



EGUsphere, referee comment RC2  
<https://doi.org/10.5194/egusphere-2022-348-RC2>, 2022  
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## **Comment on egusphere-2022-348**

Anonymous Referee #2

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Referee comment on "Lightning assimilation in the WRF model (Version 4.1.1): technique updates and assessment of the applications from regional to hemispheric scales" by Daiwen Kang et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-348-RC2>, 2022

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This manuscript convincingly demonstrates the benefits of lightning data assimilation in the WRF model when run regionally over CONUS and when run over the Northern Hemisphere at coarser resolution. The benefits over CONUS were the greatest when high detection efficiency National Lightning Detection Network data are used, but model performance improvement was noted even when the lower detection efficiency World Wide Lightning Location Network (WWLLN) data are used. The authors considered the effects of two of the Kain-Fritsch convective scheme parameters (trigger function and convective time step) in association with the lightning assimilation. These parameters have major effects on precipitation in the base case without lightning assimilation, but the effects of variation of these parameters is diminished when the assimilation is used. The paper presents comprehensive statistics on the performance of the simulations with the two lightning data sets and with the variation of convective parameters. The results suggest possible future improvement of the lightning assimilation scheme to take into account horizontal grid resolution by using the observed flash densities to determine when to trigger convection. The paper certainly fits in the scope of GMD, and I recommend publication after some minor revisions outlined below.

line 32-33: monthly mean daily precipitation

line 64: add some more references: Allen et al. (2012); Kang et al. (2019a,b)

line 90: Even though there are some....

lines 93-94: ...there is no literature evaluating how these parameters....

line 104: efficiency is much lower than the >95% of NLDN for cloud-to-ground (CG) flashes

line 109: ...with NLDN lightning flashes over CONUS

line 212: and snow.

line 218: move URL to after the word "dataset" in the previous line

line 298: ...present the more dramatic fluctuations...

line 376: ...errors were noticable (Figure 6).

line 436: ...among the BASE cases were noted in all the....

line 462: In the analysis in Figure 3b....

line 503: ...12-km LTA cases (both K2C10W and K2C10N)

line 507: ...in that the precipitation from Trig2 was....

line 574: ...directions are to use criteria values of lightning flash density dependent on grid resolution to trigger deep convection...

line 586: "updates" Please remind the reader here what the updates were

line 603: ...the convective processes (e.g., convective transport of air pollutants matching the times and locations of lightning NO<sub>x</sub> production) to have....

line 610: I'm not sure what is meant by "scope" here. Please add "strokes per flash" to

this list of new data from GLM.

lines 640-647: should these items be moved to the "Code and Data Availability" section?