

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2022-199

Nir Krakauer (Referee)

Referee comment on "Regional significance of historical trends and step changes in Australian streamflow" by Gnanathikkam Emmanuel Amirthanathan et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2022-199-RC2>, 2022

This work presents trends in annual and seasonal mean streamflow since 1950 across an expanded Australia-wide network of reference gauges. It was found that streamflow has mostly decreased, which can be thought of as a step change in the 1990s, except for some areas in the far north that saw increasing streamflow. The authors highlight the widespread interannual persistence of streamflow anomalies in Australia, and make use of statistical trend tests that account for autocorrelation. This is a valuable contribution and in my view should be published, subject to minor revisions.

There are a few unclear sentences, such as at line 383: "The main objective is to assess whether the number of locations with significant trends occur at a regional scale or not" and 540: "It is least sensitive to outliers, and skewed distribution makes it most suitable for the analysis of streamflow data". These should be rephrased. In general some proofreading is needed.

The terminology "linear trend" is confusing at times (e.g. Section 3.1), as the MK test is for monotonic but not necessarily linear changes (including step changes).

In Section 3.3, mention that the test for regional significance is actually conservative, as it is based on a null hypothesis of independent trends across stations, when the trends within a region are actually positively correlated.

Check units -- e.g., at line 409, should it be 1.8 mm/year per year?

In Section 5.3, mention the possible role of CO₂ increase in reducing vegetation evapotranspiration rate, which could increasing streamflow in certain climatic and

geomorphic settings, offsetting the increased evaporation rate due to warming -- cf. for example my 2008 HESS paper "Mapping and attribution of change in streamflow in the coterminous United States".

In Section 5.4, consider mentioning that, given the decadal persistence in streamflow regimes, it will be useful to add the available information on streamflows before 1950 to a future analysis to better separate trends from oscillations.