Atmos. Chem. Phys. Discuss., 9, C1055–C1058, 2009
www.atmos-chem-phys-discuss.net/9/C1055/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Uncertainties in atmospheric chemistry modelling due to convection and scavenging parameterisations – Part 1: Implications for global modelling" *by* H. Tost et al.

Anonymous Referee #2

Received and published: 21 May 2009

General Comments:

Tost et al. address in their study the impact of convection on trace species by examining simulations with 5 different convection schemes implemented into the EMAC atmospheric chemistry GCM. The schemes have been tuned to meet realistic radiation and precipitation fluxes during the selected time period of 4 months. The paper is well written in a clear and readable form and addresses an important task.
I recommend this study for publication with minor revisions.

Specific comments:

P 11011 L17: "...within the uncertainty range of these values." Figures 2 and 3 (supplement) provide no information on the range of observations. Therefore it is necessary to add a second data set of observations or a plot displaying the uncertainty range (for instance as a zonal mean).

P11012: From the analysis of global mass fluxes you conclude that the convective activity is different in the respective model configurations. However, convective activity comprises the magnitude of mass fluxes and the frequency. Thus for a characterization of convective activity you should additionally provide information on the frequency of convection or the mass flux of a mean event. In your Figure 1 only a time-mean mass flux is displayed. This means you averaged even over times where no convection took place.

P11013 L22-25: Equation 3 is missing. Please explain, why the overturning time is short in simulations with smaller mass fluxes.

P11015 L8-10: "...more frequently convection is triggered." From Figure 1f (time-mean mass fluxes) one cannot conclude that the frequency of convection is increased, because we have no information about it. It might also be that the magnitude of the mass flux is increased and the frequency remains unchanged.

P11015 L15: "Nevertheless the selected values show a good agreement between observed outgoing long-wave ...and precipitation." Replace "between" with "with".

P11016 L10-11: "...too much water vapour." "Too much" is an evaluation but you just compare different convection schemes. Better say "much".

P11016 L22-23: with a half-life time of 3.8 days.

P11018 L8: "The less intense shallow convection in EMA leads to lower values in the tropical boundary layer." I cannot find this result in Figure 3d. How do you explain that Radon is about 100% larger in the stratosphere in the EMA scheme compared to T1?

P11020 L19: ... and OH. Please refer to Figure 6 supplement.

P11022 L11: Please explain shortly how HCHO can be chemically altered. Otherwise your explanations cannot be understood.

P11023 L5: ECMWF.. Use EC.

P11024 L15: Shortly describe the relevant chemical reactions for HNO3. This is necessary to follow your interpretation of the results.

P11025-P11026 L29,L1: How do you interprete the results of the B1 run?

Technical corrections:

Figure captions: Please check the units in the labels and captions of your Figures (for

instance: Figure 3: Radon has units 10^{-21} mol/mol according to the plot label but is described as nmol/mol in the figure caption)

Supplement Figure 2f: The legend is missing.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 11005, 2009.