

Manuscript Review – HESS Discuss, 8, 1-46.

Title: Understanding climate processes in the Murray-Darling Basin: utility and limitations for natural resources management

Authors: Gallant et al.

Overview

The paper distils information from a technical report into a journal article which summarises current knowledge on hydroclimatic drivers in the MDB. Unfortunately this paper struggles with addressing its audience and its purpose causing the paper to lack clarity. The paper's identified audience of natural resources managers (NRM) remain undefined in the paper and the focus on this audience waivers, to the point where the concluding remarks are directed toward the research community. Some of the paper appears to be written towards the broad non-scientific group of NRMs and as such minimises jargon (e.g. no mentioning of orographic dominance when first mentioning main rainfall drivers, lack of mention of 'non-stationarity' and reference to Milly et al (2008) pg 7875 par 4, 'Ecohydrology' on pg 7896 line 15, and 'teleconnections' in section 3.3) yet I'm not convinced of the utility of this paper for this group even with minimised jargon. If the science community is then going to be the main audience then technical jargon should be used. I think the Authors need to clearly define the target audience (i.e. are they water managers, biodiversity, forestry etc.), and focus the paper to the needs of this audience through discussion addressing risk, uncertainty and management issues associated with the science raised in the paper.

The review seems broad and I think there is value in reviewing scientific research on drivers of rainfall patterns in the MDB based on weather patterns and metrics like IOD, ENSO, SAM - these research areas have important interactions and could otherwise remain segregated. NRM managers could benefit from clarification of these indices yet I feel this paper does not succinctly do this. However, I do not feel that this paper can be published as a review paper – it just does not seem comprehensive enough to merit that. I guess the authors need to decide if they are trying to write a review paper on this problem, or present some new novel methodology or assessment that other researchers could benefit from, and modify their presentation accordingly.

There claims to be a focus on the northern MDB yet the only analysis in the paper is on the southern region, an area which has already been given much attention as recognised by the Authors.

Summary tables and figures distilling the important information are suggested to improve the message delivered in this paper, for example, diagrams showing the interactions between these phenomena – Taylor diagrams, interaction diagram/correlation plot, scatterplot matrices could be used to show the effects described in the text much more clearly.

SPECIFIC COMMENTS:

- Clearly define the northern and southern MDB and explain why there is less known about the drivers of rainfall in the northern part of the MDB compared to the south.
- How representative is the Big Dry of other dry periods e.g. the Federation and World War II droughts? Would the drivers be the same?

- The title says 'climate processes' but perhaps should be 'hydroclimatic processes' as the focus is predominantly on drivers of rainfall, not on other climate variables such as pressure, wind, temperature etc.
- Figure 4 should be explained more clearly both in text and in caption.
- SAM is not given the same level of detail as other synoptic drivers in Section 3.1. Is there are reason for this?
- Section 3.2 does not identify the duration and frequency of the events outlined.
- Page 7884 line 28 – why summarise section 3.1 (intra-annual) in section 3.2 (inter-annual)? Section 3.2 also describes meteorological phenomena that affects the MDB.
- A key novelty of this paper identified by the Authors is the focus on the northern MDB yet Section 3.3 focuses on the South
- Pg 7888 line 1 – the uncertainty in climate model problems is oversimplified here – the value of the statement “uncertainty must be addressed” is not very high without suggesting techniques to deal with this uncertainty. Consider rewording to portray the idea expressed in line 7 on page 7902 “it is unclear how we can simulate climate processes that we do not yet understand.”
- Suggest that analysis in Fig. 5 be expanded to more than 7 stations and stations in the northern region. Is there a reason that all of these stations are in the southern MDB?
- Page 7890 line 21, is there proof for this statement?
- Page 7895 line 24 – the effect of climate change on these drivers may be very important. More than one sentence should refer to this.
- Pg 7897 lines 11-13 what does this mean? Should it be proportional and not inversely proportional?
- Rather than just concluding things are uncertain, a discussion on further relevance to policy or management – i.e. how to manage this uncertainty: perhaps refer to some adaptive management papers which explicitly incorporate uncertainty.
- I found the writing style of using contrasts in parentheses such as “hot (cold) ... leads to ... increase (decrease) ...” very distracting. A focus on the important results (i.e. if the focus is on droughts only talk about reductions etc.) would improve text flow.
- Pg 7901 typo line 22. Repeat ‘to’ should be removed: “some simple analysis to highlight”