Reviewer #2

Summary: This is a nice study that leverages a long-term record of objectively identified mesoscale convective systems (MCSs) and severe weather reports to identify the extent of hail and tornadoes linked to this storm type. It builds upon past studies on the topic, but is unique in its inclusion of a broader collection of MCS type (most prior studies focus solely on quasi-linear systems). Most of the findings are consistent with prior work, with one exception for the rate of attribution of tornadoes to MCSs with increasing rating/intensity (EF-0 to EF-5). The manuscript is generally well-written and includes appropriate detail on data and methods. The figures are well designed and readable, though the rainbow color ramp used in several of the radar and density figures is not friendly to readers with color-vision deficiency. I have a number of general and specific suggestions for revision, which I outline below.

We thank the reviewer for the valuable comments to improve the paper, particularly the suggestion of adopting the color scheme friendly to readers with color-vision deficiency. Our point-by-point responses are provided below.

General Comments

1. One opportunity that seems missed, but well within reach of the authors is an attribution study for severe wind reports. Wind is not acknowledged by the authors apart from a brief mention for one of the cases highlighted in Figure 2. I recommend the authors add results for severe wind to their study or at least provide sufficient justification for their exclusion from this analysis.

Wind hazards have been excluded from this study because of their more diverse causative mechanisms and much more common occurrence compared to hail and tornado. Different from the dominance of continental convective process in generating hail and tornadoes, wind hazards can result from other meteorological phenomena like hurricanes, microbursts, tight pressure gradients, strong frontal systems, etc. Their distinct characteristics, occurrence frequency, and research needs warrant separate analyses. Furthermore, when examining the data in figure R1, it is evident that both hail and tornadoes often occur simultaneously with intense surface gusty winds. These wind events overshadow the signals of hail and tornadoes when plotted together. Therefore, instead of analyzing three types of hazards all together, this study prefers to focus on hail and tornadoes, leaving wind hazard to follow-on studies.

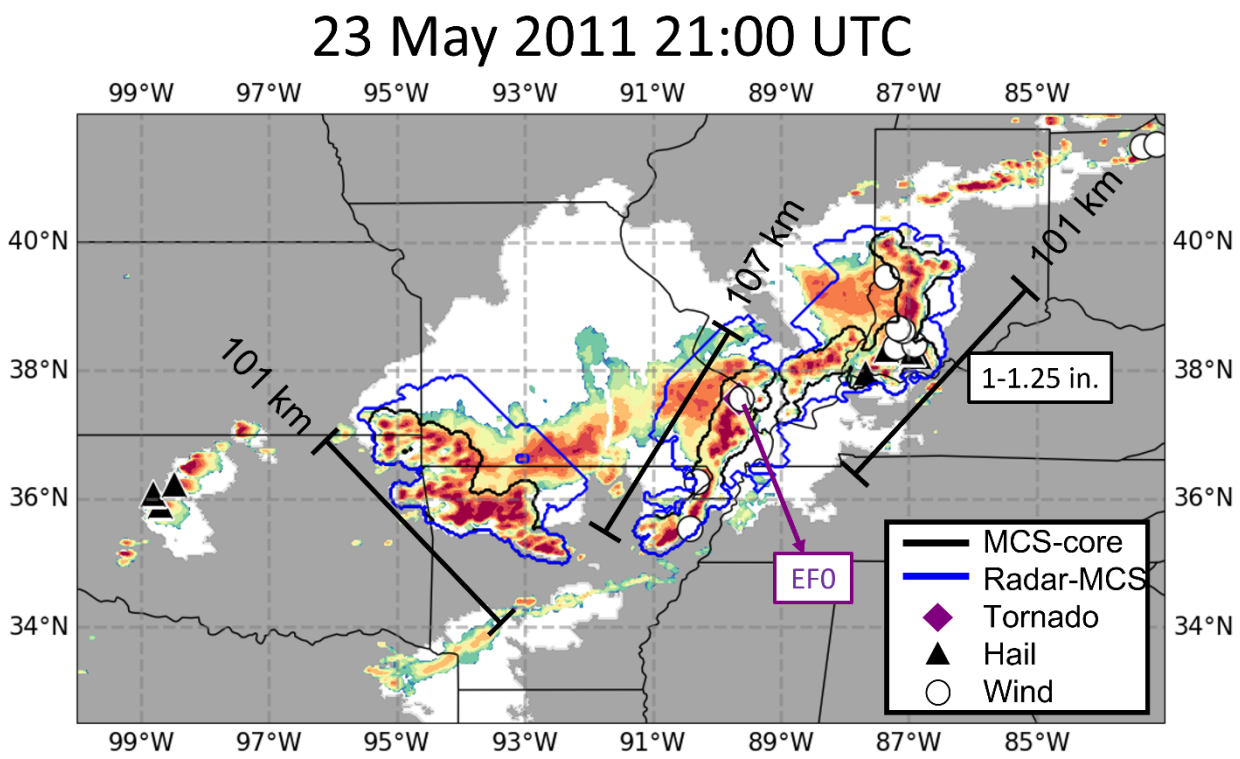

Figure R1. Figure 2a overlaid by wind reports.

Such justification has been added. 'In addition to hail and tornadoes, MCSs are also prolific in producing wind hazards. Different from the dominance of continental convective process in generating hail and tornadoes, wind hazards can result from other meteorological phenomena like hurricanes, microbursts, tight pressure gradients, strong frontal systems, etc. Their distinct characteristics, occurrence frequency, and research needs warrant separate follow-on studies.'

2. The discussion in lines 216-224 conflates documented characteristics of MCS tornado production with interpretation of the hail associations evaluated here. This discussion is confusing and the parallels do not appear to be appropriate to make because the hazard production, its seasonality, etc. are not entirely similar for hail and tornadoes. All discussion of demonstrated tornado linkages should be left to the discussion of the tornado results.

The conflated discussion of tornado has been moved to later discussion of tornado results.

3. The discussion in lines 382-389 and 400-402 is too speculative. The limitation that supercells are not identified in the analysis is an important consideration here. Because prior studies focused on MCS/QLCS severe weather attributions

have been based on mostly manual evaluation of events with specific avoidance of supercells, the differing result found here may be a direct result of the inclusion of many supercells in your MCS classification. With supercells included, the increase in low-level wind shear in the early evening hours as the GPLLJ is established is also important to tornado production. Thus, I recommend softening some of the speculation here (and perhaps elsewhere) and acknowledging more the potential impact of the inclusion of supercells in your analysis. More specification of the differences between your analysis and prior analyses will also be helpful to making stronger assertions.

Such description has been modified as suggested. 'It is noteworthy the genesis of EF4 and 5 tornadoes has been commonly associated with supercells in prior studies (e.g., Smith et al., 2012; Knupp et al., 2014), which were excluded in studies focused on MCS/QLCS severe weather attributions (Trapp et al., 2005; Ashley et al., 2019) based on mostly manual examination of radar imagery. However, by using the automated algorithm featured in this study, considerable fractions of EF4/5 tornadoes (25 out of 63) were found MCS-related because of the supercells embedded in MCSs. By manual examination of the 25 MCS-related tornadoes with severity of EF4 and 5, it is observed that their respective low-level radar reflectivity field exhibits distinct supercell structures embedded in the MCSs. These supercell structures, however, were not evident in the composite radar reflectivity data. As a result, these particular records were not considered in the analysis.'

4. The 27 April 2011 discussions would benefit from citing the recent two-part paper summarizing an in-depth analysis of multiscale aspects of the event: https://doi.org/10.1175/MWR-D-21-0013.1 & https://doi.org/10.1175/MWR-D-21-0014.1

The suggested references have been included.

Specific Comments

Lines 17-18: I do not understand what the authors are aiming to communicate with this sentence. Please revise for clarity – perhaps it needs two separate sentence describing findings for hail and tornadoes.

This sentence has been rewritten as 'As hailstone size increases, the fraction associated with MCS decreases, but there is an increasing trend for tornado severity from EF0 to EF3. Violent tornedoes at EF4/5 associated with MCSs were also observed, which are generated by supercells embedded within MCSs.'

Line 30: "supercell is" should be "supercells are"

Corrected as suggested.

Line 48: “such as moist” should be “such as a moist”

Corrected as suggested.

Line 49: “rotate” should be “rotation”

Corrected as suggested.

Line 56: “tornado” should be “tornadoes”

Corrected as suggested.

Line 60: “to the large-scale” should be “to large-scale”

Corrected as suggested.

Line 64: “variabilities” should be “variability”

Corrected as suggested.

Line 71: “tornado with” should be “tornadoes within”

Corrected as suggested.

Line 169: “sever” should be “severe”

Corrected the typo.

Line 187: “more severe tornadoes”. These are all EF0/1. What do you mean by more severe?

This sentence has been removed.

Line 192: I recommend noting that such associations are statistically rare. Should cite Trapp et al. 2005 also (https://doi.org/10.1175/WAF-835.1).

Note has been added with suggested reference.

Line 225: “because the” should be “because of the”

Corrected as suggested.

Line 227: “provides” should be “providing”

Corrected as suggested.

Line 228: recommend revising “hot zone” to “maximum frequency”

Corrected as suggested.

Line 238: “MCS decrease” should be “MCSs decreases”

Corrected as suggested.

Line 240: “reduction of MCS” should be “reduced frequency of MCSs” (I think)

Corrected as suggested.

Line 253: recommend revising “hot zone” to “frequency maximum”

Corrected as suggested.

Line 352-353: I do not understand what this sentence is aiming to communicate. Please revise for clarity.

This sentence has been rewritten as ‘Previous research has indicated that the spatiotemporal features of hazards can exhibit significant variations across different levels of severity (e.g., Anderson-Frey et al., 2019). It would be interesting to understand how the severity of hail and tornado is associated with MCS events.’

Line 353: “tornado” should be “tornadoes”

Corrected as suggested.

Line 394: “hails” should be “hail”

Corrected as suggested.

Line 396: delete “over the”

Corrected as suggested.

Line 413: “tornado” should be “tornadoes”

Corrected as suggested.

Line 430: “MCS” should be “MCSs”

Corrected as suggested.

Figures 2-4: the colors used for reflectivity/density in these figures are not easily discernable to readers who suffer from color-vision deficiency. Good alternatives are

those which are perceptually uniform or divergent. If using Python, there are some good options here: https://matplotlib.org/stable/tutorials/colors/colormaps.html. For radar reflectivity in particular, *Spectral* is a good choice.

Figures 2-4 and S1-S5 have been replotted using the color map of 'Spectral_r'. Figure 2 is attached below for demonstration purposes.

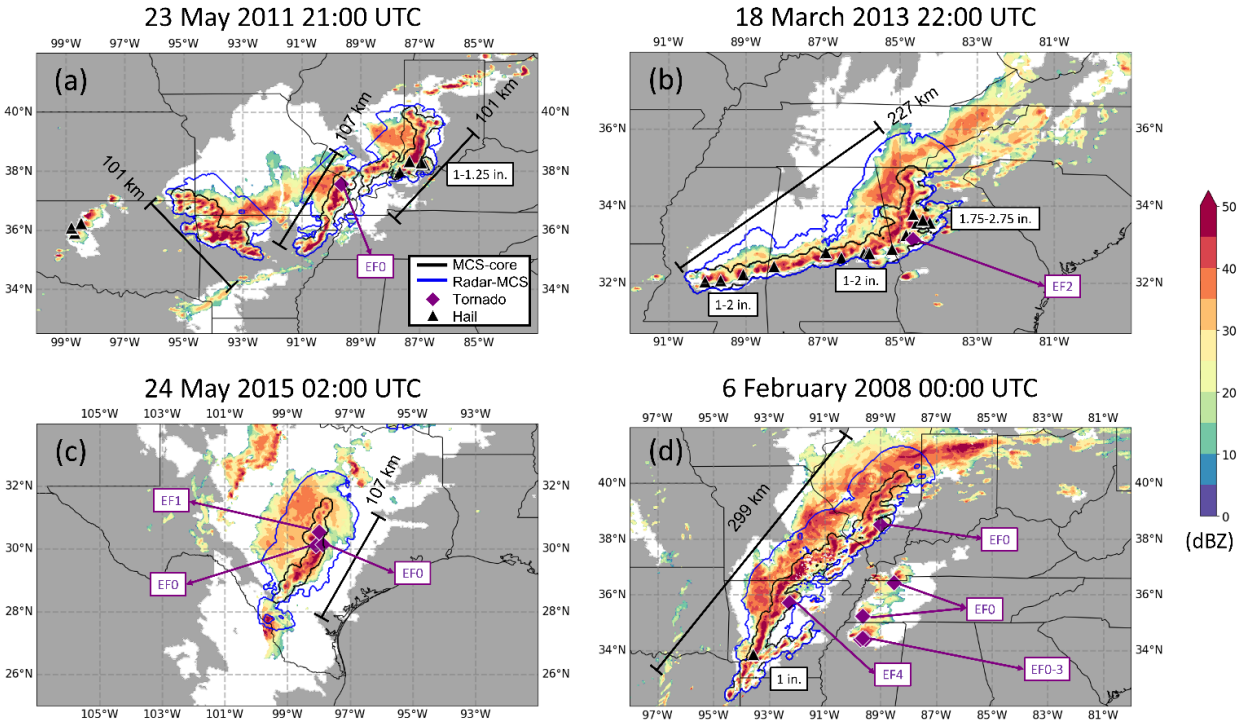

Figure 6: "Normalize" on the x-axes should be "Normalized"

The x-axes of Figure 6 have been modified as suggested.

References: several of the citations here are missing DOI numbers. Please double-check for DOIs (even on older articles) and add all that are available.

The missing DOIs have been added.