (where the vortex development is temporarily disrupted); this is in contrast to later in winter when the NH shows much more interannual variability.

This work improves our understanding of polar vortex development in both hemispheres, which is critical to understanding the dynamical processes that affect wintertime temperatures and hence ozone loss. This benefits society by improving our understanding of processes related to ozone loss and climate variability.

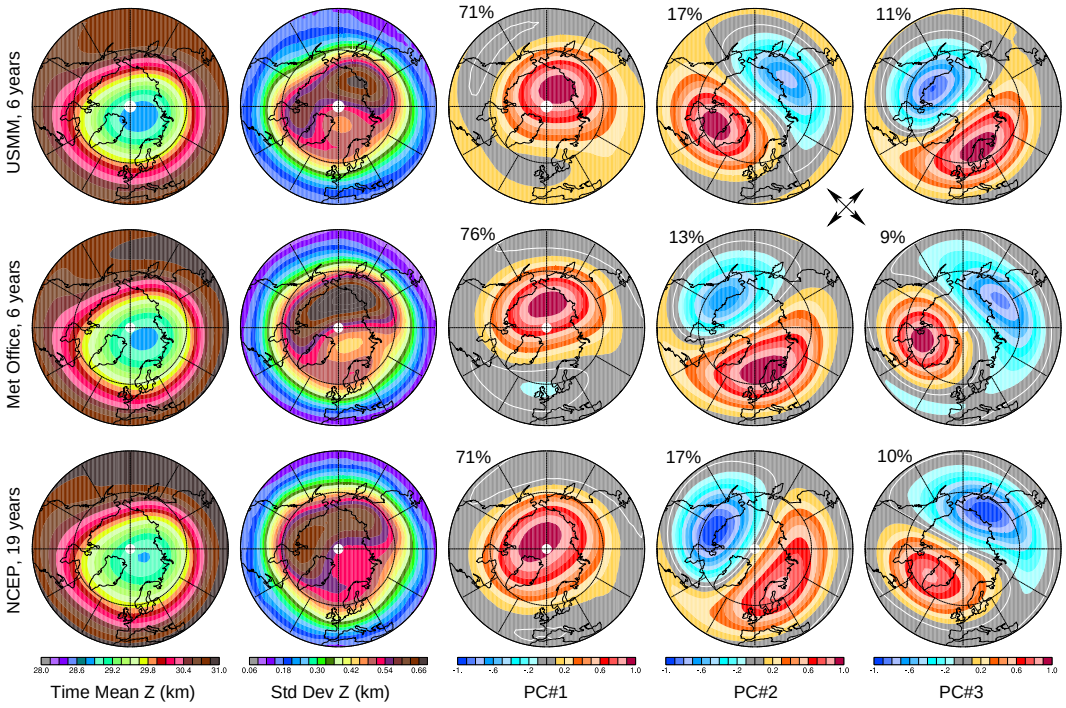

Figure 12. Time mean, standard deviation and first three principal components (PCs) from an Empirical Orthogonal Function analyses for the 10-hPa geopotential heights in the NH for 26 Oct through 3 January from (top) USMM model for 6 years, 1992-1997, (center) Met Office data for 6 years, 1992-1997 and (bottom) NCEP data for 19 years, 1979-1997. Principal component fields are normalized. Note that PC#3 in the USMM is a pattern corresponding to PC#2 in the Met Office and NCEP analyses. The PCs show the dominant patterns of variability in the middle stratosphere during fall and early winter, and the model and data show quite good agreement in those patterns.