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Scientific Theme: Atmospheric Chemistry and Transport

Reconstruction and Simulation of Stratospheric Ozone Distributions during the 2002 Austral Winter, C. E. Randall, G. L. Manney, D. R. Allen, R. M. Bevilacqua, J. Hornstein, C. Trepte, W. A. Lahoz, J. Ajtic, and G. Bodeker, *J. Atmos. Sci.*, **62**, 748–764, March 2005.
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Summary

Stratospheric sudden warmings are common in the Arctic winter stratosphere, but before 2002 were unheard of in the Antarctic. In a paper appearing in a special issue of *Journal of the Atmospheric Sciences* on the 2002 Antarctic winter and major warming, satellite-based solar occultation measurements, which provide observations around one latitude in each hemisphere on a given day, are combined with meteorological fields of potential vorticity to reconstruct three-dimensional fields of ozone from the sparse data. These fields are used to study ozone transport during the 2002 Antarctic major warming, and are compared with detailed model simulations of ozone transport. Differences between the ozone distributions in 2002 and other winters are characterized. Enhanced poleward transport and mixing are the dominant processes affecting the ozone distribution during the major warming.

This research benefits society by maximizing the information we get from sparse ozone observations, thereby allowing detailed analyses of ozone changes and interannual comparisons. This in turn improves our understanding of ozone transport and chemistry and potentially their relationship to climate change.

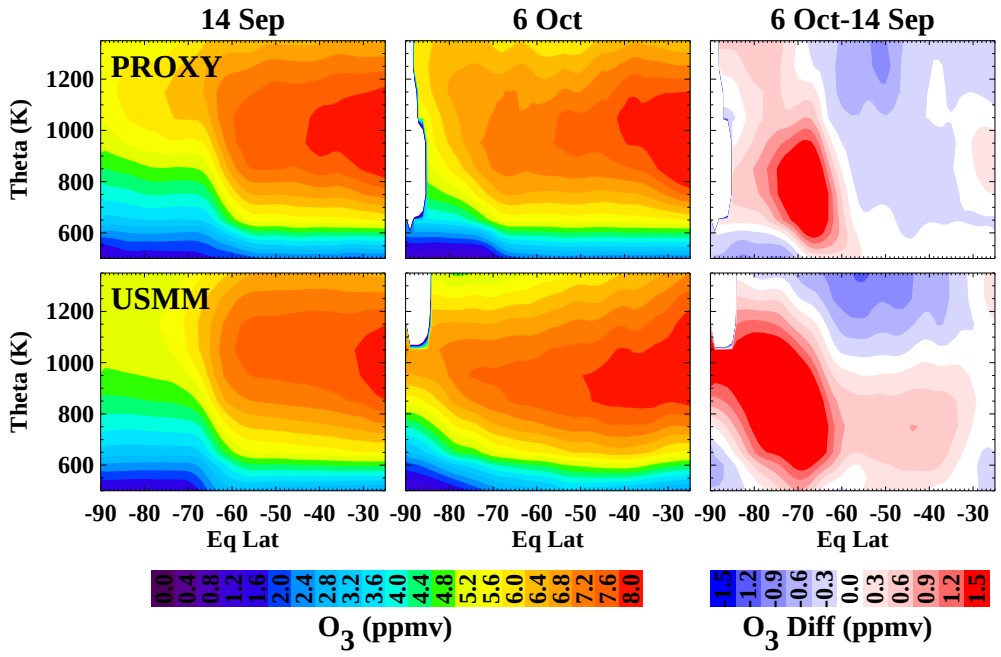

Figure 14. Plots of ozone (top) reconstructed from sparse solar occultation data and (bottom) transported in a detailed model simulation, before (14 Sep) and after (6 Oct) the 2002 Antarctic major warming. The x-coordinate is equivalent latitude, a latitude-like coordinate that separates the polar vortex and extravortex values; the vertical range (y-coordinate) is from about 15 to 47 km. The right column shows the difference between the two dates. Good agreement in ozone transport is seen between the fields reconstructed from data and the model simulation. The large ozone increase at high equivalent latitudes shows enhanced transport and mixing.