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This is a very interesting and relevant study and yields important contributions to our understanding of lightning (and in particular, downward lightning behaviour).

The paper is well-organized, with a clear structure that follows the conventional format of academic papers. The use of figures to illustrate spatial distributions and properties of GSPs enhances the clarity and understanding of the research findings. However, a more detailed discussion on the limitations of the study and potential areas for future research could further strengthen the paper

I have a couple of comments for discussion:

1. I am interested in the choice of 500 m as the distance threshold used. As noted, the EUCLID network consistently is found to have a location accuracy below 250 m and, while there is not a significant increase in the accuracy of the algorithms, would it not be worth using to achieve more accurate GSP classification?

   The reviewer's observation that the location accuracy (LA) based on ground-truth data falls significantly short of 500 meters is accurate. However, it's important to note that such ground-truth data are typically derived from a limited number of sources, including a handful of tower measurements and some mobile video and E-field measurements. Despite considerable efforts to compile these data sets, their major limitation is their sparse geographic coverage. Conversely, when examining the semi-major axis of the 50% confidence error ellipse (SMA) across Europe from 2013 to 2022, it's evident that SMA in central Europe consistently remains below 250 meters. Yet, as one moves to the periphery of the network, the SMA approaches 500 meters. Consequently, in order to adopt a standard applicable across the entire EUCLID domain, a 500-meter threshold has been selected. Moreover, previous research (Poelman et al. 2023)[1] supports this decision as pointed out by the reviewer, demonstrating that the discrepancy in underestimating or overestimating the number of Ground Strike Points (GSPs) with a threshold of 250 meters versus 500 meters is minimal, as also noted in the document.

   On the other hand, we do acknowledge that in the case of specific local lightning protection studies, e.g., for a private company, it might be worthwhile to examine in a bit more detail the potential changes that may occur when adjusting the thresholds.

[1]Poelman, D. R., H. Kohlmann, W. Schulz, S. Pedeboy and L. Schwalt, "Ground strike point properties derived from observations of the European Lightning Location System EUCLID," 2023 12th Asia-Pacific International Conference on Lightning (APL), Langkawi, Malaysia, 2023, pp. 1-5, doi: 10.1109/APL57308.2023.10182055

Similarly, while there is not a large accuracy increase between algorithms, why was the algorithm that does not take into account ellipse information chosen over the other algorithms?

The reviewer points out correctly that each algorithm detailed in Poelman et al. (2021)[2] demonstrates high accuracy, indicating that the choice of algorithm would not significantly change the results presented in this study. The real-time data stream from EUCLID employs algorithm A1, which has thus been selected as the most representative method for capturing EUCLID observations in this study as well.

[2]Poelman, D. R., Schulz, W., Pedeboy, S., Campos, L. Z. S., Matsui, M., Hill, D., Saba, M., Hunt, H.: Global ground strike point characteristics in negative downward lightning flashes – part 2: Algorithm validation, *Nat. Hazards Earth Syst. Sci.*, 21, 1921-1933, **2021**, https://doi.org/10.5194/nhess-21-1921-2021

1. Flash density is a key parameter for assessing lightning risk in lightning protection design and GSP density has an important implication for lightning risks. Recent recommendations to multiply Ng by a factor of 2 to approximate Nsg and include this in the IEC62305 approaches make this study particularly relevant.

It would be good to see some discussion of this in the manuscript. In particular, comment on whether a factor of 2 is appropriate?

Very good suggestion by the reviewer. We propose to add following to the manuscript:

Within the domain of lightning protection and risk calculation, the selection of an appropriate multiplier for ground impact points per CG flash has long been a subject of discussion and was prompted at the time since LLSs only reported flash densities. Initially, Bouquegneau et al. (2012)[3] hinted at the necessity of applying a robust safety factor in risk component calculations, which could involve adjusting the value of Ng. Building upon this, Rousseau et al. (2019)[4] further reconfirmed doubling the Ng value in cases where Nsg is not obtained from a lightning detection system that meets the IEC 62858 standards, established by the International Electrotechnical Commission in 2019[5]. This approach aims to ensure a sufficient safety margin in risk assessments. On the other hand, the CIGRE TB 549 report[6] by the International Council on Large Electric Systems, released in 2013, suggests a more modest correction factor between 1.5 and 1.7, when only flash density data are accessible. One way or another, the optimal method involves directly calculating strike point density using a comprehensive lightning location network according to IEC 62858, made possible with present day state-of-the-art LLSs.
Recent research, such as the study by Vagasky et al. (2024)[7] along with the results of this study, suggests that doubling Ng may significantly overestimate actual needs. This is supported by our findings indicating that most regions within the EUCLID domain have a ratio of less than 1.6 ground strike points per CG flash (see Fig. 2b). Therefore, although using a factor of two to estimate Nsg offers a method to enhance lightning protection when only Ng data are accessible, it may also lead to unnecessary expense.

[3]Bouquegneau, C., A. Kern, and A. Rousseau, 2012: Flash density applied to lightning protection standards. Proc. GROUND 2012, Bonito, Brazil, Brazilian Society for Electrical Protection
[4]Rousseau, A. S., F. Cruz, S. Pedeboy, and S. Schmitt, 2019: Lightning risk: How to improve the calculation? Int. Colloquium on Lightning and POower Systems, Delft, Netherlands, CIGRE
[5]International Electrotechnical Commission, 2019: IEC 62858:2019: Lightning density based on lightning location systems – General principles
[6]International Council on Large Electric Systems, 2013: Lightning parameters for engineering applications. Working Group C4.407, CIGRE TB 549
[7]Vagasky, C., R. L. Holle, M. J. Murphy, J. A. Cramer, R. K. Said, M. Guthrie, and J. Hietanen, 2024: How Much Lightning Actually Strikes the United States? Bull. Amer. Meteor. Soc., 105, E749–E759, https://doi.org/10.1175/BAMS-D-22-0241.1.

1. The final sentence of Section 3.2 "The relationship between the average GSPF and the absolute peak current is noticeable on a monthly scale, but it is not as strong as it is at the daily level."

Is this correct? The relationship seems clear at a daily level…

The original sentence in the manuscript conveys that there is a moderate correlation between average Ground Strike Point per Flash (GSPF) and absolute peak current on a monthly basis, but this correlation is not *as* strong *as* the one observed on a daily scale. On a daily level, the trends between GSPF and absolute peak current align almost perfectly.