Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-59-RC1, 2016
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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The impact of lightning on tropospheric ozone chemistry using a new global parametrisation" *by* D. L. Finney et al.

Anonymous Referee #1

Received and published: 14 March 2016

In this manuscript the authors follow up the Finney et al. (2014, ACP) paper that introduced a new scheme for estimating lighting flash rates using the upward flux of cloud ice in thunderstorms. Here this scheme is employed in the UK Chemistry and Aerosols model, which is driven by the meteorological fields from the UK Met Office Unified Model. The ICEFLUX scheme is shown to be superior to the cloud-top height scheme in predicting flash rate distributions when compared with the OTD/LIS climatology. The results also show that the ozone distributions are also improved when using the ICEFLUX scheme, when compared with OMI/MLS ozone columns and with ozonesonde observations. The manuscript is well written and well organized. There are a few additional analyses that could be added, which I outline below, but these should involve only a minor effort. The manuscript should be published after attention is given to these items.

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Discussion paper

Significant Comments: Lines 98-99: Are there separate variables for cloud ice and precipitation-size ice (snow and graupel)? If so, please be more specific here.

Line 171: Are there any biases in this tropospheric ozone product relative to sondes or other satellite observations?

Lines 219-220: The correlation is also not improved with ICEFLUX in the southern extratropics.

Lines 236-237: It would benefit the paper if these statistics were presented for the latitude bands.

Line 300: It is not clear how you are defining the tropopause. How are the 380K surface and the 2 PVU surface combined?

Line 436: I am not sure what is the significance of this Ox production in the first 20 minutes. Isn't it primarily just the production of NO2 as it comes into equilibrium with NO in the atmosphere after flashes occur? Very little ozone production is going to be produced in 20 minutes.

Table 2: What are the percentages? Are they the percentage changes from the CTH scheme? MOre meaningful might be to show the percentage changes of CTH and ICEFLUX from ZERO.

Figure 5: There should be stratospheric influx of NO2 and other NOy species.

Minor Comments: Line 21: comparison of models

Line 183: define ACCMIP

Line 267: .....instead the correlation values between the model and the sonde data (Figure 3) provide a more.....

Line 302: ....production and losses when lightning is added (Table 2).

Line 446: The increase is linear up to approximately 0.006 fl km-2 min-1 and then

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becomes steeper up to o,02 fl km-2 min-1 at which....

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-59, 2016.

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