Review of “A machine learning-based perspective on deep convective clouds and their organisation in 3D. Part II: Spatial-temporal patterns of convective organization”
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Recommendation
Minor revisions

General comments
This study presents the spatial and temporal patterns of convective organization based on a three-dimensional cloud field constructed using a machine learning technique that combines data from horizontal distribution from geostationary satellite MeteoSat-11 and vertical profiles from Cloud-Sat Cloud Radar. The area of interest (AOI) spans from 30°S to 30°N and 30°W to 30°E, where parameters such as cloud area, cloud top height, cloud lifetime, the number of deep convective clouds, core size, and the area ratio between the core and the anvil are analyzed.

Detailed results illustrate seasonal and geographic variations in organization indices and related quantities. The newly constructed dataset provides unique insights into convective organization within the AOI, making it a valuable resource for understanding these characteristics. Therefore, the paper could be published only after clarifying the following results.

The reviewer’s main request is to clarify the description of the results. For example, the term “convective activity” is used without clearly specifying its characteristics, leading to confusion rather than clarification. Although the manuscript presents various findings on geographic distributions and seasonal evolution, it would benefit to present a summarizing analysis that highlights the key conclusions. In particular, the differences in convective organization between sea and land, as well as between the Northern and Southern Hemispheres (Figs. 14 and A1), remain unclear and should be clarified.

Moreover, many of the key results are not exclusively derived from the unique three-dimensional dataset with continuous object tracking. Ideally, the analysis should emphasize aspects uniquely obtainable from this dataset. It was disappointing that the authors chose indices of convective organization that could be derived from 2D imagery alone. The authors should clearly summarize the

advantages of their unique dataset and highlight how it advances our understanding of convective organization.

The characteristics of the dataset, especially the 3D objects obtained through the machine learning method, should be described more clearly in this paper, even if detailed explanations are provided in Part I. In particular, it remains unclear whether the identified 3D objects are smoothly connected over time.

Specific comments

L26, “convective organisation (or aggregation)”: The authors should distinguish “convective organization” and “convective aggregation” by giving their definitions.

L30, “The spatial distribution of convective clouds is not arbitrary.”: This sentence is unclear.

L37, “several regions”: It is unclear. What types of “regions” are meant in this context?

L44, “So far, the models show convective organisation increases with a warming climate”: Wing et al. (2020) also showed a change in convective organization with warming in RCEMIP.

L58-60, “At the same time, food security and a high climate risk exposeWest Africa to multiple threats (Berthou et al., 2019). Changing atmospheric conditions could intensify those hazards.”: We know that these points are important but not specifically related to the current research. These sentences should be moved to the final section, instead of the introduction, or removed.

L104-105, “It is characterised by lower temperatures and a strong vertical ascent, which we identify by an extensive vertically contiguous 105 layer and a high radar reflectivity (e.g., Igel et al. (2014); Takahashi et al. (2017)).”: Vertical ascent is not directly analyzed by the proposed method, neither in Igel et al. (2014) nor in Takahashi et al. (2017). This sentence should be modified.

L173-174: Please describe the methodology of the moving windows in more detail. What types of iterations are applied to calculate the indices?

L179, “the frequency distribution shows an overlap of lower index values for all indices”: This sentence is unclear. What does this mean by an overlap?

L230-232: What is the meaning of “a diverging convective activity”? In Fig. 7a, we cannot see where the maximum cloud area is. Where is “a lower cloud lifetime” in Fig. 7c?

L244, 245: What does “convective activity” mean in the sentences, and which figure shows this? Which figure and location show “a higher convective activity comes with a lower area ratio, a higher number of DCCs, a larger cloud and core area”?

L254, “the convective organisation is overall weaker around the equator”: In 4.1, “convective organization” is not clearly defined and is not specifically described. The definition of organization must be clarified.

L255, “Their impact on large-scale patterns of organisation is limited compared to MCSs”: The meaning of this sentence is unclear.

L263, “(Figure 9, a-b,g-h,i-j)”: Fig.9-j does not exist.

L264: “Figure 7” should be “Figure 6”. Figure 7 does not show seasonal distributions.

L274: What does “convective activity” indicate here?

L274-279: In Figure 7, which index is used to define a most or least organized group?

L303-304, “Overall, organised clouds (P90) come along a larger cloud anvil area, a longer cloud lifetime, a lower CTH, a lower area ratio, and more and larger DCCs”: It is unclear from Figure 13 to see these relationships. The relationships between the indices and these properties should be directly compared. A part of the comparison between the indices and the number of DCC is shown in Fig. 4g-i.

L320-336: The authors describe notable characteristics which can be seen from Fig. 14. However, some points are not convincing from the figure. Please check whether the description is consistent with the figures. For example, in L328-330, I

cannot see a noticeable narrowing in summer (JJA) for ROME. The differences in the effect size are significant according to the numbers in the Figure, but not clearly visible.

L350, L359-360, “the microphysical cloud properties”: Cloud anvil area is a cloud macrophysical characteristic rather than a microphysic property. It is true that cloud microphysics affect cloud anvil area through the balance between sedimentation and the outflow, the present study does not examine microphysical cloud properties specifically.

L361-362, “For continental cloud clusters in the northern hemisphere, we find more distinct results regarding the relationship between DCCs and the degree of organization”: This is one of the noticeable results discovered in this paper. However, this conclusion is indirectly shown by the figures in 4.1.2. The authors are suggested to show a more direct analysis showing the conclusion.

L468: Spell out “JAS”.