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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Reactive nitrogen (NO_y) and ozone responses to energetic electron precipitation during Southern Hemisphere winter" *by* Pavle Arsenovic et al.

Anonymous Referee #1

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Article summary: The authors present an analysis of energetic particle precipitation effects on the polar middle atmosphere. The impact of low (auroral) and middle (radiation belt) energy range electrons on polar reactive nitrogen (NOy), reactive hydrogen (HOx), and ozone are quantified. They used the chemistry climate model SOCOL3-MPIOM and Envisat Michelson Interferometer for Passive Atmospheric Sounding (MIPAS) and Aura Microwave Limb Sounder (MLS) satellite instruments in their studies. By comparing a year of high electron precipitation with a several year-long quiescent period, they found that there was about 15% less ozone in the polar stratosphere during Southern Hemisphere winter in both model predictions and satellite observations.

Review summary: The paper has some very interesting results on the impact of energetic particle precipitation on the polar middle atmosphere. In particular, they quantify the effect of low and middle energy range electrons with both a model and satellite instrument measurements. This type of study of the atmospheric impact of electrons in different energy ranges has only been considered before in a few other studies. The paper provides interesting results for the rather active year 2005 in comparison with the more quiescent time period 2006-2010. I do think that the paper should be published. The paper is generally well-written, but I have some suggested wording changes.

Suggested wording changes:

1) Page 2, line 13: Change "found a significant" to "found significant"

2) Page 3, line 13: Change "nitrogen monoxide" to "nitrogen monoxide (nitric oxide)"

3) Page 3, line 31: Change "aboard Aura" to "aboard the Aura"

4) Page 5, line 6: Change "brings model" to "brings the model"

5) Page 5, line 7: Change "from outer" to "from the outer"

6) Page 5, line 10: Change "In study" to "In the study"

7) Page 5, line 13: Change "analyzed 2005" to "analyzed the 2005"

8) Page 5, line 18: Change "in JJA" to "in the JJA"

9) Page 6, line 2: Change "simulation mesospheric" to "simulation the mesospheric"

10) Page 6, line 11: Change "Recent study" to "A recent study"

11) Page 6, lines 20-21: Change "in LEE, MEE and REF simulation" to "in the LEE, MEE and REF simulations"

12) Page 7, line 6: Change "Second difference" to "A second difference"

13) Page 7, line 7: Change "for small" to "for a small"

14) Page 7, line 9: Change “by increase” to “by an increase”

15) Page 7, line 9: Change “small increase” to “small increases”

16) Page 7, line 15: Change “shows increase” to “shows an increase”

17) Page 7, line 15: Change “cause increase” to “cause increases”

18) Page 7, line 16: Change “or tenth” to “or a tenth”

19) Page 7, line 17: Change “total” to “the total”

20) Page 7, line 21: Change “ALL case” to “the ALL case”

21) Page 7, line 27: Change “albeit” to “albeit the”

22) Page 7, line 27: Change “Biggest” to “The biggest”

23) Page 7, line 30: Change “300” to “300 ppbv”

24) Page 7, line 31: Change “Since sum” to “Since the sum”

25) Page 8, line 1: Change “for ozone” to “for the ozone”

26) Page 8, line 3: Change “is more” to “is the more”

27) Page 8, line 3: Change “produce stratospheric” to “produce the stratospheric”

28) Page 8, line 13: Change “to reproduce” to “to the reproduction of”

29) Page 8, line 24: Change “near HOx” to “near the HOx”

30) Page 8, line 25: Change “and increase HOx” to “and an increase of HOx”

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