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Scientific Theme: Atmospheric Dynamics and Transport

An Observational Study of the Final Breakdown of the Southern Hemisphere Stratospheric Vortex in 2002, Y. J. Orsolini, C. E. Randall, G. L. Manney, and D. R. Allen, *J. Atmos. Sci.*, **62**, 735–747, 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, Orsolini and coauthors examine the period *after* the major warming – the final springtime breakdown of the stratospheric polar vortex. Water and ozone data from the Michelsen Interferometer for Passive Atmospheric Sounding (MIPAS) instrument on the European Space Agency's Environment Satellite (ENVISAT), meteorological analyses, high-resolution trajectory-based transport calculations, and water and ozone fields reconstructed from sparse solar occultation satellite data are all used to detail the dynamics of the vortex breakdown, focusing on the middle stratosphere where MIPAS data quality is best. The vortex, already weakened by the major warming, broke up about a month earlier than usual. A consistent picture of the evolution and dispersal of vortex fragments was seen using low-resolution MIPAS data and high-resolution trajectory calculations.

This research benefits society by improving our understanding of mechanisms of dynamics and transport during the breakdown of the Antarctic polar vortex. The Antarctic vortex breakdown allows ozone depleted air to disperse throughout the southern hemisphere, including over more densely populated areas. Understanding of the processes involved is thus important to assessing human impacts of these events.

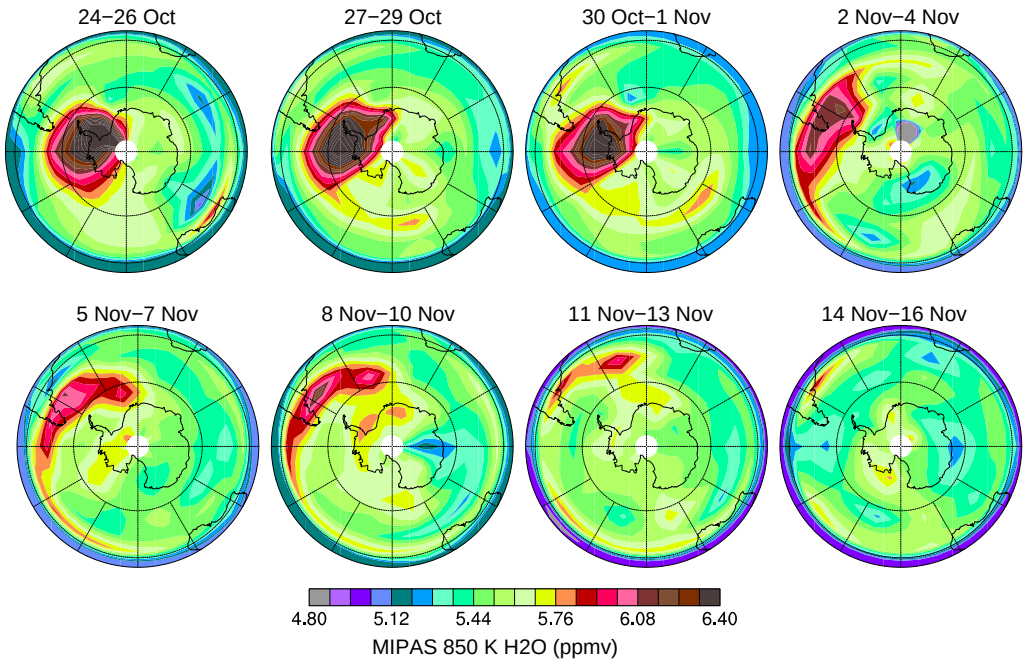

Figure 7a. Maps of MIPAS water vapor during the Antarctic vortex breakdown in 2002, at 850 K (near 30 km), showing the erosion and transport of the main vortex remnant.