

***Interactive comment on “Influence of convective transport on tropospheric ozone and its precursors in a chemistry-climate model” by R. M. Doherty et al.***

**Anonymous Referee #2**

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General comments:

The paper provides an interesting discussion on the impact of convection on tropospheric chemistry and especially on the global ozone budget. The substantial discrepancies found between this study and previous ones highlight our poor knowledge in terms of convective schemes and their role in the vertical redistribution of compounds. However I feel that in a few places the paper lacks a bit of discussions as well as quantifications. The differences found between this study and previous ones would also benefit from a more extensive discussion. I recommend publication of the paper after

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the following issues are addressed.

Specific comments:

Section 1. The authors mention that lightning NO<sub>x</sub> play an important role by reacting with isoprene in the UT. However, these emissions are still highly uncertain. Could the authors mention and discuss the total lightning NO<sub>x</sub> emissions in their model? Could they compare their number with that of the previous studies they refer to?

Section 2. Could the authors be more precise on the performances of their model, especially of the convective scheme? They mention that experiments were performed with radon, however they should provide more details on this evaluation. They could also try to discuss their model's performances in terms of convective precipitations, for example.

Section 3.1. The discussion in that section is somewhat hard to follow, in part because a number of processes are involved in the budget of each region. Could the authors synthesise their results in a table or a “cartoon” which would include the budget (i.e., transport and chemical terms for key reactions associated with ozone and NO<sub>x</sub> production and loss) for the different regions they consider in both the control and no-convection simulations? One of the rationales for conducting this study is to gain understanding how future climate may affect tropospheric chemistry. Thus, if possible, could the authors mention the effect of convection on the global OH budget? In Table 1, it is seen that the NO<sub>x</sub> burden changes substantially between the two runs. What about the NO<sub>x</sub> lifetime?

Section 4. The authors state that the largest difference between their study and that of Lawrence et al. (2003) may be the convective schemes. I think the paper would benefit from a more detailed discussion on the main differences between these schemes. Are the schemes fundamentally different and in which manner (i.e. location, strength, etc.)? Was the experiment of Lawrence et al. (2003) conducted in a similar manner (i.e. with water vapour and lightning NO<sub>x</sub> kept constant)?

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 3747, 2005.

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