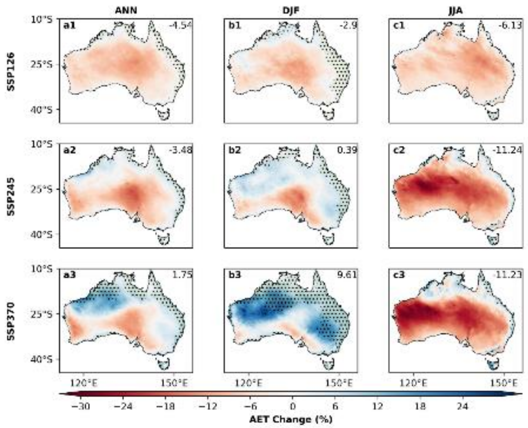
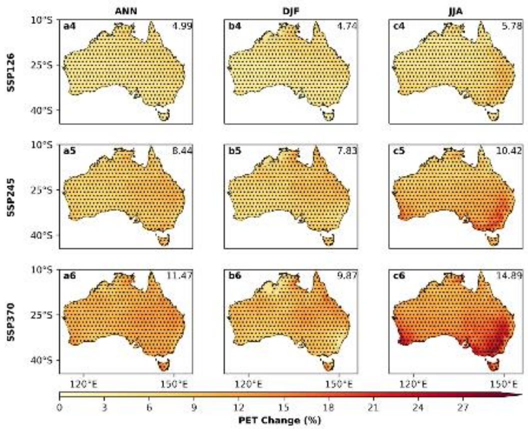
Response to Reviewer's comments for manuscript entitled "Projections of actual and potential evapotranspiration from downscaled high-resolution CMIP6 climate simulations in Australia" [MS No. egusphere-2025-498] submitted to HESS

ID	REVIEWER COMMENT	RESPONSE	STATUS
Reviewer #1			
R1.1	The manuscript presents a very thorough and broad assessment of AET and PET datasets and projections for Australia. The introduction, analysis and discussion give a good overview of the performance of the available AET and PET products. The paper is well written, clearly structured and I appreciate that the limits of the products and the results are clearly stated.	We appreciate the time you spent providing helpful feedback to improve our manuscript. Below we outline the changes we will make to the manuscript to address your comments.	NA
R1.2	First, the abstract would benefit from more plain language. While abbreviations like AET and PET are defined, CCAM is introduced without explanation. Removing it or adding a brief description of what CCAM refers to and why it is used would make the abstract more accessible to non-specialist readers.	We will modify the abstract to reduce complexity as suggested by the reviewer. This will include removing any reference to "CCAM", which we will term "downscaled CMIP6 models" instead to make it more intelligible to readers.	To be implemented
R1.3	The introduction is very thorough but also very long, and the study's aims only become apparent at the end. The mention of "old observational datasets" seems abrupt and lacks sufficient context. Clarifying how these datasets relate to the objectives would improve readability and make it easier to follow.	We will revise the Introduction to improve logical flow and readability. The study's aims will be introduced earlier (e.g., in the second paragraph in Introduction) as suggested. We will downsize the introduction, by moving some parts to the methods to improve readability and emphasize the objectives of our contribution.	To be implemented
R1.4	The initial visual comparison of datasets across Australia is a helpful starting point, but it would be even more informative if it were supplemented with a quantitative assessment of spread or uncertainty between the datasets, e.g. a map of the model spread. Specifically, identifying regions with the largest disagreement among models	We will implement the signal-to-noise ratio analysis to quantify the model spread and uncertainty of the projected changes of the spatial maps. These changes will be made to Figure 4 and Figure S2. We have attached an example of the proposed changes to be made to Figure 4 below.	To be implemented

	would highlight areas where confidence is lower and further improvement is needed.	  We will also add the text below in the methods explaining the approach. "*We examined the signal-to-noise ratio to determine where the climate change signal emerges from the 'noise' of the model ensemble (Hawkins and Sutton, 2011). Here, we take the signal as the model ensemble average, while the noise is calculated as the standard deviation of all the projections. As we focus on end of century climate change impacts, model uncertainty is*	

considered as noise and is expected to be the greatest source of uncertainty. Stippling is shown on ensemble mean change maps where the signal-to-noise ratio is greater than 1.0 (Chapman et al., 2024), indicating agreements among models and implying a higher degree of confidence.”

We will also include an additional figure (Figure 5) to outline the spread of the projections from all models for all emissions scenarios across Australia by the end of the century for both AET and PET. This will consist of a scatterplot with individual model changes in AET and PET as percent and marginal boxplots to highlight the model spread and uncertainty. We have included the proposed plot and caption below.

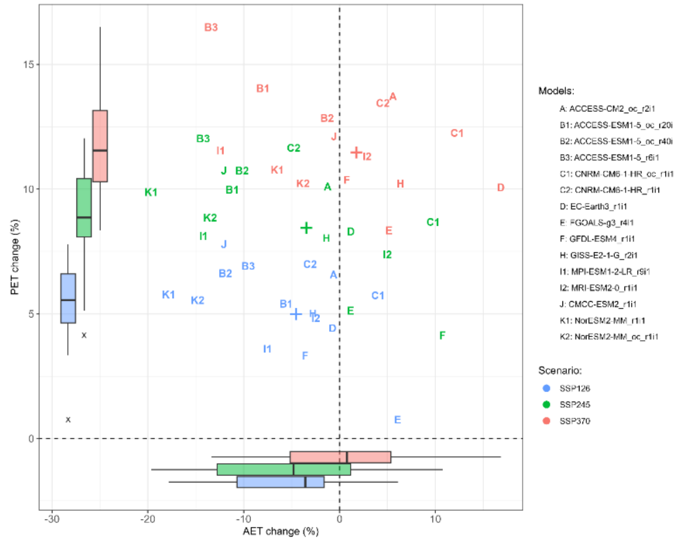


Figure 5. The percentage change in annual AET and PET for the individual downscaled CMIP6-CCAM models across Australia for SSP126, SSP245, and SSP370 (1995–2014 compared to 2080–2099). The box and whisker plot shows the interquartile range (box), and the median (bar), while the whiskers extend from the box to the furthest datapoint within 1.5x the interquartile range. The symbol “+” shows the ensemble average and the symbol “x” indicates the outliers from the marginal boxplots.

In accordance with the proposed changes to these figures, we will edit the Results to add interpretation of these new results. The proposed text to be added to the Results section is below.

“For AET, there are a few areas where the signal-to-noise ratio is greater than 1, most notably along coastal eastern and northern Australia. Generally, model agreement is greater in DJF than in JJA, and greater for the high emissions scenario (SSP370) than the moderate or low emissions scenarios. By contrast, PET can be seen to have generally had a widespread model agreement according to the signal-to-noise ratio across the whole country, with a few minor exceptions. These differences relate to the very clear increases noted for PET due to increasing temperatures, which are not reflected in AET due to the majority of Australia being water-limited rather than energy-limited.
While there is a clear sign of an increase in PET across Australia by the end of the century for all the models considered across all emissions scenarios (Figure 5), the magnitude of the changes can be seen to vary among individual model members. By contrast, for AET, there is disagreement among the individual model members on the sign of the change. For example, for SSP126 while most models show a decreasing signal, there are two models which project increases. For the moderate emission scenario (SSP245) most models project decreases, whereas for the high emission scenario (SSP370), most models project increases. Even when using the same emissions scenario, the projected changes in AET can differ significantly among models, highlighting a key aspect of climate modelling uncertainty and variability in the projections.”

And:
“After bias correction the model agreements have been improved for AET, particularly for SSP370 in DJF season and ANN (refer to the stippling in Figure S1 rows 1-3). For PET, bias correction also improved the consistency across models in some regions, as the signal-to-noise ratio was noted to be greater than 1 across nearly the whole country (Figure S1 rows 4-6).”

R1.5	Adjusting the order of SSP scenarios in Figure 6 to the order used in Figures 7 and 8 would make it more intuitive to interpret the results. Also, I would include the caption entirely for Figure 8, even if it is the same as for Figure 7, so that the figure can stand on its own and readers don't have to jump between the two.	We will adjust the order of SSPs in Figures 5 and 6 to the order used in Figures 7 and 8. Also, we will include the caption entirely for Figure 8.	To be implemented
R1.6	Lastly, regarding the drivers of change, CMIP6 models usually include LUC in their scenarios. It would be interesting to discuss if some of the changes you identify can be tied to LUC instead of CC. What do you think?	As suggested, we will include the following sentences in the discussion to explain how these changes in AET and PET are influenced by land use changes, and not just climate change: *"Regarding the drivers of change in AET and PET, some of the changes we identify can be tied to land use change, not just climate change. For example, deforestation or agricultural practices can alter surface water availability and vegetation cover, impacting AET, while changes in land surface properties (like albedo) can affect PET."*	To be implemented