2nd Review „Analyzing 23 years of warm-season derechos in France: a climatology and investigation of synoptic and environmental changes“ by L. Fery and D. Faranda (WCD)

The paper reconstructs tracks of past major derecho events over France and examines prevailing environmental conditions in terms of geopotential height anomalies, 2-m temperature, total precipitation, wind fields, CAPE and shear using ERA5 reanalysis. Based on the obtained event set, analogues in the meteorological fields were estimated as 29-day mean fields for two 30-year periods. The authors attribute changes in the meteorological fields as climate change signals. For most of the events studied, the authors found increased precipitation and temperature, while geopotential height remained largely unchanged. They also examined the possible influence of natural climate variability on these changes, based on ENSO, AMO, and other large-scale teleconnections and parameters.

The authors have done a great job by more or less completely revising the paper. They have taken all of my major revision points into consideration and implemented them in a very satisfying way. This is highly appreciated. In particular, the increase in sample size, the expansion of the event catalog, and the use of convection-related parameters such as geopotential height, CAPE, or vertical wind shear have significantly improved the scientific quality. It also addresses my major concerns about the usefulness of the paper for other researchers.

There are still several issues that need to be addressed before the paper can be accepted for publication. However, these issues can be considered minor revisions. See the list of minor revisions and changes below.

General:

1) Why is the time frame limited to May through August? As shown in Fig. 3, July and August have the highest number of derechos, so one can assume that September is also relevant here (in line with the analysis of lightning data from other studies).
2) There are still several flaws in the English writing (see the long list of Edits), and I'd again suggest to consult a native speaker or a proofreading service to improve the writing (e.g. consistent use of tempus, the "s" in the third person singular, use of definite and indefinite articles). In addition, some sentences are very long and complicated, with several subordinate clauses on different topics, which makes reading and understanding very difficult.
3) Once an acronym or abbreviation is defined, it should be used throughout the manuscript.
4) Use NHESS terminology: date is day month year (e.g., 20 July 2020); units must be abbreviated in conjunction with numbers (e.g., speed is 10 km h^{-1} and not 10 km/h).

Minor revision points:

1. Condense the first five lines of the abstract as ot is very general. More important is the recapitulation of the main points of the article.
2. L9: Specify what you mean by “changes in synoptic conditions”, e.g., by adding “considering two different time periods”
3. L15-17: I’d suggest deleting this sentence in the abstract
4. L68: “typically produces heatwave or stormy conditions”; this is very unspecific and somehow a contraction. Also, “stormy” is not appropriate for convection
5. Whole paragraph L60-75: This is a nice example highlighting the relevance of derechos and the question of climate change. However, I suggest moving this part to the beginning of the

introduction (and shortening this part a bit) before defining derechos and discussing the influences of climate change.

6. L89: Do you have a reference for the stated decrease in relative humidity? Is this also true for CMIP6 data? I know that the older CMIPs show such a decrease in the mid-latitudes. European soundings I looked at a few years ago showed no change in relative humidity.
7. L132-133: “are difficult to disentangle from the associated synoptic-scale winds” This is not really an issue if one simply considers the horizontal pressure gradient.
8. L148: “The reports can come from weather stations”; here you are referring to ESWD, which does not include weather station data.
9. Sect. 2.2: Specify the version of CAPE you used here: mixed-layer CAPE, surface-based CAPE, most unstable CAPE?
   Wind shear is defined as $\frac{\partial v}{\partial z}$, thus the unit is s^{-1}; I assume you use wind vector difference as a proxy for shear in this study.
10. L165-166: The sentence “The method ensures that comparisons are relevant ..” is unclear
11. L174: A geostrophic flow requires a linear geopotential, which is not the case here.
12. L177: Fronts are not per se sub-synoptic events
13. L184-185: I’m a bit confused here: are the 2-m temperature and daily precipitation totals really from ERA5 data as stated here, or from EOBS as stated in L195?
14. L198: Why 30 years? Both periods are 31 years.
15. L210: Here you may cite Piper et al. “Investigation of the temporal variability of thunderstorms in central and western Europe and the relation to large-scale flow and teleconnection patterns”, who investigated the relation between thunderstorm occurrence and NOA, SCAND, and EA patterns.
16. L230: Why do you calculate a linear trend for the entire period when you previously stated that the first period is only marginally affected by climate change?
17. L267: Considering the first and the last report to define the length of a derecho introduces an undefinable level of uncertainty. What about regions and times with significant underreporting? Can you somehow estimate the associated effect? At least a statement about the resulting uncertainty is needed. Also, what is the uncertainty of assuming straight lines for the tracks instead of somehow curved tracks?
18. Tables always have a heading and not a caption.
19. L288-292: What are the reasons for the different hot spots? You can compare this map with lightning data or just speculate. I’d also suggest that identifying four hot spots from a sample of 29 events is not a very robust result. Similarly, how do you explain the diurnal cycle (L310)?
20. Figure 3: The color bar for the time does not make sense as all reports have the same time.
21. Figure 4 and following: I guess it's a problem with Latex that the figures are shown after the literature section?
    I would split Figure 4 into three different figures: one with a-p, one with q-w, and the last with t and x. This would make the discussion much easier.
    In the figure caption, change sea level pressure to geopotential height.
22. The subfigures of Figures 5 and 6 should have the same aspect ratio as that of Figure 4. Also, the captions of Figures 5 and 6 should read "Same as Figures 4a-d, but for...".
23. L306: You should also mention the ESWD reports here.
24. Last paragraph of the conclusions: You may want to phrase new perspectives and outlook in a more affirmative/positive way.

Edits:

1. I highly acknowledge the restructuring of the result section and the focus on the main results. However, I doubt whether an appendix of 91 is really helpful. Besides, almost none of the figures in the appendix are discussed in the manuscript, which is not appropriate.
2. Check the brackets in the citations; very frequently \citet{} is used instead of \citep{}; e.g., L42, L113, L116-118, L172, L286, L315-316, L390, L394
3. The terms "high-end" and "low-end" intensity are unclear and not appropriate here. It implies that you refer to both ends of a statistical distribution function rather than to a rough estimation.
4. Be consistent in the use of units; better m s^{-1} instead of m/s
5. L2 there → their; "…and threaten infrastructure"
6. L9 delete "In the second part.." (or otherwise include before "In the first part…")
7. L10: encoded is not an appropriate expression
8. L11: include "…distant past **period**…"; past → period
9. L13: include "**vertical** wind shear" (in contrast to horizontal wind shear)
10. L20: "damaging **winds related to** downbursts" (it's not the downburst with vertical wind component but rather the horizontal wind that produce the damage)
11. L22: "feature predominantly linear characteristics, but also include several bow echoes representing the regions of highest wind speeds" or something like this to resolve the contradiction of "linear characteristics" and "bow echoes"
12. L24: delete "on radar display"
13. L27: "include **a** rear-inflow…"
14. L28: "…wave pattern () oriented embedded within" there's either something mission or you should delete "oriented"
15. L28: "occur**s**"
16. L30: "typically move"
17. L37: reformulate such as "…there must be no more than 3 hours between two consecutive severe wind gust reports…."
18. L39: "emanate~~s~~"
19. L44: there "…there **are** at least…"
20. L46: derecho**s**
21. L52: "America (USA), …"
22. L57: "In particular, to our knowledge, there is no previous work…"
23. L60: "the public was surprised by"
24. L61: "The associated MCS…"
25. L69 (see also comment 6): "downburst leading to horizontal wind speeds near the surface of up to 225 km h^{-1}"; in the original sentence, it reads as if the downburst has that wind speed
26. L72: "…(with anomalies in SST of…"
27. L76: mesoscale convective events → MCS
28. L85: write out CAPE and refer later on CAPE solely
29. L88: delete "midlatitudes and"
30. L89: reformulate "…which makes ~~difficult~~ any statement about the frequency of severe thunderstorms **difficult**…"
31. L90: "results concerning changes in the …"
32. L93: "and **to** analyze…"
33. L95: deleted "convective available potential energy"
34. L96: "…and **to** introduce…"
35. L98/99: put Section before 2.1 and 2.2
36. L103: use USA only
37. L110: either "a…gust" ore "reporting gusts" if in plural

38. L111: “We then filter out the days that do not have a concentrated area of wind gust reports.”
39. L112: to what does “they” refer to?
40. L112: “…there are likely not…” do you mean **they**?
41. L113: include~~s~~
42. L116: Unclear what you mean by “It”; I think there is a dot missing before Feng et al.?
43. L120: MCSs (Plural)
44. L125: from → since
45. L128: systems
46. L129: “have a global coverage” → “cover large areas”; as you know, single geostationary satellites used for storm detections cover only parts of the globe. So this statement is misleading.
47. L135: mesoscale convective system → MCS; emanate~~s~~
48. L137: have → has; “… define ~~as~~ a derecho **as** a…”
49. L141: MCSs
50. L145: “…tracks extend” Plural
51. L147: lightning (plural does not exist)
52. L149: doesn’t → do not (plural)
53. L150: …”gust speed**. T**his is also a limitation **of our study**,…”
54. L154-155: consider reformulation such as “…the former provide the general setting for convection-favoring conditions in a specific region.”
55. L157: “To investigate this” to what refers this?
56. L157: we examined
57. L158: CAPE was already defined
58. L162: climate change started earlier, so “marginally affected” is not appropriate. Besides, “human activity” is too general, better say “greenhouse gas emissions”
59. L164 ~~“long-term~~ **annual or multiannual** natural variability”
60. L160-165: a brief discussion about how DLS, CAPE, and Z500 are relevant for convection would be appropriate.
61. L165: “attributed to ~~the~~ climate change ~~signal~~.” (otherwise you should specify the signal)
62. L170: delete “when warming was much more limited” as this occurs several times
63. L175-176: “…which can drive extreme events such as MCS associated with derechos.
64. L178: delete “…and the release of latent CAPE” (btw: it’s latent energy or CAPE, but not latent CAPE).
65. L190: large-scale dynamics
66. L198: “We divide the datasets into two periods…” this is now stated for the 4th time…
67. L202: delete this sentence
68. L214: unclear what is meant by “the event itself is suppressed.”
69. L229: plural p-values and H-test results
70. L247-248: this sentence is a bit cumbersome
71. L260: human activity → climate change (note that “human activity” has a very broad meaning).
72. L275: “…seen **in** Figure**s**…”
73. L278: France have → France has
74. L298: **in** Figure 2
75. L302-303: reformulate “one might obtain upgraded intensities”
76. L307: lower → less
77. L326: an MCS
78. L333: include Figure 4

79. L334: I'd suggest to refer to the geopotential instead of low and high pressure (strictly spoken: your geopotential chart is on the same pressure level of 500 hPa, so there are no high and low pressure systems detectable).
80. L336: "…which ~~is~~ one is the…"
81. Entire Sects. 3.2 and 3.3: correct is "increase/decrease **in**" and not "of" or "on"
82. L338: sea surface temperature → SST
83. L340 for **the** EOBS
84. L342: on 18 August
85. L343-344: "As for deep layer shear 6, we find no significant signal along the path of the MCS". It is unclear to what you refer to as shear was not discussed yet. Besides, to which Figure do you refer?
86. L350 are statistically not significant
87. L351: "() similar to SCAND () suggesting"
88. L373: "~~in~~ **on** average"
89. L376: same as comment 79
90. L380: I do not understand what you mean by "Apart one event for each no good analogue can be found"
91. L388: "… an**d** we observe…"
92. L389: "almost half of the casese…"
93. L400: what is meant by "More some patterns…"?
94. L412: "… **and** the proportion…
95. L414: use plural: MCSs …tend
96. L420-421: New sentence: "Further investigations **are** necessary…and the effect of anthropogenic …"
97. L440: Is that statement necessary? For me it seems to be redundant given the paragraph above.
98. L445: solely SST
99. L449-452: Consider reformulating this sentence as it is very cumbersome.