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Review of wcd-2021-40

Kathrin Wehrli (Referee)

Referee comment on "A dynamical adjustment perspective on extreme event attribution" by Laurent Terray, Weather Clim. Dynam. Discuss., https://doi.org/10.5194/wcd-2021-40-RC1, 2021

Review of «A dynamical adjustment perspective on extreme event attribution» by Laurent Terray (wcd-2021-40)

General Comments

The manuscript is well-written, follows a clear narrative and the conclusions are supported by the analysis and literature cited in the paper. I especially appreciate the comprehensive literature review and that the observation-based results are frequently compared to results from modelling studies and vice versa. The study complements existing work in the field and provides added value to the understanding of past extreme events and long-term changes in extreme indicators. It shows that the dynamical adjustment method is a practical and versatile approach that can even be considered for rapid attribution of extreme events.

I was wondering whether there is similar year-to-year variability in the contribution of the dynamic component to changes in TXx and TNx as there is on a daily basis for the specific events. Below I also added a comment about this point. Maybe the author has already done some analysis in this direction that he can share.

Overall, I am happy to recommend publication and I only have minor comments and questions to the manuscript, which are given below.

Minor comments

line 37: The second approach of extreme event attribution is introduced as the "process-based or storyline approach". To me, the term «storyline» might need a little more explanation in this context as I think I would not name every process-based study a storyline. Both are not probabilistic and aim to understand the driving factors. However, following e.g. Shepherd et al. 2018, storylines also explore different plausible climates, which is not done in Wehrli et al. 2019 or the present study. I am aware that it is probably not possible to make a clear distinction between a process-based or storyline study in every case. It might help if the author could share his definition of a storyline.

l. 60: I would leave away the word "tropical" as the heatwaves examined in Wehrli et al. 2019 were not really tropical events even if parts of the regions examined for Australia and South Africa can be classified as tropical/sub-tropical climate.

l. 98: It would be nice to briefly mention what method was used in Horton et al. 2015 as the study will be referenced also later in the manuscript.

l. 278: Do you mean "more persistent" instead of "intense"? The first spell in mid-December looks more intense to me than the second.

l. 397: Could this trend in TX due to dynamics be related to one extreme event in the recent years such as the Russian heatwave? Would the maps look different if you left out 2010? And is there a lot of year-to-year variability in the contribution by dynamics?

l. 401: Do you have a hypothesis why the thermodynamic component trend is overall cooling TNx? Would you expect this to be due to the local or the remote contribution associated with internal variability?

Reference:

Shepherd, T.G., Boyd, E., Calel, R.A. et al. Storylines: an alternative approach to representing uncertainty in physical aspects of climate change. Climatic Change 151, 555–571 (2018). https://doi.org/10.1007/s10584-018-2317-9

Details, typing errors, etc.

To ensure reproducibility of the study the location and extent of the SLP regions that were used for the two events in 3.1 and 3.2 still need to be specified . I only found the numbers for the TX regions in the tables.

l. 103: Do you mean TN **maxima**?

l. 115: Later in the manuscript (e.g. Table 1) an underscore is used before the version number in 20CR_V3

l. 220: The period chosen for the cold European winter is not exactly two weeks but 17 days

l. 237: Do you mean Fig. 1**b**?

l. 254: insert "the" before amplitude

Fig. 1: I find it hard to distinguish the one contour line that is thicker. Line thickness could be increased or the zero SLP anomaly line could be highlighted in a different colour e.g. violet.

l. 269: typo, should be 2009-20**1**0 early winter

l. 270: Shouldn't the numbers in the brackets be -3.07 °C and -2.04 °C?

l. 271: 20CR_V3

l. 336 I would close the first bracket after "anomaly"

l. 381: For the TX, TN and the SLP domain it should say °E instead of °W.

l. 387: I think the bracket saying “smallest” should be omitted as you are using the largest anomalies whether it is TX or TN.

l. 444: Was it not mitigated by around one third from -3.07°C to -2.04°C (instead of 50%)?