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Nonlinear Processes in Geophysics
Discussions

Interactive comment on "Identification of Droughts and Heat Waves in Germany with Regional Climate Networks" *by* Gerd Schädler and Marcus Breil

Anonymous Referee #1

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In this study, the authors used Regional Climate Networks (RCNs) to identify heat waves and droughts in Germany and two sub-regions for the summer half years & summer seasons of the period 1951 to 2019. They used several metrics from RCNs to estimate the extent, intensity and collective behavior of extreme events. The results were compared with standard indices including the effective drought and heat index (EDI and EHI). Their findings suggested that the RCNs are able to identify severe extremes in all cases and moderate extremes in most cases. One highlight of this manuscript is the clear introduction of the concept of RCN. The work is interesting and the RCN methods used in this work may also be useful for other studies. However, there are still several concerns to be addressed. A major revision is needed.

1. One major concern is about the added value of the RCN method compared with the

standard indices (EDI and EHI). In this work, the authors compared the results from the RCN method and those from EDI and EHI, but lack a detailed summary of the advantages of the RCN method.

2. In the manuscript, the authors used different metrics to measure the spatial extent and the intensity of the extreme event. However, detailed discussions on these two properties (extent and intensity) are missing. It seems that the main point of the work is to compare the metrics (mainly the edge density) with the EDI/EHI. It is not clear why the intensity is measured?

3. To determine the correlation threshold, the authors conducted a series of sensitivity runs with respective to correlation threshold and its effect on the metrics. They found that an average edge density of about 0.01 gives good results, and chose a value of 0.95 as correlation threshold. The question is, does this threshold dependent on the distributions of the variable of interest? Can this threshold be used for different variables?

4. When identifying extreme events, a margin of 0.2 is applied to account for averaging and moderate extreme events. Why choose 0.2? Are there any reasons?

5. When calculating the correlations using precipitation time series, dot product was used. However, I think an Event Synchronization (ES) analysis (refer to, e.g., Boers et al., Nature Communications, 2014) may be more appropriate, as in ES, one can consider a time-lag to better determine whether the two considered events from two nodes are synchronized.

6. In table 2 and table 3, the authors compared the metrics in average years and extreme years. Here, a significance test may be needed to better show the differences. In addition, when comparing the different results from average years and extreme years, a composite analysis may be better. For example, calculate the mean metrics over all the average years, and compare them with those averaged over all extreme years.

7. In Fig. 4 and Fig. 9, what do the red and blue curves stand for?

8. On page 19, lines 16-17, the reference Tsonis et al., BAMS, 2006 is repeated twice.

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