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Atmospheric Chemistry and Physics Discussions

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

R. M. Doherty et al.

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We would like to thank all the referees for their detailed and thoughtful comments on the paper. Here we present our initial responses to most of the referees' comments. Not all points raised by the referees are dealt with here. We will include a full response to all comments in our final response.

Some responses to referee #2

Section 1. The authors mention that lightning NOx 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 NOx emissions in their model? Could

they compare their number with that of the previous studies they refer to?

Global lightning NOx emissions are 7 TgN/yr. Lawrence et al (2003) use a lower value of 4.9Tg N/yr. We have mentioned this in the discussion (page 3759), we will expand this text.

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.

We will add a comparison with observations section after section2, and discuss previous work on comparison of the model with observations. See ML comments 1 and 4, and referee 1 comment 3.

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 NOx 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 NOx burden changes substantially between the two runs. What about the NOx lifetime?

The effect of convection is to increase the OH burden by ˜8%. We have now calculated the NOx lifetime. This decreases from 1.4 days (convection off) to 1.1 days with convective mixing. We will add text to the discussion.

Section 4. The authors state that the largest difference between their study and that of

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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) conduct in a similar manner (i.e. with water vapour and lightning NOx kept constant)?

We hope to compare convective mass fluxes between the two studies (see referee ML comment 4) and will add a discussion of this to the text. Water vapour and lightning NOx were kept constant in Lawrence et al. (2003).

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