Natural Hazards and Earth System Sciences Discussions

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Comment on nhess-2021-13

Anonymous Referee #2

Referee comment on "Global ground strike point characteristics in negative downward lightning flashes – Part 2: Algorithm validation" by Dieter R. Poelman et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2021-13-RC2, 2021

General comments:

I read this paper with great interest. This paper test the validity of three strokes-to-ground-strike-points grouping algorithms by comparing the outputs of the grouping algorithms with the ground-truth data derived from high-speed video observations in several regions. As I said in my comments for part 1 (the companion paper), this validation study can help current LLSs to derive strike points data from their existing data and such product is going to be a very important parameter for lightning protection/lightning risk assessment. See additional specific technical comments below.

Specific Comments:

- Since SMA is not available for all LLSs, I recommend authors add A4 (even simpler than A3), which uses distance threshold only to determine if a stroke is PEC or NGC and show the results of the simplest method as well, just for comparison.
- In this paper, the authors listed the performance of three algorithms using different distance thresholds. In order to ensure a high success rate, the selection of such threshold in all algorithms is strongly dependent on the location accuracy of the network. I think that might need more discussions. Hopefully, authors can come up with a general guidance/rule regarding how to select the optimal distance threshold with respect to the location accuracy (or even more parameters) of the network.
- Can authors share any insights on why larger peak current are more likely to be correctly classified (PEC vs. NGC)? Possibly related to location accuracy's dependence on peak current? Do large peak current CGs always have better location accuracy?
- Table 1, it would be nice to also give years when the ground-truth datasets were recorded.
- Line 116, I think here you are referring to "electric field change sensor/meter", or fast/slow antenna. Field mill is usually referred to as the electrostatic flux meter that monitoring electric field intensity at ground over a long period but with time resolution

usually in one second.

- My understanding is that in your ground-truth dataset, you only kept flashes with at least two return strokes detected by the LLS. Correct?
- Line 172, "repeated until the mean GSP positions do not vary anymore" I thought it is repeated till the last return stroke was assigned.
- In this study, there is no flash grouping (group strokes into flashes) on the LLS end involved in this study because a flash was first defined by the high-speed video data and LLS data were searched for the flash. Is my understanding correct?
- Line 190, please provide a reference for the scaling method
- Line 110, Here I am providing two additional references on CG validation studies of NLDN using videos published in JGR, with titles: 1) Upward lightning observations from towers in Rapid City, South Dakota and comparison with National Lightning Detection Network data, 2004-2010. 2) A study of national lightning detection network responses to natural lightning based on ground truth data acquired at LOG with emphasis on cloud discharge activity.

Minor editorial suggestions:

- Line 59: "By definition, the location of a flash is determined by that of the first stroke in the flash." This is probably true for some of the LLSs (like NLDN or EUCLID). Some use centroid.
- Line 87, What are "CC discharges"?
- Line 61, It is not clear to me what does subscript SG stands for.
- Figure 1, please label stroke no in (b), as you did for (a).