

Interactive comment on “Impact of West African Monsoon convective transport and lightning NO_x production upon the upper tropospheric composition: a multi-model study” by B. Barret et al.

Anonymous Referee #2

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This paper investigates the impact of convective mixing and NO_x emissions by lightning on the upper tropospheric chemical composition during the West African Monsoon using four 3D global chemistry transport models involved in the AMMA project in conjunction with satellite and airborne observations. This is a useful paper that provides a rigorous analysis of the factors that influence ozone and CO over West Africa during the Monsoon. It also gives an estimate of the lightning NO_x source over Africa during this period. This paper is well written and organized. I recommend this paper for publication after few minor corrections.

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Specific comments:

Abstract:

p2247, line 8 “the baseline . . .” I would recommend to clarify the sentence.

p2247, line 15 “with good agreement in the Northern Hemisphere” This statement needs clarification because the figure 4 does not show a good agreement between MOZAIC and models in the Northern Hemisphere expect for INCA (that underestimates ozone in the South Hemisphere).

Description of the models:

MOCAGE:

I would suggest to add the reference of the parameterization used to redistribute NO_x emissions on the vertical.

LMDz4-INCA:

p2253, line 3: “second-order scheme” -> this point would need to be checked.

p2253, line 9: this point would need to be checked. I would have thought that PR (92) is used for both maritime and continental lightning. In Jourdain and Hauglustaine (2001), Michalon et al. (1999) was only used in a sensitivity study. Please indicate the reference PR (97) for the parameterization of the number of NO per flash (IC and CG) and mention the parameterization used to redistribute LiNO_x emissions on the vertical.

TM4:

p2254, line 2: “ Marine lightning is prescribed to be ten times . . .” -> I would suggest to add the reference of the work it is based on.

Analysis of convective mass fluxes:

p2260-2261: I think it would be useful to explain briefly why the detrainment mass fluxes in INCA are very different in term of magnitude and distribution than in the other

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models.

Analysis of the lightning activity during summer over West Africa:

P2269-2270: It would be useful to give an explanation for the overestimation of lightning over the Sahel by some models.

Figure 2: The colorbar does not appear correctly.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 2245, 2010.