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Interactive
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Interactive comment on “Understanding climate processes in the Murray-Darling Basin: utility and limitations for natural resources management” by A. J. E. Gallant et al.

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Summary

This is a well-written paper, summarising the state of current understanding of the dominant drivers of interannual variability of rainfall across the Murray-Darling Basin. The paper is also useful in examining how these drivers interact, leading to potentially improved predictability of rainfall (at least for those drivers that have a lead-time of predictability).

While the sub-title of the paper is ‘limitations for natural resources management’, the

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authors do not really examine how the understanding (and lack thereof) of climate drivers may limit natural resource management. However, as it is unlikely that many natural resource managers will read this paper, this is probably not a major problem, and the learnings from this paper should in any case be relayed to natural resource managers by other means. I trust that the authors and other initiatives such as SEACI and IOCI will perform this important but often overlooked role.

Major comments

The authors play down the importance of the IOD, basing their conclusions on studies that suggest the IOD is a by-product of ENSO. While this certainly appears to be the case, other research has shown that the IOD can have an impact on south eastern Australian rainfall independent of ENSO. The authors questioning of the existence of a dipole mechanism is warranted, yet they also point out that southern MDB variations are associated with SST variability in the eastern Indian Ocean. While the importance of the dipole in the IOD may be debatable, the importance of the Indian Ocean on southern MDB rainfall is not, and this should be stressed. Secondly, the state of the IOD appears to follow on from the previous ENSO state. Thus the importance of the IOD may vary depending on the ENSO that spawned it.

The IPO discussion is useful. I am surprised that the authors did not mention that the IPO has been in a positive phase for the past decade, potentially being one of the drivers of the Millennium Drought. They do however address this in Section 5. The authors state that global climate model projections do not show consistent changes in rainfall across the MDB. While this may be true of the MDB as a whole, the global climate models do project drier conditions across the southern Murray-Darling Basin, and particularly Victoria with the vast majority of models agreeing on a drying trend across the far south-east of Australia. This is seen in the outputs of both the Murray-Darling Basin Sustainable Yields Project and the Tasmania Sustainable Yields Project (<http://www.csiro.au/partnerships/SYP.html>).

Minor comments

The caption for Figure 5 states that it shows the difference in annual (April to October) number of heavy rain days. Surely it is the 7-monthly or 6-monthly number of heavy rain days?

Figure 7 is very interesting. The authors have not made enough of the fact that La Nina's can bring dry conditions across the southern MDB and Victoria when the SAM is in a positive phase. This anomaly to me looks to be one of the most interesting features of the Figure. They do however come back to this in Section 5 of the paper.

The CSIRO and BoM reference should read 'Climate Change in Australia' not 'Climate Change is Australia'. I would think that a reference to the website for this and the CSIRO MDB SY reference would be useful for the reader.

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