

Interactive
Comment

Interactive comment on “Variability of NO_x in the polar middle atmosphere from October 2003 to March 2004: vertical transport versus local production by energetic particles” by M. Sinnhuber et al.

Anonymous Referee #1

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This paper analyses the impact of energetic particle precipitation on the distribution of NO_x as measured by MIPAS from October 2003 to March 2004, both in terms of the direct and indirect effects. The authors show that the descent of NO_x from the MLT into the polar upper stratosphere/lower mesosphere in January/February 2004 overwhelms the direct effect of the October 2003 Halloween solar proton events (SPE). They analyse the relation between NO_x and CO, examine NO_x enhancements in both hemispheres, and provide upper bounds for the direct effect of electron precipitation at different altitudes. This is an important result since contradictory findings had been

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found in the literature concerning the impact of electron precipitation in the aftermath of the Halloween SPE.

I find the paper exceptionally well-written, clear and thorough. I have only minor comments listed below. 1) There is a bit of a contradiction in the Abstract, since it says that local production by precipitating electron is unlikely, but then an upper bound (e.g. 6 ppb at 56-70km) is provided. It should say that the production is weak, smaller than the upper bound. Please clarify.

2) What the authors mean by “cross-talk” in retrieved NO between different altitudes is a bit unclear. A couple of sentence on the relevant retrieval issues could be helpful to the reader.

3) Fig 9: units for the electron fluxes on the y-axis should be included.

4) Given the results of Fig 10, wouldn't it be more relevant to show also the day-time SH NO anomalies at a level above 60km, where they are higher (rather than 48, 54 and 60 km)?

Spelling/English

P2: ...during “high” winter...: unclear

P4: continuously

P6: “for the four scenarios shown in Fig 8”. Scenario might not be the appropriate word here.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 1, 2014.

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