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Comment on nhess-2022-194

Anonymous Referee #2

Referee comment on "Increased spatial extent and likelihood of compound long-duration dry and hot events in China, 1961–2014" by Yi Yang et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2022-194-RC2, 2022

This article assesses long duration dry and hot events over China. The analysis is done locally at each grid but also includes 3D analysis of the events taking their duration, temperature magnitude and contiguous area into account. The paper presents the climatology of each characteristic and assesses changes in the characteristics over the observation period. The paper is well written and the results are nicely presented. I can recommend this paper for publication after some minor revisions that I have outlined below.

The authors point out that the gridded dataset is based on a number of underlying observation stations and briefly mention at the end of the manuscript that a comparison with station data would be interesting to assess in further studies. However, I think it is important to show or discuss the spatial distribution and density of these stations. This would highlight if some regions are more observed than others and whether we should trust the changes found in regions with low observation densities. For example, in Figure 12b, is it surprising that C7 has no events for three decades (from 1990 onwards)? How trustworthy is the data in this region?

P3 L71: I suggest replacing ‘meteorological drought’ with a ‘dry spell’. The two terms seem to be used interchangeably throughout which might become confusing for readers as ‘meteorological drought’ has been defined in many different ways in the literature (e.g. some define meteorological drought with SPI), while a dry spell definition is more precise and will not become confused with different definitions.

P3 L89: The metric ‘Count’ can be difficult to interpret and I don’t think it’s the best metric to use when assessing events defined by their duration. For example, each summer has

92 days, if you have 1 event that lasts 80 days and rain on the remaining 12 days, you have 1 event. Equally, you may also have a wet summer with one event lasting 14 days, or multiple short duration events that leads to a high count. This is an issue in interpreting changes in the metric. For instance, a reduction in the number of events could mean they are less frequent or that are more persistent. Perhaps an explanation of this would help though I see that the analysis of event counts is supplemented with changes in the number of LDDH days (Figure 3), which is helpful.

P5 L127-128: Perhaps you could be more precise here as well as give an example of what you mean by a dominant spatial pattern. Is it finding clusters of similar events in different regions within the analysis area or the shape of the patterns (etc.)? Also, please provide the motivation behind this cluster analysis and further discussion of the relevance of the results obtained from this.

Section 3.2.1: This section could be improved, particularly the description of the metrics they assess and the justification for the metrics assessed in Figure 8. It's not instantly clear what exactly the authors are assessing here. My understanding is that they assess trends in the mean annual characteristics of events. This is not so informative without an assessment of the variability within seasons (e.g. larger/longer impactful events may be averaged out by smaller/shorter, and less impactful, events). Perhaps an assessment of the trend of the maximum event each year would be more informative. For instance, one could estimate a conditional trend for the area associated with the annual maximum duration event, or vice versa.

Figure 7: It would be interesting to included magnitude in this figure also. Do larger area events have higher temperatures?

P14 L294-5: 'The annual maximum mean duration' is confusing. I'm not sure what this means exactly, it should be clarified.

Figure 12a: For events starting in August, do they automatically end at the end of August or are days in September counted also if the event persists past the end of August? If not, this might contribute to the low number of events in August.