

Interactive comment on “Multi-century cool and warm season rainfall reconstructions for Australia’s major climatic regions” by Mandy Freund et al.

Anonymous Referee #1

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General Comments

This paper is generally good and well written. I have a few comments, most of which are relatively minor.

Major Comments

1. The abstract refers to cool and warm season rainfall reconstructions as being sub-annual. Elsewhere in the abstract they are referred to as seasonal and on p11 as bi-seasonal. Sub-annual is confusing. What they really are is half-year reconstructions, with the two parts of the year based on the cold and warm part of the year. Stick with one definition for them. Bi-seasonal seems best, sub-annual doesn't mean anything.

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2. When using CPS and rescaling using the mean and SD from the calibration period, you are assuming a normal distribution. How good is this for some of the smaller NRM regions? Particularly for the warm season, some regions show large positive spikes indicating that the distributions for some regions will be positively skewed. This makes using CPS more difficult, and it might be that proxies are less good at differentiating wet seasons from one another, but it could be worth a comment.

3. You've used deciles based on the period 1900-2014, so for the proxy series the last 30 years up to 2014 is based on instrumental data. Do your results get altered by basing both on the period from 1900-1984 and not padding with instrumental data? Also you do pad with 30 years, not the 20 you say, as 2014 is 30 years after 1984.

4. What would be useful in Table 1, when text on p9 discusses the cool and warm season rainfall series, is to add a % value for how much the cool or the wet season contributes to the overall 'annual' total. You could base this on a April to March year. This could help in the importance of some of the rainfall declines. Some regions get much more rain in one season compared to the other.

5. Is it worth also concluding that the 400-year reconstruction didn't produce a drought as extreme as the 3 in the instrumental period? As these are different lengths, did you go back and look at droughts of different lengths of numbers of years. The Millennium drought was 13, the WW2 drought 11 and the Federation drought 9.

Minor Comments

1. In the abstract or in the Introduction you mention the high-variability of Australian rainfall. This could be emphasized a bit more, as Australian averages (when expressed in percentage terms) are highly variable compared to other parts of the world. I recall seeing a plot of N and separately S Australian averages (Giorgi regions) compared to other similar sized regions of the world and Australia needed a different scale from all other regions.

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2. On p2 lines 19-26 you talk about decrease in rainfall. Might be worth mentioning in impact terms that the costs of droughts are much more than the costs of floods. I'm assuming this is the case?
3. Add in on p3 that Cook has also produced the OWDA (Old World Drought Atlas) with a paper in 2016 in Science Advances.
4. Line 12, change Europe to Eurasia as there are lots of proxies across the whole boreal forest zone and from eastern Asia.
5. Useful if Figure 1 and Table 1 could be linked and the map named the 8 regions. It took me a while to realize that the big bit in the middle was called 'Rangelands'. It also seems as though this region is just what's left from naming the other regions.
6. P4, line 16, these two references are missing (BJ93 and T et al.2015).
7. Another ref missing on p6 line 4. A better ref here would be Cook et al (1994, IJC, 14, 379-402).
8. On p6, the dates of the various droughts do overlap – maybe they are close regions and overall only affect part of Australia? Worth mentioning this though.
9. P7 introduces STRP and STRI, but Table 1 just refers to STRI and STRL. How do these two relate to STRP?
10. On p8 the cool season paragraph refers to 3 regions which extend back to 1200, 1260 and 1366. This is OK, but in the next paragraph the wet season 3 regions extend back to just 2 years?
11. Remove the 'as' before ENSO's on line 14 of p12.
12. Move the left bracket on line 7 of p13, so begin with Cook et al. (2016) found. ...
13. In Table 1, SE Drought is in twice in the third column. This is why it doesn't get a date the first time? I presume all these dates are the accepted dates?

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