

## ***Interactive comment on “Synchronicity of historical dry spells in the Southern Hemisphere” by D. C. Verdon-Kidd and A. S. Kiem***

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This is a good (if rather short) paper examining the synchronicity of droughts across the southern Hemisphere south of 30 degrees latitude. The conclusions with regards to key indices of climate and their relationships to droughts across the entire southern Hemisphere are justified, but the authors imply that their findings are at odds with projections of increased drought as a result of anthropogenic climate change. However a closer look at the data presented in this paper indicates the exact opposite, with the periods of drier than average conditions corresponding to periods of accelerated global warming (and increased pressures in the subtropical ridge), and the periods of normal rainfall corresponding to a slow down in global warming and reduced intensities in the

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subtropical ridge as postulated in CSIRO (2012). I would encourage the authors to re-examine their data and reverse their assertions regarding the conclusions of this paper being at odds with projections of anthropogenic climate change.

More general comments follow.

Section 2.1. It is not sufficient to mention that there are ‘limitations’ with the reanalysis data. The reader needs to be confident that the reanalysis data is suitable for the task being carried out. A description of the limitations of the data and the likely impact of these limitations on the results of the study is required.

Section 2.2: Why was data sourced only south of 30 degrees latitude?

Section 4. The authors assert that the lack of trend in dry spells seen in Figure 3 are at odds with projections of increased drought under anthropogenic warming, however they have used all rainfall stations south of 30 degrees in their analysis, while the projections of increased drought relate exclusively (at least in CSIRO,2012) to the mid-latitudes. The analysis in CSIRO (2012) also suggests that drought periods are more likely during periods of accelerated global warming, rather than during periods when the rate of global warming is lower (related to the intensity of the subtropical ridge). It is intriguing that little evidence of the Federation, WW2, and Millennium droughts can be seen in the yellow bars in Figure 3. The 5 year cumulative rainfall probably shows these droughts better than the others (at least for the WW2 and the Millennium droughts).Some discussion of this would be welcome, otherwise this would seem to indicate that the approach taken of identifying the 5 driest periods might be called into question.

Section 5. I would think that the evidence presented of drought in New Zealand, Africa and South America consistent with the Federation drought is hardly ‘compelling’. In Africa, just 2 of 4 stations recording at this time were also in drought, in South America, there is at least one station on the west coast that was not in drought, while in New Zealand there also appears to be at least one also not in drought. Perhaps the authors

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could quantify the number of stations in/not in drought and tone down their language based on that?

Section 6: The reference to the Hendon et al (2007) citation is missing.

Section 7: The timing of the dry spells across the southern Hemisphere (1910-1950, and post-1980) with a wetter period in between correlates very well with the periods of accelerated global warming as described in CSIRO (2012) and a number of papers by Timbal et al. I would suggest that some mention of this is needed. This accelerated global warming with associated increasing intensity of the subtropical ridge is one of the key mechanisms through which increasing droughts are postulated under climate change. This correlation in fact reverses the assertion by the authors that the findings of the current paper are at odds with the projections of anthropogenic climate change coming from CSIRO.

References CSIRO: Climate and Water Availability in South-Eastern Australia: A Synthesis of Findings from Phase 2 of the South Eastern Australian Climate Initiative (SEACI), Australia, 2012.

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