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

This manuscript presents an overview of current research into climatic variations in the MDB. The article is slanted towards the needs of natural resource managers.

The paper is well written and presents a potentially useful contribution. I say potentially because the paper makes the ever growing "modes of variability" literature more accessible. This is important. It seems that every time you turn around, the climate scientists have a new index, e.g. ENSO, IOD, SAM, ... This is confusing to most natural resource managers. The thing that is really missing, and would be an excellent contribution to the literature, is to explain to natural resource managers (e.g. hydrologists, irrigation managers, farmers, etc) why climate scientists use all these (ever growing number of) indices. It seems to me that the issue goes like this. Analysis of annual rainfall time series for the MDB shows that it is, from a statistical point of view, a purely random time series (Sun et al 2011 Water Resources Research, 47, W00G02, doi:10.1029/2010WR009829). This means that there is no predictability in the rainfall time series itself. Hence any attempt at prediction must be based on external variables. The various indexes play the role of (surrogate) external variables. Hence the use of ENSO is based on ....etc… However, because of the random nature, not all of the inter-annual variations in rainfall are likely to be due to a single ocean-atmosphere phenomenon that is summarised by a simple index. Hence other indexes are constructed, and so on.........

I had a few other comments but nothing major.

Comments

1. page 2, lines 16-20. The first two sentences neatly sum up the importance of extremes. I would also add that "pushing the boundaries" can also drive adaptation responses for those that experience the extremes.

2. page 7, lines 1-5. This sentence does not read correctly? Please rephrase.

3. page 15, lines 26-28. The model projections need a citation. Sun et al (2011 Water Resources Research, op cit.) is the most current citation here.

4. page 22, lines 25-29 and Fig. 7. Fig. 7 presents a new and very informative result. However, it is hard to interpret properly without some measure of the relative frequency of the various combinations. A simple remedy is to add the number of occurrences. You have done this in Fig. 7 (the little n = 6, etc) under each plot. You need to describe those in the caption and discuss in the text. For example, both top and bottom rows are ~ 25% of the years each, leaving 50% for the middle rows, and so on.

5. Fig. 5 caption. Typo 6 lines down from top of caption. Delete "than". Should read …. more (less) heavy rain days ….