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Interactive comment on "Model simulations of stratospheric ozone loss caused by enhanced mesospheric NO_X during Arctic Winter 2003/2004" *by* B. Vogel et al.

B. Vogel et al.

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We thank C. Jackman for a very thorough and very favorable review. The referee listed nine 'specific comments' and thirty-three technical corrections. We are grateful for the 'technical corrections', which is a great help to write the paper in correct English. Regarding the 'specific comments' we agree with all these points. These comments highly improve the paper and explain some statements more precisely. Following the reviewers advice, we discuss the 'specific comment' 6) in more detail (see below). We thank the referee for the note, where ionization rates and suggested NOx production from SPEs are listed on a website. We think it would be a good idea to use these date for an new model project including local production of NOx caused by SPEs.

To the 'specific comment' 6):

There was a mistake in the reported column ozone loss: the statement 'we derive a column ozone loss about 2.5 DU, but lower than 4.5 DU' has to be changed to 'we derive a column ozone loss about 3.3 DU, but lower than 5.5 DU'. The first values were from a preliminary model run, the latter were results from the final model run. Thank you very much for the additional total column ozone loss calculated in the 2-D CTM results of Jackman et al. (2005b). We will discuss this additional results in our paper. We revised this paragraph (page 4928, lines 3 – 14) as follows.

In our simulations the enhancements of different NOy species below 55 km downward to 30 km altitude observed immediately after the SPEs (Lopez-Puertas et al., 2005) caused by particle precipitation reaching the stratosphere are not considered. The impact of local NOx production on polar ozone loss is considered in a study by Jackman et al. (2005b), where the influence of the solar proton events in October-November 2003 with a 2-D CTM is simulated. They calculated a total column ozone loss of 0.4 % (1.5 DU) in mid-November 2003 increasing to about 1.1 % (4.1 DU) between mid-February and the end of March 2004 for latitudes $< 70^{\circ}$ N, which is caused by the October-November 2003 SPEs (C. Jackman, personal communication). We derive a column ozone loss about 3.3 DU, but lower than 5.5 DU in mid-November caused by the solar protons producing NOx at altitudes above 55 km in October-November 2003. The reason for this discrepancy is not clear at this time, but the representation of diabatic descent in the vortex and vortex confinement are rather different in a 2-D CTM and in the 3D Model CLaMS. The difference might be an indication that in mid-November 2003 also the transport of enhanced NOx not caused directly by the SPEs in October-November 2003 from the mesosphere into the stratosphere had an impact on the total ozone loss in the stratosphere during this period. On an absolute scale, the differences are small and our results support the conclusion by Jackman et al. (2005b)

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that the impact of solar proton events on the Northern Hemisphere polar total ozone decreases is small.

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Interactive Comment