

Interactive comment on “Using hydraulic head, chloride and electrical conductivity data to distinguish between mountain-front and mountain-block recharge to basin aquifers” by Etienne Bresciani et al.

Anonymous Referee #1

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General Comments: This manuscript presents research that was completed to determine the source(s) of recharge to the Adelaide Plains, Australia. The authors were specifically interested in determining whether recharge in the Adelaide Plains was sourced from mountain-block recharge (MBR) or mountain-front recharge (MFR) or a combination of the two in the nearby Mount Lofty Range using a combination of regional hydraulic head data and chloride data. The article is well written and will likely gain broad readership within the hydrogeology and mountain hydrology communities. It has immediate regional implications to the evolving conceptual framework for the

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Adelaide Plains. There are a couple of weaknesses in its current form that prevent a recommendation for acceptance.

First, the Abstract, Introduction, and Conclusions do not do the article justice. The Abstract needs data in my opinion, but this is admittedly difficult since most of the results are presented spatially in maps. In any case, the Abstract feels methods-heavy since only the last 6 sentences discuss actual results. This could be remedied with a concise problem statement in the Abstract contrasting the different conceptual models. The Introduction suffers from the same problem. While most readers familiar with mountain hydrological processes will know the typical range for MBR and MFR, it may be useful for the larger HESS community to provide numbers (range of recharge) with geographic setting. This is easy to incorporate into a table and provides the readers with what to expect for MBR and MFR, why it's important, etc. The Conclusions is the weakest section in my opinion and may need a complete overhaul. The article is entertaining and will likely gain appreciation in the communities mentioned above. However, the Conclusions are methods-heavy and do not discuss the regional or broader implications.

Second, Figures 6 and 7 are difficult to interpret. Figure 8 is much more informative. Is there a way to show this data more effectively? This is important since so much of the interpretation revolves around these figures.

Third, it may be very useful/informative to have conceptual diagrams for Section 2.1, especially for those readers who have not read Winter's seminal chapter.

Specific Comments: P2 L2 (Page 2 Line 2): suggest changing "rainfall" to either "precipitation" or "rainfall and snowfall" for the broader audience. Suggest adding references to Winograd et al. (1998) and Earman et al. (2006).

P2 L23: suggest changing "ultimate" to "most robust" or "more robust".

P3 L3: it's still uncommon to have many wells in other mountainous regions. Perhaps

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this statement should be tempered to reflect regional conditions.

P3 L6-9: Can you expand on what is implied in this statement? It assumes that the reader has an intimate knowledge of the references studies.

P3 L23: What is meant by "triangular facets"? Do you mean interfluve? Please define.

P4 L6: This is not correct. It should be groundwater discharge to streams occurs when groundwater levels are higher than the stream as indicated in Winter's chapter. Correct?

P4 L22: delete "as discussed in the following" and elsewhere in the article.

P5 L18-20: This is not always the case, not always true.

P5 L21: This is a sweeping statement. Is it possible that Cl-(MFR) can be higher than Cl-(MBR), especially where streams draining the mountains are accumulating lots of Cl- from groundwater in other regions?

P6 L11-18: Is there seasonality in precipitation and recharge?

P10 L9-14: please add arrows to show these locations.

P11 L2: suggest amending the statement to read, "had the same Cl concentrations or if mineral sources of Cl were non-negligible and/or spatially variable, "

P11 L11: should this be "long" instead of "short"?

P13 L27-30: do you have Br data? If so, Cl/Br ratios would provide additional support for this statement.

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