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Hydrology and Earth System Sciences Discussions

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

D. Verdon-Kidd and A. S. Kiem

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The authors would like to thank the reviewer for their thoughtful comments. Detailed descriptions of how each of the reviewer's comments have been addressed are included below:

1. Reviewer 1 queried the use of raw monthly SLP data to train the SOM. In particular the reviewer noted that this approach may simply capture the seasonal cycle and recommended that the SOM should instead be trained on SLP anomalies.

Response - Raw monthly SLP data was chosen for this analysis rather than SLP anomalies as the aim of the study was to determine how the large-scale climate modes

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modulate the occurrence of known regional climate phenomena (such as cut off lows, pre-frontal systems etc). The regional climate patterns are best characterised using the raw data because the SOM methodology acts to cluster similar patterns together. If anomalies were used rather than raw SLP values, similar anomalous patterns would be grouped together which could be derived from various months/seasons and represent various climate systems. The problem with using anomalies to train the SOM is that, for example, an anomalous synoptic pattern in January is unlikely to result in the same rainfall as an identical anomalous pattern occurring in July (bearing in mind that the aim of this exercise to link synoptic patterns with rainfall). This problem may be overcome by applying the SOM technique to anomaly data for each month individually (i.e. to identify say 12 synoptic patterns for January). However, with only 60 years of data available for analysis the sample size becomes too small. For this reason the SOM was carried out using raw SLP data.

As noted by Reviewer 1, the use of raw SLP information to characterise the range of regional patterns influencing the Victorian region also preserves the seasonality of the synoptic types. The preservation of seasonality is important if the relationships identified in this study are to be used to inform seasonal forecasting frameworks in the future (e.g. we need to know what the synoptic types typically associated with each season are and how this 'seasonality' changes during various phases of the large-scale climate modes). The SOM also picks up more than just the seasonality as if this was the case the SOM would identify only 12 synoptic patterns (i.e. one for each month). In fact, one of the benefits of the SOM technique over other cluster analysis techniques is that extreme (or uncommon) types are identified in addition to the commonly occurring types. It is the occurrence of these extreme types that is often of most interest in understanding climate variability and enabling improved seasonal forecasting.

2. Reviewer 1 recommended the use of a recognized index for the IOD

Response - The IOD index used in this study is based on SST anomalies over Indonesia (0-10oS, 120-130oE). This index was identified by Nicholls (1989) and relates to

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one of the 'poles' of the Indian Ocean Dipole. This index is recognized and has been shown to be a good indication of winter rainfall in eastern Australia (Verdon and Franks, 2005). In fact, this index was found to relate better to east Australian rainfall than other IOD indices such as the DMI of Saji et al. (1999). When SSTs are anomalously cool over Indonesia, winter rainfall tends to be lower, while warm SSTs in the same region are related to higher winter rainfalls in eastern Australia.

The text in Section 2.3.2 has been updated to clarify the use of the II to represent the IOD.

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