Atmos. Chem. Phys. Discuss., 7, S3350–S3352, 2007
www.atmos-chem-phys-discuss.net/7/S3350/2007/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Lightning and convection parameterisations – uncertainties inglobal modelling" *by* H. Tost et al.

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Received and published: 24 July 2007

Reply to Referee#3:

We thank the referee for his useful comments to which we reply in the following.

General comments: We are willing to revise parts of the manuscript analysing the possible deficiencies in both types of parameterisations (lightning and convective), as suggested by the referee with the help of Fig.2 of the manuscript. However, parts of this desired analysis are already part of the manuscript (Sect. 4.7) which will be consequently extended. In the Tost et al. (2006) paper we mainly focussed on the hydrological cycle. Therefore, only some of the results from this work can be used in combination with the lightning schemes (especially with the A_prec approach), and we will implement the respective findings into a revised manuscript.

Specific comments: P6769 L5: The number of 2 to 8 TgN/yr is found in Schumann and Huntrieser(2007), and this will be used in the revised manuscript.

P6771 Sect.2.2: The cloud top heights are determined as the top level of each convective column derived from the convection parameterisation, i.e. the uppermost level in which a convective updraft mass flux is calculated. This information will be added in the revised manuscript.

P6772: We will start new paragraphs as suggested.

P6775-6778: This section will be reformulated addressing the aspects mentioned in the general comments.

P6778 L7: Since we are comparing the annual mean flash densities for the year, it is obvious that only spatial correlations are shown in the Taylor diagram, but it will be mentioned explicitly in the revised manuscript.

P6779 Sect.4.2: We do not agree with the removal of this section. Even though the TRMM convective storm height is derived with a precipitation radar, it is observational data characterising the convective cloud top height. Furthermore, the P_cth scheme has been derived from monthly mean climatologies and should therefore be applicable also to such data. With respect to the precipitation, we will use the 3 hourly precipitation values of the TRMM 3B42 product for this analysis, being closer to the model output frequency and apply the A_prec scheme with this data.

P6781 L14: We do not doubt that the results of Allen and Pickering (2002) agree with other data sets, but the combination of convection and these schemes do not perform well in our model setup. This will be reformulated. However, the conclusion on which part of this combination is responsible for the disagreement with the observations is not straightforward.

P6784 L5: These results originate from the different temperature profiles in the model simulations with the exchanged convection schemes. Consequently, the 0°C threshold

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is reached at different altitudes, resulting in differences in the cloud to ground and intra cloud flash frequencies and consequently different flash densities for each type. Even though the total number of flashes (IC + CG) can agree well with the observed satellite data, the distinction into these two types which have a different NOx production efficiency (the description will be added in the model description section), is different with the exchanged convection schemes.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 6767, 2007.