JPL (MLS Team) Scientific Publication

Scientific Theme: Atmospheric Dynamics and Chemistry

Diagnostic Comparison of Meteorological Analyses during the 2002 Antarctic Winter, G. L. Manney, D. R. Allen, K. Krüger, B. Naujokat, M. L. Santee, J. L. Sabutis, S. Pawson, R. Swinbank, C. E. Randall, A. J. Simmons, and C. Long, *Mon. Wea. Rev.*, **133**, 1261–1278, May 2005.
MLS contact: Gloria Manney, manney@mls.jpl.nasa.gov, 505-454-3364.

Summary

Stratospheric sudden warmings are common in the Arctic winter stratosphere, but before 2002 were unheard of in the Antarctic. Studies of the 2002 Antarctic winter rely on one or more commonly used meteorological analyses from several assimilation systems. To explore how the choice of meteorological analysis may affect data analyses and modeling studies, in this paper we compare diagnostics like those used in many studies between several of the commonly used analyses. While the meteorological datasets show broad overall agreement for large scale dynamical features, several differences can be significant. Both of the long-term reanalyses (crucial for trend and variability studies) available (from the European Centre for Medium-Range Weather Forecasting (ECMWF), and from the US National Centers for Environmental Prediction/National Center for Atmospheric Research) have serious deficiencies that make then unsuitable for many detailed analyses, especially quantitative studies depending on temperature. Three operational assimilated datasets, from ECMWF, the UK Met Office, and NASA's Global Modeling and Assimilation Office, are best suited for most detailed studies. For many studies, though, it is still important to assess the differences between using different meteorological analyses in order to understand uncertainties in the conclusions.

This research benefits society by improving our understanding of how using different meteorological datasets may affect scientific studies. Understanding these uncertainties is critical to studies such as those modeling stratospheric ozone loss, and studies of trends and variability in temperatures and ozone. These in turn are key to predicting and detecting ozone recovery and effects of climate change.

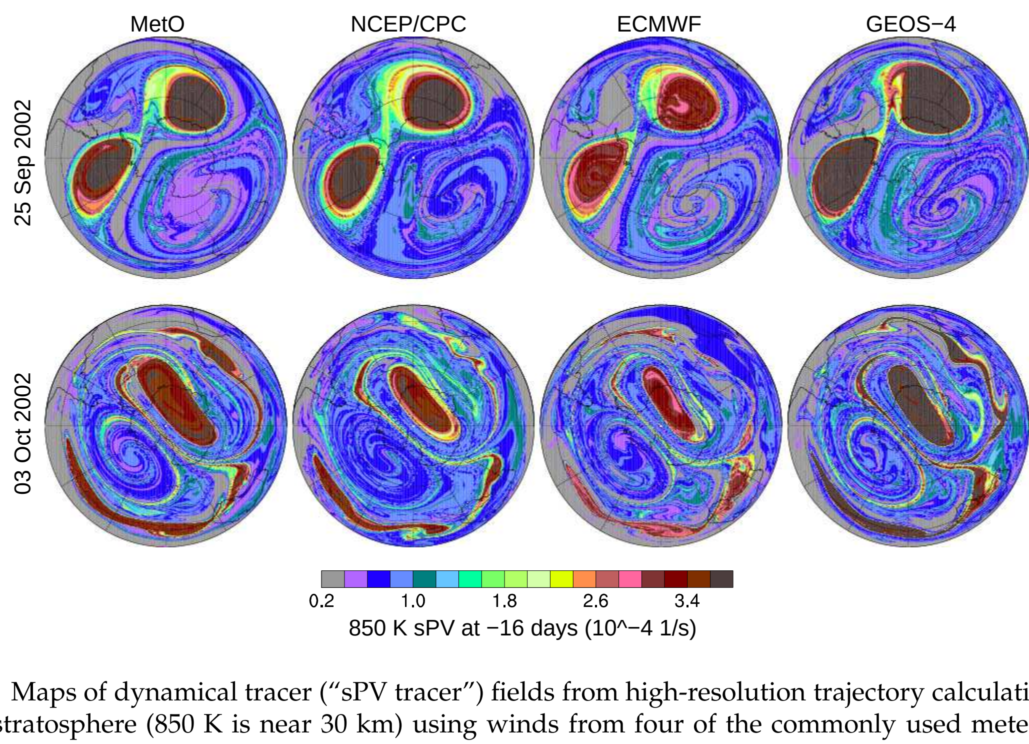

Figure 9. Maps of dynamical tracer ("sPV tracer") fields from high-resolution trajectory calculations in the middle stratosphere (850 K is near 30 km) using winds from four of the commonly used meteorological analyses. Substantial differences in transport using wind fields from different datasets are reflected in the strength and depth (magnitude of gradients and of sPV values, respectively) of the vortex, details of its evolution (e.g., the degree of separation of two lobes on 25 September), and structure of filaments pulled off the vortices.