Review of "Future changes in seasonal drought in Australia"

This study examines changes in projections of meteorological, agricultural, and hydrological droughts in Australia while quantifying the contributions of different sources of uncertainty. The study uses CMIP5 climate projections from four global climate models (GCMs) under two carbon emission scenarios. Each of the climate projections is downscaled using four statistical and dynamical downscaling methods to drive the Australian Landscape Water Balance model (AWRA-L), to generate hydrological projections. The results indicate an increase in future droughts in Australia despite inherent uncertainties. Among the sources of uncertainty, the four GCMs contribute the most, followed by the downscaling methods and the emission scenarios.

The study is well-designed, and the manuscript is well-written. The topic aligns well with the scope of the *HESS* journal, and I consider it suitable for publication, however, after addressing a few at least moderate comments:

1. **Use of outdated climate projections**: The study relies on hydrological projections driven by CMIP5 climate projections. While I understand that the study makes use of existing projections, it raises the question of whether these findings would hold with the latest CMIP6 climate projections, which represent the current state of knowledge on this topic. Although replicating this analysis with CMIP6 projections will be a major task, could the authors at least compare the CMIP6 and CMIP5 projections (without downscaling or running the hydrological model) from the same four models? This would provide insight into the similarities and differences between the two projections.

2. **Novelty of results**: The main motivation of this study is to address the existing uncertainties in future drought projections in Australia that "have remained stubbornly uncertain due to a lack of model agreement in projected precipitation changes in most regions". To underscore the study's novelty, it may be helpful to compare the state of knowledge on future droughts in Australia both before and after this study. Including this comparison, perhaps in the discussion section, would enhance the manuscript's contribution to the field. Additionally, discussing the implications of this additional knowledge on decision-making regarding future droughts in Australia would further strengthen the study's relevance and novelty.

3. **Diagnosis of uncertainties in hydrological projections**: The changes in hydrological projections appear more widespread and severe than changes in precipitation. Further exploration of the causes of those differences would be beneficial. Is this discrepancy due to compounding effects of precipitation and temperature changes, or possibly intraseasonal changes (e.g., shifts in rainfall intensity)? Alternatively, could differences in downscaling methods, particularly their temporal disaggregation schemes, be contributing factors?

4. **Quantifying contributions of uncertainty in the abstract**: It would be helpful to include the relative importance of each source of uncertainty in the abstract. For example, stating that GCMs contribute approximately X% to the uncertainties, and downscaling methods contribute Y%, would help more clearly summarize the results in the abstract. Additionally, it would be valuable to at least comment on the relative contributions of

uncertainties from dynamical versus statistical downscaling methods, since statistical methods are more widely used, as they are numerically far less expensive.