Review : Eccles et al., 2025

High-resolution downscaled CMIP6 drought projections for Australia

General comments

This paper “High-resolution downscaled CMIP6 drought projections for Australia” is well written, with a clear structure, well-chosen illustrations and well explained results to address their research question: representing the characteristics of meteorological droughts in Australia at high-resolution.

I particularly commend the introduction and the discussion, giving a very good perspective on the study and its results.

I feel the comments from the previous reviewers have been well addressed, with pertinent elements added to the article and comprehensive answers written.

I recommend this article for publication and only have a few minor comments, notably to improve the presentation of the methodology and the choices made in the downscaling part of the study.

Minor comments

My main issue in the paper is related to the section “2.2 Data”, which I feel could be made clearer. It would be helpful to better present the project for which the downscaling was done, to explain some of the choices made. Why “some model variants were downscaled multiple times” (l.114) ? This sentence seems to come too early, and corresponds to the explanation given l. 124 and Table 1?
How did the authors select their model ensemble? Why are some CMIP6 models downscaled with different set-ups and not others?
This needs to be better explained, especially since in the later sections, we need to understand when it is pertinent to analyse the 15-model ensemble, or rather consider an 11-model average.
It would made the section 2.4 clearer (l. 196 to 204).

Also, the authors mention that the downscaling approach significantly improve the performance on temperature and precipitation than using the coarse scale GCMs. Against which observation data? Since we are in the data section and that observation data are directly mentioned in the following paragraph, I feel this information could be added.

Still in the methodological part, section 2.3, the authors mention a calibration on the historical period to fit the SPI and SPEI distribution in the future period.
I do not understand fully how this was conducted, and also how it fits with the analysis later on of the changes in the SPI and SPEI distributions and shifts in percentiles, if these distributions have been calibrated…
The paragraph from l. 174 to l. 180 needs to be made clearer, with more details given on the transfer function used for the calibration, if there was a calibration. The first section of the results (3.1) seems to imply that there was none, since you look at the biases between observation and simulation. Otherwise, how does the calibration changes the performances? I am confused.

Specific comments for the authors

Introduction

- There is a redundant information in the introduction, with l.65 to 69 similar to l.84 to 86. Since the structure of your introduction shows: the use of GCM (l.54 to 64), their limits and the use of RCMs (l.65 to 70), but last studies used for CMIP5 (l.71 to 81), I feel you could

reorganise slightly l81 to 86. It would avoid the redundancy and better highlight that you want to work with CMIP6, and it is the main novelty of your study.

- To help the method section of the article, I think you could mention the RCM you used in the end of your introduction and detail a bit more the Queensland Future Climate Science Program (QFCSP).

Method

- P.7: you use a notation SPI/SPEI. If I understood correctly, it means "SPI or SPEI". Be careful, it looks like a ratio. I feel this need to be changed.
- Sentence l. 212-213 is not clear. A percentile can not be a shift. The sentence is not correct. Ta define a shift, you need a reference. So I think I understand what you mean. If the 50^{th} percentile in the projected distribution matches the 40^{th} percentile in the historical period, therefore there is a 10% shift towards dryness.

Results

I feel the results are very well explained with pertinent illustration. Still I have a few comments.

- Section 3.2.2: how do you define the "area affected by droughts"? Is it all pixels for which there is at least one drought event (depending on the severity of the drought event defined)?
- L. 352-354: unclear : "differences between the 10^{th} and 90^{th} percentiles"?

Discussion

- L. 383: "time in" ?
- L. 424: What does "this" refer to? The elevated PET?
- L. 454: "may better" → "would rather" ?