

***Interactive comment on* “Comparison of lightning activity in the two most active areas of the Congo Basin” by Jean K. Kigotsi et al.**

Anonymous Referee #1

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Review for NHESS-2017-105

Title: Comparison of lightning activity in the two 1 most active areas of the Congo Basin
Authors: Kigotsi et al.

General comments: This manuscript presents an exploratory analysis of lightning activity over two distinct areas of Congo Basin: 1) the area where the maximum annual lightning flash rate density (FRD) is observed (west of the mountains that delineate the Rift Valley), hereinafter called Area_max, and 2) the area just west of Area_max, where very high but less pronounced FRD is observed, hereinafter called Area_sec. The manuscript is of the interest to the audience of this journal but needs a few adjustments. I recommend its acceptance only after addressing the issues described below.

Major remarks:

Data: a) Soula et al. (2016) did an excellent job in calculating WWLLN detection efficiency (DE) for each year (2005-2013). This work should leverage from Soula's work and correct 2012 (DE=4.44%) and 2013 (DE=5.90%) data before doing the analysis. The subtle differences from 2012 to 2012 shown here could be an artifact of the different DE. b) Also, why is it relevant to compare 2013 to 2012? Also, was there something different in terms of atmospheric conditions (such as significant droughts, rainier year, El Nino, La Nina, etc.)? My suggestion is to make it simple and combine the years, you may be inserting a lot of uncertainties in your analysis.

Session 3.3: c) I really don't think that the analysis of number of days within classes of flash counts is considered an "Annual variability". d) Also, why use only 2013? e) L 146-147: "The number of days without any flash (CL0) is much larger for Area_sec than for Area_max (7 and 0, respectively)". A difference of only 7 days is not representative of annual variability.

Session 3.4: f) In essence, Fig.3 and Fig. 4 show the same results. Also, the results presented are really confusing making me not to get the relevance of this session.

Session 3.5: g) Did you really expect a correlation between daily number of flashes in each area? This is a very weak way to show that thunderstorms are different within each area and you should rethink how to approach this issue.

Session 3.6: h) Very confusing... first of all, "monthly proportions" to what? To total number of lightning in each year? If the objective is to show "monthly activity", why not show flash counts by months? Or is it also the objective to show seasonal contrasts? Please explain better. i) Again, what is the relevance of comparing 2012 to 2013?

Minor remarks:

In general, review the significant figures (or digits) of all your numbers. E.g.: - L 99: ratios of 1.941 and 2.585, should have only one significant digit - L 106: 15.33 flashes

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km-2 <yr-1>, should have no significant digit after “point”, while 8.22 and 8.62 should be 8.2 and 8.6 (considering that lightning strokes are a single unit)

L 9-23: Avoid using abbreviations in the Abstract text, such as Area_max and Area_Sec, except if explicitly explained in the Abstract.

L 28-29: As a reference, Albrecht et al. (2016) show the impact of resolution (0.1o, 0.25o, 0.5o) while ranking the lightning hotspots. Please see Table ES4 of supplemental material: <https://doi.org/10.1175/BAMS-D-14-00193.2>.

L 50-52: Table ES4 of supplemental material (<https://doi.org/10.1175/BAMS-D-14-00193.2>) also shows the persistence of DRC as the second Earth’s lightning hotspot.

L 69-88: Please, make it clear that WWLLN detects only cloud-to-ground (CG) lightning and that it does not detect intracloud (IC) lightning, which, in general, is the majority of lightning produced by a thunderstorm. This is also one of the reasons why your values in Fig. 1a differ from those of Albrecht et al. (2016).

L 91, Figure 1: Although your analysis considers full years, the most adequate unit is “flash km-2 yr-1”, and it should be called “flash rate density”.

L 93: “. . . days of year with thunderstorm activity. . .”. Since WWLLN detects CG lightning only, you should substitute “thunderstorm activity” by “lightning activity”.

L 98-99: “On the contrary, the flash <rate> density <in an individual 0.05o resolution point> is very different . . .” . Is that correct?

L 104-105: “By comparing with the values reported by Soula et al. (2016) for a resolution of 0.1°, . . .” which are???

L 115-116: Please give scientific references for this affirmation, or you should state that this is a speculative affirmation.

L 127: “Both areas exhibit the same type of <diurnal lightning activity> evolution with a large. . .”

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L130: Please annotate that Local Standard Time (or Solar Time) is the same as UTC (i.e., LST = UTC -0)

L 137-154: You should show only Figure 3 or Table 2, they are redundant. The same is valid for Figure 4 and Table 3.

L160-161: Please define the specific day (or months) regarding the 179 and 92 days span.

L 189-190: “This observation is consistent with the fact that the lightning activity is more spread during the day in Area_sec as indicated in Figure 2.”. This may be due to the contribution of nocturnal lightning by MCSs or isolated storms that develop later in the afternoon if compared to Area_max. If you take a closer look in Albrecht et al. (2016) Figure 3, you will see that there is more lightning during the night for the hotspots that are in Area_sec (i.e., 6th and 7th Africa’s hotspots).

L 219: “... different locations of our areas”. Not really. The daily cycles shown in Albrecht et al. (2016) consider a 1 degree box around the hotspots, and 6 out of 10 Africa’s hotspots are within your Area_max and 2 hotspots (Africa’s 6th and 7th positions) are within your Area_sec (vide Albrecht’s Figs. 2 and 3).

L 219-220: “They found also a more pronounced daily cycle...”. This is because they considered a smaller area (a 1 degree box around the hotspots).

Tables 2 and 3: “Number of days”, plural in the first line of the tables.

Table 3: explain what (%) means, i.e., proportion to what? The sum of % is 100% in each column?

Figure 4: Explain “proportion of day”

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