

Weather Clim. Dynam. Discuss., referee comment RC2
<https://doi.org/10.5194/wcd-2021-72-RC2>, 2022
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Comment on wcd-2021-72

Anonymous Referee #2

Referee comment on "Regime transitions of Australian climate and climate extremes" by Jorgen Segerlund Frederiksen and Stacey Lee Osbrough, Weather Clim. Dynam. Discuss., <https://doi.org/10.5194/wcd-2021-72-RC2>, 2022

The main idea of the paper is interesting and deserves to be published, but I have some concern about the shape of the paper and the way it is presented. The paper doesn't really flow and it would benefit from presenting the results in a way such as the reader know what question is to be addressed in each section and how it is related to the rest of the paper. Also, the main question(s) of the paper should be clarified. Does it focus on transition periods? or regional differences?.....

For most of the sections, there is a lack of conclusions. Results are presented in details but the key message of a section should be summarized so the reader can have a clear idea about what he got from the analyses.

Part 3.1: I didn't really understand the way authors defined the periods to average results (Fig.1 / Table 1). It seems a bit random. Also, authors refer to some particular signal for the last of the periods (2014-2018) but it is not surprising as it only concerns 5 years whereas most of the other periods refer to multi-decade averages. This whole paragraph should be written in a more consistent and justified way. Also, instead of Table 1, period-averaging results could be displayed directly in Fig.1 (as horizontal bars for example). This comment is also valid for all other tables and results showing period averaging. In a same way, figures showing 10-year running means could simply be plotted on the top of annual results (with a curve or something similar).

Also, a lot of literature review is merged with the results and many references are quite old. Although I totally agree that it's important to refer to previous studies, in this paper there's sometime a mixed approach between a review paper and a new study paper. I'd suggest to limit more the review part to the introduction, to focus more on the most recent studies, and only refer to previous papers in a limited way in method and result sections. But in general I appreciate that authors did an extensive review work, especially for people (like myself) who are not familiar with Australian climate.

Variable and indices used should be described to the methodology instead of being presented in the main text (deciles, percentage area coverage.....). Especially, % area coverage should be clearly defined. Does it use a single threshold for whole period/season? In that case, it may explain the dramatic change for extreme temperatures (basically it's just a shift in seasonal temperatures). It would be more interesting to use calendar day thresholds for example. But I'm not sure about which methodology has been used here....

Some other comments:

Fig.1(a): why is it displayed as centered values around the mean whereas all other similar plots are displayed as absolute values?

Fig,4: When plotting differences between 2 periods it's good to show where it is significant or not (with a t-test for example).

Fig5: although the decrease then flattening is quite clear, I'm wondering how reliable are reanalysis before 1970s, as there weren't satellite observation at that time?

L109-110: Figure description should be in the figure caption, not in the text.

Section 5 is not really useful...