



EGUsphere, referee comment RC1  
<https://doi.org/10.5194/egusphere-2022-1453-RC1>, 2023  
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## **Comment on egusphere-2022-1453**

Anonymous Referee #1

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Referee comment on "Thunderstorm environments in Europe" by Deborah Morgenstern et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-1453-RC1>, 2023

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The overall quality of this paper is good. The research uses objective statistical methods (PCA and K-means clustering) to simplify atmospheric variables, thunderstorm types and spatially similar regions to good effect. This enhances the understanding of thunderstorm types present in different regions of Europe and explores their seasonal variations. In particular, this method allows the identification of less frequently occurring thunderstorm types which pose a risk to particular types of infrastructures. The thunderstorm types identified by this method had not yet been defined in this way across a wide and variable geographic area, so this identification, therefore, complements and enhances the current understanding of thunderstorm behaviour in Europe. The methodology to identify thunderstorm types may now be used at regional resolution and in other areas to continue to add to knowledge.

The Abstract – consider explaining more clearly the rationale for undertaking this research. The strikes to tall infrastructure are mentioned in the first sentence as the main reason for undertaking the research. Tall infrastructure is then not mentioned very often in the main body of the paper. It is suggested that either the authors include more discussion of the relevance of their results to tall infrastructure so it is more prominent in the mind of the reader. Alternatively, the abstract could be reworded so that the emphasis is taken off tall infrastructure and it could be mentioned merely as an example of the potential benefits / end users of this research.

The discussion makes good points and relates this research back to the literature well. However, some greater depth would enhance this part of the paper nicely. Examples of points which could be expanded:

-The identification of the thunderstorm types could be related back to the results of previous studies with similar domains (coastal, continental) and seasonal variations in lightning occurrence – the Baltic and the UK are mentioned in particular and perhaps the authors could extrapolate from their results which thunderstorm type and by extension

atmospheric conditions, might produce a risk from lightning in the regions / seasons identified in these countries (where there might be wind farms located). This should then fit in nicely with the author's statement that these already identified regions compliment their research by bringing together all this information in one place.

-The authors mention that this research is limited by the resolution of atmospheric data. Do the authors have any suggestions to tackle this for further research? Are there any potential higher-resolution features (mountain ranges) within the identified domains / regions that may influence the thunderstorm types as a result?

The text of the paper does contain some grammatical errors which are noted where identified by the reviewer. However, there may be others which have not been identified, so the authors should check again the text for grammar using relevant grammar assistance technology if necessary. The authors may also wish to check whether it is the convention in their field/this journal to use American-English or English-English as there are some instances of "summarize" instead of "summarise" or "fall" instead of "autumn" which the journal may or may not have a preference for.

L11 – Perhaps provide examples of meteorological settings

L12 – Suggest replacing "Plenty" with "Numerous". If "Plenty" is to remain suggest amendment to "Plenty of".

L34 – Suggest replacing "at land and advected to the sea" with "over land and advected out to sea" or "onshore and advected out to sea"

L35 – Perhaps instead of "it endures longer" which suggests a singular long-lasting lightning flash, replace with "where lightning activity endures longer"

L35 – Suggest replace "water surface is" with "sea surface temperatures are"

L45/46 - Suggest inclusion of study location where the correlation of SST and lightning strokes were discovered.

L46 – Suggest replace "to use the" with "the use of"

L56 – Do you mean to ask the question of how thunderstorm characteristics vary by meteorological conditions across Europe or how thunderstorm occurrence varies by meteorological characteristics across Europe... Please make the wording of this question a little clearer.

L61 – suggest change “second one (Sect. 3)” to “second (Sect. 3)” The word “one” is unnecessary and removal may improve the flow of the sentence.

L64 – Suggest change “The found thunderstorm types” to “These thunderstorm types”

L87/88 – Suggest review of sentence grammar / rewording here to make clearer. The use of the word “As” to start the sentence does not seem quite right.

L100 – “France and Belgium, being a less homogeneous but very representative domain.” Representative of what? Please consider making this clearer for the reader.

L123 – “In the following, only one sample is discussed, as all repetitions led to qualitatively the same results.

“ Please consider providing greater detail on how the repetitions were compared and found to be the same.

L157 – consider changing “are considered as ‘baselines’ there.” To “are considered as ‘baselines’ “ The word “there” does not seem to be necessary.

L160 – “Meteorological similar domains gather close to one another” perhaps this should read something like “Domains with similar meteorological characteristics are represented in close proximity to one another within this diagram”

Figure 3 – This is a nice way to represent these results, however it is a little busy which makes interpretation more difficult. If possible, some improvements should be considered to simplify the plot for the benefit of the reader. Suggest experimenting with; removing or making smaller the point symbols, removing the domain letter labels to the right of the chart which can extend the x-axis (these can be moved to figure caption instead), increasing the size of the y-axis.

L188 – Suggest change from “With this the spatial different thunderstorm conditions in Europe” to “These spatially different thunderstorm conditions in Europe”

Figure 4 is really good, shows the results very clearly for the reader to then understand the main text discussion. Suggest making the CP, noMF labels a bit more prominent so the distinction between the types is immediately obvious to the reader.

L208 – Style wise it is not usual to include we, or I in a research paper and the tone is a little informal. Suggest changing “Now we dive deeper into the characteristics of the found thunderstorm types” to something like “More detailed analysis of the thunderstorm type characteristics is undertaken”

Figure 5 – Similar to figure 3 in places it is difficult to interpret due to being quite busy. Wind field noMF in particular has a rather faint colour which becomes obscured by others. Please consider again removing or reducing the size of the point symbols or changing the colour scheme to make the graph clearer to read.

241 – “Now that the thunderstorm types are found” tone is a bit informal. Suggest rewording this sentence.

L246 – Where it states “there is often a bigger one” consider replacing the word “one” with something clearer or rewording the sentence, perhaps “there is often a dominant type”

Figure 6 – include y-axis labels or y-axis explainer in the figure caption. To make it clear whether this refers to absolute counts, is a percentage or scaled like earlier plots.

Figure 7 – J, K and L domains with their barplots are a little cramped, suggest investigating offsetting the barplots to edge of the figure and indicating their domain using arrows to see if this improves things a little.

L277 – Consider replacing “little thunderstorms” with “fewer thunderstorms”

L300 – It is not ideal to start a sentence with the word “And”. Suggest rewording this.

L313 – Consider changing “lightning is climatological unlikely” to “lightning is

climatologically unlikely”

L317 – Please remove full stop from: Europe?”.

L336 – Consider changing “origins” to “originates”

Please consider the comments made regarding the figures in the main text of the paper with respect to the figures in the appendix.