Hydrol. Earth Syst. Sci. Discuss., 10, C7934–C7936, 2014
www.hydrol-earth-syst-sci-discuss.net/10/C7934/2014/

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Links between the Big Dry in Australia and hemispheric multi-decadal climate variability – implications for water resource management" *by* D. C. Verdon-Kidd et al.

Anonymous Referee #2

Received and published: 18 February 2014

General Comments

This paper is an interesting and important contribution to our understanding of regional climate trends in south-eastern Australia (SEA). The authors review climate trends since the middle of the last century in south-eastern Australia (SWWA) with reference to the broadly similar climate trends in south-west Western Australia, and, to a lesser extent, similar latitudes elsewhere in the southern hemisphere. Briefly, many studies have demonstrated that the decline in rainfall in SWWA occurred during the 1970s, whereas the decline in rainfall in SEA occurred around the mid-1990s, and that these climate trends are both due to similar regional-scale climate shifts. It is fair to say that

this apparent 20-year reprieve for south-eastern Australia is not properly understood, and this paper provides a significant contribution to improving our understanding.

An anomalous wet spell (late 1980s to mid-1990s) is identified in SEA rainfall; this wet spell is mostly not present in SWWA rainfall amounts. The overall objective of the paper is thus a detailed analysis of the likely causes of this wet spell. A pattern-recognition methodology (SOM) is used to identify and classify synoptic types. These are then related to rainfall amounts at reference stations in south-eastern Australia. Importantly, it appears that there are specific synoptic patterns that were relatively more frequent in the anomalous wet spell. These are related qualitatively to larger-scale climate drivers known to influence rainfall in southern Australia. It is a shame that this methodology is not extended to SWWA rainfall stations, with a subsequent comparison between east and west, as this could provide more tangible evidence to back the authors' claims that the wet spell in SEA is indeed a temporary reprieve from the drying trend since the 1970s in SWWA. The comparison with other southern hemisphere land masses could also be enhanced with at least a reference to, and discussion of, other papers of interest, e.g. Cai et al. (2012).

Cai, W., Cowan, T., and Thatcher, M. (2012) Rainfall reductions over Southern Hemisphere semi-arid regions: the role of subtropical dry zone expansion. Scientific Reports, 2:702, doi:10.1038/srep00702.

Specific comments

Many of the figures could easily be improved for clarity, for example: font sizes increased throughout; and the panels in figures 2-3 could be aligned to make comparison easier. Figures 8 and 9 are crucial for the paper, and I recommend improving these substantially. The authors go to great lengths in the text to explain the different synoptic patterns that bring or withhold rainfall to southern Australia and their relative importance to different geographical areas. It is apparent that the SOM methodology has identified and classified these systems, but it is very difficult to identify differences

between the contour maps in figures 8 and 9. An improved colour scheme may help here, but perhaps also better organisation of the material and its relationship to figures 10-11 need to be considered. Perhaps even only representative synoptic types need to be considered in detail. There is clearly a structure to the classification system as noted by the authors (e.g. that in general the top half is westerly flow, and the bottom half is easterly flow), however it is not clear what exactly the alphanumeric (i.e. 1-5, A-D) scheme represents, and combined with the apparent similarity of many of the synoptic types, it is difficult for the reader to draw firm conclusions from this section. Moreover, the SOM methodology is not described in much detail at all in this paper. I don't suggest a detailed description, but some insight into the type of classification this procedure does would be useful (e.g. is it cluster-based, or related to rainfall amounts?).

The climate scenarios examined in section 7 in order to ascertain the effect on runoff is perhaps the least successful part of the paper. To me, it seems perilously close to circular reasoning: the rainfall decline since the 1970s would be more pronounced without the wet seasons in the late 1980s, and if these wet years are replaced by averages, streamflow is reduced and drought risk is enhanced. Indeed, the main findings of this section, as summarised in the last sentence of section 7, are clearly self-evident without any further analysis.

Technical corrections:

The DSE reference has year 2011 and 2012 in different parts of the paper.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 13539, 2013.