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WEATHER AND CLIMATE DYNAMICS

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Dear Editor:

On behalf of all the co-authors, I am pleased to submit the second revised version of the research article entitled “Supercell Convective Environments in Spain based on ERA5: Hail and Non-Hail Differences” by Calvo-Sancho et al. for consideration in the journal Weather and Climate Dynamics.

First of all, we thank the reviewers for their time and constructive comments. We believe they have significantly helped to improve the quality of the paper. We hope that the corrections we have made will be in accordance with the “Weather and Climate Dynamics” standards and expectations. Please find attached the detailed answers to all the comments and queries provided by the reviewers.

Thank you very much.

Yours sincerely,

Carlos Calvo Sancho

Dear Reviewer 2,

We would like to thank you for your time and effort in our manuscript. We really appreciate the detail of your reading, as your comments have been very useful in improving the paper. We have tried to address all your questions. Please, find below our replies to each one.

General: manuscript needs language proofreading from a native speaker because it contains errors and does not meet publishing quality.

We have tried to detect and amend the linguistic errors to our best knowledge.

L35 A reference to Blair et al. (2017) may be also relevant in this context.

Thank you for your suggestion. This reference has been added in the revised manuscript.

L35: "Supercells are common phenomena in spring and summer (Brooks et al., 2019), and can be detected through ground-based or satellite lightning detection systems" - I still think that supercells cannot be detected through satellite or lightning detection systems. While both of these systems can be useful as supporting information, Doppler radar data is a primary source to confirm a mesocyclone. Please rewrite.

Thank you for your comment. We agree and this sentence has been rewritten in the revised manuscript (lines 35-38).

Supercells are common phenomena in spring and summer (Brooks et al., 2019), and can be detected through Doppler radar data to confirm the associated mesocyclone (Blair et al., 2011; Kahraman et al., 2017). Moreover, ground-based or satellite lightning detection systems can be useful as supporting information (Bedka et al., 2018; Galanaki et al., 2018).

L46: I am not sure if referenced literature says anything about "reduced rotation and shorter life spans" of the supercells in Europe compared to their U.S. counterparts.

According to Quirantes et al. (2014) mesocyclones in Spain tend to be smaller, horizontally and vertically, in general, than the classic ones in the U.S., and therefore present lower rotation velocities and shorter life spans. Nevertheless, an important severity is still present in any type of supercell. Consequently, in Spain the environmental parameters related to severe convective weather are generally lower than in North America and, therefore, the mesocyclone rotations are both less intense and with shorter life spans.

https://repositorio.aemet.es/bitstream/20.500.11765/709/10/Caracteristicas_supercelulas.pdf

L85: "Doppler" with capital letter (also throughout the manuscript).

Thank you for your observation. It has been amended in the revised manuscript.

L98: "may not represent conditions in which supercell developed"

It has been amended in the revised manuscript following your suggestion.

L127: Authors should use an en-dash symbol when describing intervals, e.g. "0–6 km" instead of "0-6 km".

Thank you for your observation. The en-dash symbol has been used in the revised manuscript.

L207: "(referred to absolute values)" - I am not sure what "absolute values" mean in this context.

We agree and this explanation has been deleted in the revised manuscript.

Figure 5: Wind shear isoline step of 1 m/s is probably too detailed. A step of 2, 4 or even 5 m/s would improve readability of this figure.

Thank you for your recommendation. This figure has been redone depicting less wind shear isolines.

L242: Updraft speed of a local-scale convective cell has likely nothing to do with large-scale ascent denoted by ERA5 coarse grid (omega denote vertical changes of around 0.2 Pa/s on Figure 5). Please rewrite.

This sentence has been deleted in the revised manuscript.

L244: "This due to the degree to which precipitation and outflow affect with an updraft is reduced as the WS over the updraft depth increases." - it is hard to understand what the authors mean here.

We agree and finally this sentence has been deleted in the revised manuscript.

L296: I am skeptical whether we can write about capping inversion layers when the median of MLCIN is -20 J/kg. Perhaps rather the lack of inversion layers or very weak inhibition?

Indeed, you are right, and this sentence has been amended in the revised manuscript (line 301).

The SP-HAIL events show a very weak inhibition (Figure 8b) with a MLCIN median of -20.2 J kg⁻¹ (Table 3), and of -12.2 J kg⁻¹ for SP-NONHAIL

L302: What is a "mechanical trigger"?

In order to clarify, we have used "mechanical lifting" instead of "mechanical trigger" in the revised manuscript (line 307).

L302: "Therefore, a mechanical trigger (e.g., air parcels lifted by orography or low-level convergence wind) is required to force initiation of convection to overcome the LCL" - Why LCL? Perhaps the authors confused it with LFC. A layer between LCL and LFC can still contain stable layers that will prevent storm development.

Indeed, it was a mistake, and this sentence is referred to LFC. It has been amended in the revised manuscript (line 309).

L336: I don't think that SRH "quantifies the cyclonic updraft rotation". It is rather a metric of environmental helicity that can support development of rotating updrafts.

We agree and this SRH definition has been amended in the revised manuscript (lines 343-344) following your recommendation.

Storm-relative helicity (SRH) is a frequent parameter used for forecasting supercells and tornadoes since it quantifies the streamwise vorticity that can support the development of rotating updrafts in right and left moving supercells the cyclonic updraft rotation in right and left moving supercells (in this survey only the right-moving measure is used; Davies-Jones et al., 1990; Bunkers et al., 2002).