

Interactive comment on “Regional lightning NO_x sources during the TROCCINOX experiment” by C. Mari et al.

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The paper is a nice addition to the topic of lightning-generated NO_x and its chemistry. However, it does not contain any discussion of the sensitivity of their results to the vertical placement of the lightning NO_x sources, or to the production rate of NO_x by IC and CG lightning flashes. This is an important component, especially in light of the current uncertainty of the relative production rates of NO_x by IC and CG lightning. I recommend that the model be run with different production rates and vertical placements of flashes, and the results of these runs compared with those already reported in the manuscript.

Specific Comments:

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1) The model places IC flashes uniformly between the cloud top and the freezing level, while CG flashes are placed uniformly below the -10°C level. This is in contrast to numerous studies summarized in MacGorman and Rust (1998) which show that there is nothing uniform about the vertical placement of either IC or CG lightning flashes. Instead, there is often a unimodal or bimodal vertical distribution of lightning flashes, with little path length occurring near the ground. I believe a more realistic approach would be to use a method similar to that used in DeCaria et al. (2000, 2005) where the lightning NO_x has a multimodal vertical distribution. I recommend that some additional simulations be made to assess the sensitivity of the model to different initial vertical distribution of lightning NO_x.

2) Similarly, for the production amounts of NO_x by both CG and IC flashes, additional simulations should be made using different values of production by IC and CG flashes to see how sensitive the results are on the values that were chosen, especially in light of the many recent studies that have shown the IC flashes likely produce as much NO_x as CG flashes.

Technical Comments:

1) Page 5200, line 16: “(hereafter LiNO_x)” should be removed, since LiNO_x has been defined previously.

2) Page 5200, line 22: the word “the” should be added between “of” and “LiNO_x”.

3) Page 5204, line 21: “brasilian” should be capitalized as “Brazilian”.

References:

DeCaria, A.J., K.E. Pickering, G.L. Stenchikov, J.R. Scala, J.L. Stith, J.E. Dye, B.A. Ridley, and P. Laroche, 2000: "A cloud-scale model study of lightning-generated NO_x in an individual thunderstorm during STERAO-A," J. Geophys. Res., 105, 11,601–11,616

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generated NO_x and its Impact on Tropospheric Ozone Production: A 3-D Modeling Study of a STERAO-A Thunderstorm,” J. Geophys. Res., 110, D14303, doi:10.1029/2004JD005556

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