

Interactive
Comment

Interactive comment on “Short- and medium-term atmospheric effects of very large solar proton events” by C. H. Jackman et al.

C. H. Jackman et al.

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We thank Claire Waymark for helpful comments. The Comments are listed first and our Reply: is given next. We are submitting a revised manuscript with two additional figures.

Here are a few comments;

p.10554 line 10: Why is a chemical tracer used to calculate the edge of the polar vortex instead of the mean zonal winds and how are the CO profiles obtained?

Reply: We take the MIPAS NO_x plots (top of Fig. 4) from the Lopez-Puertas et al. [2005a] study, who use the MIPAS measurements of CO to determine the polar vortex boundary. Lopez-Puertas et al. [2005a] used the dynamical tracer CO because it is more accurate than the zonal winds for defining the vortex edge as CO itself is a direct

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measurement of the descent of air. The mean zonal upper stratospheric and mesospheric winds in ECMWF are based on only a few measurements at the uppermost altitudes and hence it is thought that the use of CO is more accurate. The CO profiles were retrieved from the same MIPAS spectra at the co-location of the measurements by using the IMK/IAA non-LTE retrieval processor. This retrieval has not been published yet and is a paper in preparation by Funke et al. which has not been submitted yet. Some details are given, however, in Funke, B., et al. (2007), Analysis of nonlocal thermodynamic equilibrium CO 4.7 mm fundamental, isotopic, and hot band emissions measured by the Michelson Interferometer for Passive Atmospheric Sounding on Envisat, *J. Geophys. Res.*, 112, D11305, doi: 10.1029/2006JD007933.

Fig.8 and Fig.9: How do the MIPAS retrievals compare to the WACCM3 model for a non SPE case?

Reply: We have compared MIPAS and WACCM3 on 26 Oct. 2003 (non-SPE) and have found very reasonable agreement for HNO₃ in the stratosphere in both hemispheres. The MIPAS/WACCM3 comparison for N₂O₅ shows reasonable agreement in the middle and lower latitudes and also for the NH polar maximum altitude (~30 km). However, MIPAS shows a peak near 1.5 ppbv and WACCM a peak near 3 ppbv at 30 km at the NH pole. A future study should probably compare these constituents in different seasons (solar zenith angle influences) and years (interannual dynamical differences) to see if there are any systematic discrepancies.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 7, 10543, 2007.

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