

Comment on gmd-2021-351

Anonymous Referee #3

Referee comment on "A parameterization of long-continuing-current (LCC) lightning in the lightning submodel LNOX (version 3.0) of the Modular Earth Submodel System (MESSy, version 2.54)" by Francisco J. Pérez-Invernón et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-351-RC3>, 2021

General Comments

My primary concern regarding this manuscript is the scope or the purpose of the LCC parameterization. As the authors described, the main reason to perform this study is for the prediction of wildfires ignited by LCC. In that sense, the analysis of LCC over ocean doesn't make much sense. However, it may help enhance the understanding of land vs ocean differences in convection frequency and intensity, and in turn to help more accurate lightning NO_x implementation in atmospheric modeling in the future. I suggest that the authors provide some discussions in that direction. Even though majority of the lightning NO_x models at this time don't distinguish the flash types due to limited observations and knowledge regarding lightning NO_x production efficiency, it may not be the case in the future with more observations and studies becoming available. The manuscript is in general well written and clearly presented.

Specific Comments

- Since the terms LCC (>9 ms) and LCC (>18 ms) are used repeatedly through the manuscript, it would be good to define it as LLC9 and LCC18 from the first appearance, and that will simplify the descriptions and even easy to comprehend.
- Line 25, how LCC-lightning relates to positive lightning?
- Line 28, "Despite the evidence of the role of LCC-lightning in lightning-ignited fires", any reference or observations?
- Lines 284-285, "On the contrary, the higher correlation coefficient over ocean is reached during March, April, and May". Does this mean that the maximum lightning activity over ocean occurs during these months?
- The discussions regarding the correlation coefficients on Page 10 (Figure 13) are rather vague due to the low values of the correlation coefficients and the little differences among the different parameterizations, especially for those over the ocean. It could

enhance the credibility by providing the significance values (p-value) and the confidential intervals of these numbers.

- Lines 360-363, do other years show similar seasonality over different regions?