Atmos. Chem. Phys. Discuss., 8, S551–S553, 2008
www.atmos-chem-phys-discuss.net/8/S551/2008/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Cloud system resolving model study of the roles of deep convection for photo-chemistry in the TOGA COARE/CEPEX region" *by* M. Salzmann et al.

Anonymous Referee #2

Received and published: 5 March 2008

This version of the manuscript is definitely more readable than the earlier versions that I read during the "technical review" stage of the ACPD process. Considerable additional detailed material can be found in the Supplement, which is about the length of another full paper!

Unfortunately, this modeling analysis has to be treated solely as a sensitivity study since no direct observations of flash rates or chemistry are available for the time period and region simulated. All that the authors can do is to determine which of their simulations most reasonably best fit the few observations from the Pacific of flash rates, NOx and ozone. The authors should make it very clear in the introduction that this is a

sensitivity study (perhaps in the paragraph stretching from line 18 on page 406 to line 8 on page 407).

I do not think that this modeling exercise really gives us any new insights on the NO production from lightning. We just learn which combinations of lightning flash rate prediction parameters and NOx production rates yield reasonable results over the TOGA-COARE region. The finding that the lightning NOx had on small impacts on ozone withing the modeling domain is interesting. What is the residence time for NOx within the domain? Perhaps it really doesn't have enough time to photochemically produce much ozone within the domain. More ozone production may take place farther downwind. Some comment to this effect in the paper would be appropriate.

Specific comments:

p. 406, line 20: what 7-day period from TOGA-COARE is being simulated?

p. 410, lines 16-22: Another important part of the DeCaria et al. scheme for placing lightning NO emissions is a pressure dependence for the NO production. Is this included here? I noted a separate set of simulations that use a pressure dependence without the Gaussian distributions of channels. But, these two criteria for NO placement should be used together.

p. 410, lines 22-26: If I am understanding this description of the manner in which the flashes are placed in the model, the CG flashes for a time step of 56s are placed in the column with maximum updraft velocity and the IC flashes are placed in the column with greatest hydrometeor mixing ratio about the -15C isotherm. It seems to me that this scheme is not very realistic, as real flashes have channel lengths of tens of kilometers stretching over large horizontal areas of the cloud. It likely produces some unrealistically large NOx mixing ratios. In addition, Dye et al. (2000) showed that flashes tended to be located a bit downstream of the convective core (and likely also the vertical velocity max.).

ACPD

8, S551–S553, 2008

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 403, 2008.

ACPD

8, S551–S553, 2008

Interactive Comment