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Hydrology and Earth System Sciences Discussions

Interactive comment on "Changes in Köppen-Geiger climate types under a future climate for Australia: hydrological implications" *by* R. S. Crosbie et al.

Anonymous Referee #1

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General comments:

The authors present a state of the art method to depict climate zones for the present climate as well as the future climate covering the Australian continent. Thus, projections of Köppen-Geiger climate types for a 2030 and 2050 climate are compared to a 1990 historical reference using 17 Global Climate Models (GCMs) and five global warming scenarios depicting climatic shifts according to a global warming of up to 2.4 °C with possible consequences for vegetation and hydrology. As similar approaches of using climate classifications and shifts of climate types can be found in the current literature, and the authors also refer to this literature, this manuscript provides also differences between the used GCMs and possible vegetation change projections with consequences for hydrology. Thus, the manuscript represents a substantial contribution to scientific progress within the scope of HESS.

Specific comments:

The paper presents projections of Köppen-Geiger climate types across Australia for future climates based upon 17 GCMs and five global warming scenarios. There is no consensus amongst the GCMs in the projections for the Tropics whereas for the Arid climate types almost all GCMs project an increase in area and definitely all GCMs project reductions in the Temperate and Cold climate types. The increase in the area covered by the Arid climate types is balanced by a reduction in the Temperate climate. As the Köppen-Geiger climate classification was developed based upon the distribution of vegetation it may provide a useful surrogate for vegetation change projections under a future climate. A transition in vegetation type from annual cropping to perennial grassland would have a compounding effect on a reduction in recharge whereas a transition from forest vegetation to grassland would have a mitigating effect upon a reduction in runoff. Therefore it is recommended in the conclusions that detailed research is necessary to incorporate the indirect effects of climate change due to vegetation change into studies of climate change impacts upon water resources in Australia.

Thus, substantial conclusions are reached and with its results the paper addresses relevant scientific questions in the scope of HESS, even though the idea of the paper as well as the used concept and tools are not really novel. The scientific methods and assumptions are of course valid and clearly outlined and the results are sufficient to support the interpretations and conclusions. All results are traceable and the authors give really proper credit to related work, but the indication of their own new and original contribution leaves a bit to be desired. The title clearly reflects the contents of the paper and the abstract provides a concise and complete summary of the paper. The overall presentation is well structured and clear and the language is fluent and precise.

HESSD

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Mathematical formulae and symbols are not used and symbols, abbreviations and units are correctly designed and used. The number and quality of references, tables and figures is appropriate.

Technical corrections:

The sentence "The majority of annual cropping ..." on page 7424, beginning at line number 28, reads a bit bumpy and should be reformulated.

The colouring of the different climate classes in the pictures 1, 2, 4 and 7 does not allow an optical differentiation of some climate classes, especially Aw and Dfb look very similar. This begs the question, why not the original colour scheme of Köppen and Geiger was used?

The two left images in figure 5 should be switched as they fit better to the context of the explanations on page 7421.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 7415, 2012.