

Interactive comment on “On the relationship between large-scale climate modes and regional synoptic patterns that drive Victorian rainfall” by D. Verdon-Kidd and A. S. Kiem

Anonymous Referee #2

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Identification of the key regional synoptic patterns was performed in the study using SOM (Self-organizing map). The SOM has been used by other studies and is not a new approach. Although no further development of the SOM methodology performed here, the study shows interesting results, i.e. identification of the key regional synoptic patterns and explaining possible relationship between regional synoptic patterns and rainfall and between regional synoptic patterns and large-scale climate modes from seasonal to inter-decadal variability in Victoria. The paper contains original results.

However, there are two main issues which should be incorporated in the analysis:

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1. The authors stated in the introduction that there was an epoch of elevated rainfall and streamflow occurred during the mid-1940's through the mid-1970's across much of Eastern Australia and a step change towards a drier climate around mid-1990 in southern eastern Australia, in particular Victoria. In this study, all SLP data (from 1948 to 2007) were integrated to the SOM calculation without separation for different climatic epochs. Similarly, they used mean monthly rainfall from 1948 to 2007 without considering different climate epoch. Since the authors claims that this study is useful to improve rainfall forecasting for Victoria both in the short (seasonal) and long term (multi-decadal scale), further analysis should be performed to identify the key regional synoptic patterns for different climatic epochs.

2. Conducting sensitivity analysis. The authors should perform sensitivity analyses of using different sizes of spatial regions and different grid resolutions. They may effect on the results of the frequency of occurrence tests between the regional synoptic patterns and large-scale climate modes. In addition, the authors should explore other relationships which may occur between 20 key regional synoptic patterns and other large-scale climate modes, such as the relationship between the synoptic patterns and the Nicholls Dipole Index (the difference between the SST anomalies occurring in the central Indian Ocean (10-20oS, 80-90oE) and Indonesia (0-10oS, 120-130oE), Nicholls 1989) which also show potential prediction for monitoring rainfall conditions in Australia.

Nicholls, N. (1989), Sea Surface Temperatures and Australian Winter Rainfall, *J. Climate*, 2, 965-973.

Some minor comments:

1) Need clear explanation on the statement on section 2.3.2 first paragraph: "An index based on SST anomalies over Indonesia (0-10S, 120-130E) is used in this study to represent climate variability in the Indian Ocean associated with the Indian Ocean Dipole (IOD)". The IOD is normally calculated as the difference between the SST anomaly in the tropical western Indian Ocean (50-70oE, 10oS-10oN) and the SST anomaly in

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the tropical south-eastern Indian Ocean (90-110oE, 10oS-Equator), Saji et al. (1999). Therefore the box based on the SST anomalies over Indonesia (0-10S, 120-130E) do not part of the IOD boxes. This statement needs to be clarified.

Saji, N.H., B.N. Goswami, P.N. Vinayachandran, and T. Yamagata (1999), A dipole mode in the tropical Indian Ocean, *Nature*, 401, 360-363.

2) The authors should present complete explanation for all comparisons of the box plots among 8 catchments presented on Figure 5 including the explanation of the differences of the dotted plot patterns outside the maximum and minimum threshold boundaries of the box plots. Some catchments show different patterns (see for example the differences of monthly box plots between O'Shannassy and Wimmera including the differences in the dotted plots), but there is no explanation about it. In addition, there is also a need to explain each symbol used in the box plots.

3) The authors should include in the conclusion section the limitations of the study such as the possibilities to apply other synoptic patterns from other dataset sources or apply different method instead of SOM to examine the synoptic types (see Pandora et al., 2006).

Pandora K.H, W. Drosowsky and N. Nicholls (2006), Shifts in the synoptic systems influencing southwest Western Australia, *Climate Dynamics*, 26: 751-764, DOI 10.1007/s00382-006-0115-y

4) The subtitle fonts of Figures 4, 6, 7 and 8 indicating the synoptic types are too small. It should be enlarged.

5) There is an acronym (II) on Table 1 below the header "Average IOD". If it indicates "Indonesia Index";, it should be noted.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 2791, 2008.

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