

Interactive comment on “Influence of galactic cosmic rays on atmospheric composition and temperature” by M. Calisto et al.

Anonymous Referee #1

Received and published: 26 January 2011

General comments:

The authors discuss a modeling study on the influence of galactic cosmic rays (GCRs) on the atmospheric composition, temperature, and zonal wind. Although most of the GCR impact is small, they show statistically significant effects in certain tropospheric and stratospheric regions on NO_x, HO_x, ozone, temperature, and zonal wind from the GCRs. The paper contains valuable information and model analyses. It is generally well organized and well presented. I have four specific comments and point out some minor typos or suggestions for the authors to consider in a future version of their manuscript.

Specific comments:

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- 1) The title of the manuscript could possibly changed to “Influence of Galactic Cosmic Rays on Atmospheric Composition and Dynamics” since the GCR influence on zonal wind is also discussed.
- 2) p. 660, lines12-18: Description of the model simulations, which are each 27-yr long (1976 to 2002). Comment: Do these model simulations have varying boundary conditions for the source gases (chlorofluorocarbons, nitrous oxide, methane, carbon dioxide, etc.) and sea surface temperatures? If so, how do these changing conditions influence the computed statistical significance of the results?
- 3) p. 661, line 28 and p. 662, line 1: It appears that the GCR influence on HNO₃ is only mentioned briefly here in regards to Figure 4. Perhaps another sentence should be added contrasting the GCR-caused HNO₃ effect to the GCR-caused NO_x effect.
- 4) p. 664, lines 20-27 and p. 579, Fig. 9 caption: This is somewhat confusing for the reader. The text on p. 664 discusses a March monthly mean with use of the ionization rates from Usoskin et al. (2010) and a January monthly mean with use of the ionization rates from Heaps (1978), whereas the Fig. 9 caption only notes the January monthly mean plots. Comment: It seems like it would be best to show the same month when comparing monthly mean computations. Thus, a comparison of the two January monthly means (with the use of each separate GCR ionization rate input) sounds like a reasonable undertaking. Was the March monthly mean plotted for one model simulation and the January monthly mean plotted for the other model simulation? If so, please explain why. If not, please remove “March” from Figure 9.

Technical corrections (minor typos, suggestions):

- 1) p. 654, line 20: Change “identifies” to “identifies”
- 2) p. 656, line16: Suggest changing “equal” to “similar”
- 3) p. 663, line 5: Suggest changing “on” to “at”
- 4) p. 664, line 2: Change “in of” to “of”

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- 5) p. 664, line 3: Suggest changing “in particular” to “in particular,”
- 6) p. 664, line 11: Suggest changing “southern hemispheric troposphere” to “southern hemispheric middle latitude (50S) troposphere”
- 7) p. 664, line 16: Change “PCS” to “PSC”
- 8) p. 664, line 25: Change “parameterization” to “parameterizations”
- 9) p. 665, line 18: Change “with 95%” to “with a 95%”

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 11, 653, 2011.