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Interactive comment on “Energetic particle induced inter-annual variability of ozone inside the Antarctic polar vortex observed in satellite data” by T. Fytterer et al.

Anonymous Referee #1

Received and published: 29 December 2014

General comments: The authors use three satellite instruments (ENVISAT MIPAS, TIMED SABER, and Odin SMR) to investigate the possible influence of energetic particles on ozone inside the Antarctic polar vortex. This is a very fascinating subject and I commend the authors on their work. They find a strong indication that ozone depletion is associated with geomagnetic activity through the charged particles' production of NO_x. The authors use three different solar and geomagnetic indices (F10.7 cm solar radio flux, Ap index, and > 2MeV electron flux) in their analysis of ozone and NO₂ data. They also use a comprehensive three-dimensional chemistry and transport model (3dCTM) in their analysis. The paper is very well-written and the conclusions

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are presented in a clear and reasonable way. I recommend that the paper be published subject to the authors considering one specific comment and three suggested technical corrections.

Specific comments:

1) p. 31266, lines 8-10: “The cause of the NO₂ behaviour is possibly related to the formation of the reservoir species ClONO₂ and HNO₃, slowing down the catalytic destruction of O₃ by Cl.” The authors might be interested to know that this mechanism was discussed in some detail in Jackman et al. (J. Geophys. Res., 114, D11304, doi:10.1029/2008JD011415, 2009), who used the Whole Atmosphere Community Climate Model (WACCM) to study the impact of the very large July 2000 solar proton event on the atmosphere (see Figures 6 & 7).

Suggested technical corrections:

- 1) p. 31251, line 28: Change “show, that,” to “show that”
- 2) p. 31260, line 2: Change “for the all” to “for all”
- 3) p. 31260, line 28: Change “pattern” to “patterns”

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 31249, 2014.

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