

***Interactive comment on* “The effects of lightning-produced NO_x and its vertical distribution on atmospheric chemistry: sensitivity simulations with MATCH-MPIC” by L. J. Labrador et al.**

Anonymous Referee #0

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General Comments: This manuscript is a very well-written and constructed analysis of the impact of various amounts of lightning NO_x emissions and various schemes for distributing these emissions in the vertical. As might be expected, the conclusions are something less than conclusive, primarily due to the lack of sufficient measurements of atmospheric trace gases in regions affected by lightning. However, the authors are able to eliminate the 0 and 20 TgN/yr emission scenarios as unrealistic, but are unable to discern whether 2, 5, or 10 TgN/yr yields the best results. Concerning the vertical

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distribution, the authors lean toward accepting the Pickering et al. (1998) profiles as most realistic, but this result is not conclusive. This analysis is the best that can be performed with available data.

Specific Comments: Introduction - Concerning the 1-20 TgN/yr range: 20 TgN/yr is definitely an outlier compared with most other post 1997 experimental and model-derived estimates of lightning NO_x production (e.g., Wang et al., 1998; Huntrieser et al., 2002; Martin et al., 2002; Ridley et al., 2004, etc.). This should be stated here.

Section 2.1; lines 20-22 - The flash activity over the SE USA and over India/SE Asia looks underestimated to me. The underestimate over India/SE Asia is mentioned a few lines later. I think this sentence should be changed to reflect the underestimate over the SE USA.

p. 6244, lines 15-16 - It is not for certain that CG discharges produce more NO than IC flashes (see Cooray(1997); DeCaria et al. (2000); Fehr et al. (2004)).

p. 6244, lines 27-28 - change "marine continental" to "tropical marine".

p. 6246, line 2 - Concerning Fig. 2 - For which source strength is this?

p. 6246, first paragraph - It would be useful to illustrate the differences between the vertical distributions by the fraction of the total lightning emission that is above certain altitude thresholds, such as 5 km, 8 km, 10 km.

p. 6246, lines 20-21 - why bother with the 20 TgN/yr scenario. Nobody has arrived at a value this large since 1997.

Figure 2 - why does the source go to zero at 200 hPa? Are the cloud tops never higher than 200 hPa. Certainly in the tropics convection extends higher than this level.

Technical Corrections: p. 6248, line 25 - Fig 5b should be Fig 5a.

p. 6249, line 1 - Fig. 5a should be Fig 5b.

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Figure 5 - caption should be changed to (a) EVEN5 and (b) ANVIL5

Figure 11 - PICK55 should be PICK5

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 6239, 2004.

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