

Interactive comment on “How streamflow has changed across Australia since 1950’s: evidence from the network of Hydrologic Reference Stations” by S. X. Zhang et al.

Anonymous Referee #2

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General comments The overall impression of this paper is that it is very clear, well-structured and interesting. The topic of temporal hydrologic change is highly relevant, and the quantitative data analysis of 222 stream gauges is comprehensive and previously unprecedented.

The paper presents a neat compilation of a large quantity of data and addresses relevant scientific questions within the scope of HESS – both regarding the issues of temporal hydrologic change, but also the central question regarding aggregation, compilation and presentation of large data quantities (daily discharge values for 222 stations for ~45 years).

The presentation of the HRS web portal great! This is a valuable resource, which will

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be of great use for the international hydrological community. A paper such as “How streamflow has changed across Australia...” will (apart from its research significance in other ways) have an additional value of helping more researchers find the publicly available Australian discharge data.

The paper is written in a clear, concise and straightforward manner, answering most questions that arise. The title clearly reflects the contents of the paper. The language is (as far as I can judge) fluent and correct, the paper is generally very readable. The mathematical formulae, symbols, abbreviations, and units correctly are correctly defined and used. The length of the paper is exemplary short, but still comprehensive enough.

The abstract provides a concise and complete summary, although I’m slightly confused about the expression ‘living gauges’.

The scientific methods and assumptions are valid and clearly outlined, allowing reproduction (and traceability of results, as all data and used equations are publicly accessible). The statistical methods are thoroughly explained, and the decision to have these equations in an appendix is wise. The amount and quality of supplementary material is considered appropriate, and the figures and tables are generally in good shape, and are referred to accordingly.

In general, the number and quality of references seems appropriate for the topic, even though I think that a few more references regarding climate change could have been provided. Especially, I miss a reference to the most recent IPCC which would be of value here.

The scientific approach and the applied methods are valid and the results are sufficient to support the interpretations, and the substantial conclusions that are reached.

Specific comments My primary concern regards the limited reasoning regarding how the temporal change in streamflow is interrelated to a temporal change in precipitation.

C2

The authors mention clearly that this is not within the scope of the study – which of course is fine. However, the dry period in the last decade in the south-eastern and south-western region is mentioned as a cause of some of the general downward trend. Although a thorough analysis is of course not viable within the scope of this paper, it would be nice to (if possible) have some discussion regarding the likeliness of this downward trend only being a consequence of the rainfall during a few dry years, or if the trend is likely to be consistent in the longer time perspective. Looking at table 2, at the years of the step change – 1996 is clearly the most dominating year (13 of 22!): an added reflection regarding the impacts of this (probably very non-normal) hydrological year would be interesting. How much impact does this “outlier year” have on the temporal trend? Would the same general pattern be seen even if it was to be omitted from the analysis? I do not request you to do the complete analysis of this issue, but some kind of (further) discussion on the topic could be useful.

Also, I believe that most data is available from the 1950's and onwards. However, I guess that longer time series should be available at least for some gauges. A comparison regarding an even more long-term time series would give additional weight to the results – although, this may be the subject of another study.

Line 152 – please also add the median time-series length.

Lines 206-208 – is any of this presented here? Or mainly as background info to the tables/figures?

Line 262 – shouldn't also land-use changes be mentioned in this context?

One last comment: the fact that different hydrologic years are used for different stations (if I understand it correct) – will this have an impact on the results (lines 149-151)?

Technical corrections There are hardly any technical corrections that need to be addressed in the paper. The authors have made a robust study, and compiled the data in a presentable and concise manner.

C3

I am however not clear about what the authors mean by the concept of ‘living gauges’, neither in the abstract nor in the text (lines 29 and 93) – don't just normal gauges record and detect changes in hydrologic responses?

As not being very familiar with Australian geography, I would have appreciated (if possible to do in an aesthetic manner) information regarding the names of the basins in figure 1 – perhaps by inserting the roman numerals from table 1 on the map?

Also, table 2 seems to be of somewhat low resolution (the letters are blurry) – if possible, please improve this.

Figure 5 (and 6 and 8), please add Q_ (appropriate index) in the text for clarity.

Thanks for a good read, and congratulations on your thorough study! I'm looking forward to seeing more of this paper in the future!

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C4