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Hydrology and Earth System Sciences
Discussions

Interactive comment on "On the non-stationarity of hydrological response in anthropogenically unaffected catchments: An Australian perspective" *by* Hoori Ajami et al.

Anonymous Referee #1

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This is an interesting study on the ongoing problem of understanding hydrological non-stationarity. I like the work, but I am unclear regarding the robustness of the results as discussed below.

[1] The introduction is well written. I wonder whether there are two other relevant links to be made here. (a) To work on streamflow elasticity (e.g. http://engineering.tufts.edu/cee/people/vogel/documents/climate-elasticty.pdf), and (b) on classification approaches trying to assess nonstationarity (e.g. http://www.hydrol-earth-syst-sci.net/18/273/2014/). I think these two previous approaches might be interesting to connect with here since they both found that a lot of the variability in runoff ratio was difficult to explain and predict.

[2] Similarly, there has been a lot of work on trying to disaggregate the roles of vegetation, storage, energy and moisture on predicting runoff ratio using Budyko type frameworks, which I think also show that it is difficult to come up with simple explanations for reasons for nonstationarity - which I think is line with the results shown here.

[2] In the results section (3.1) the authors state that variables increase, or decrease, or show trends. It would be good if they could quantify these a bit more, rather than just stating that the trends are statistically significant. Especially since the value of such significance tests is regularly questioned (e.g. http://onlinelibrary.wiley.com/doi/10.1002/esp.3618/abstract).

[3] The main question I have relates to the fact that the authors largely focus on analysing the 20 out of 166 catchments for which they saw nonstationarity in the response. While the subsequent analysis of those 20 is fine, I wonder what can be said about the 146 catchment where runoff ratio is not changing? For example, how many of the stationary catchments have experienced precipitation or vegetation or ET changes similar to the ones where runoff ratio changed? That would be a baseline analysis to see whether an interpretation of the causes of runoff ratio nonstationarity are robust. So my main question to the authors is whether they can demonstrate that the catchments not showing runoff ratio change have experienced changes that are smaller regarding the potential driving variables?

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