

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

Anonymous Referee #2

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I am very interested in the analysis and discussions about the different influences of vegetation cover and climate changes on runoff in the manuscript. But in my opinion, some analysis is unconvincing and some conclusion is arbitrary. So, I suggest the authors conduct further improvement on the manuscript. Major comments are given below.

1. I suggest that the authors change the usage of “non-stationary catchment”. Significant increasing or decreasing doesn’t mean that the catchment is not stable. On the contrary, non-significant trend also does not mean stationary. 2. What I am most interested are figure 3 and figure 4. For figure 3b, the authors state that “In catchments with positive precipitation fractional vegetation cover relationships, fractional vegeta-

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tion cover sensitivities decline with increases in annual precipitation across the catchments”. But I would argue that, fractional vegetation cover sensitivity increases significantly with increases in annual precipitation across the catchments when precipitation is smaller than 700 mm; Authors also concluded statement “Fractional vegetation cover sensitivity is highest in the xeric (arid) catchments with lower mean annual precipitation compared to the rest of the non-stationary catchments” from figure 3b. But I cannot see any direct index reflecting “arid”. I would suggest that authors plot dF_{tot}/dP against with PET/P in figure 3b, as well as in figure 4a. 3. For figure 3c, the authors should point out: what ranges of HI values mean dry and what HI values mean wet? It is also interesting that in wet regions (low HI), vegetation cover increases when the climate becomes dryer (HI increases)? Authors should give reasonable explanations. 4. For figure 3d, because high F_{tot} always locates in wet regions. So, according to figure 3d, in dryer regions (low F_{tot}), runoff coefficient always increases as vegetation cover increases? This is conflict with the conclusion that reforestation and forest growth usually significantly decrease the runoff in dry regions. 5. For figure 4b, the authors concluded that “. . .in catchments where groundwater constitutes significant component of stream flow, fractional vegetation cover exhibits smaller variability. . .”. I would also suggest that the authors used the ratio of base flow to total runoff to replace the mean based flow as the x axis. 6. The authors only analyze the vegetation cover besides climate factors. Former studies showed that catchment area and slope etc. are also very important factors, which might significant influences the changes of runoff to climate and vegetation cover changes. The areas of selected catchments ranges from 6.6 to 232846 km², which might bring unexpected influences on the analysis about figure 3 and 4. That is also probably the reason while only 20/166 catchments showed significant trends in runoff coefficients. So I suggest the authors should consider other catchment factors and explain the underlying reasons. 7. Lack specific data and method descriptions. For example, authors didn't explain how ET and PET were calculated etc.

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