

Interactive comment on “Runoff generation processes during the wet-up phase in a semi-arid basin in Iran” by H. Zarei et al.

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General Comments:

This short paper describes a study of the catchment rainfall-runoff relationships in a semi-arid catchment in an under-represented area of the world, Iran. The paper is well written and the results are of interest to catchment hydrologists. Despite recognizing the fact the authors may have been operating on a limited budget and had time constraints as well, I cannot recommend this paper move beyond a discussion paper to a final paper published in HESS for the following reasons:

1) The study relies on only 2 rain gauges in the 283 km² catchment. Therefore, one does not have much confidence in the computed runoff ratios, which form a major part

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of the findings and discussion.

Response: We do agree that only two rain gauges provide a generally poor representation of such a large meso-scale catchment that is studied in this manuscript. To improve this analysis we will in the next version of the paper include precipitation information from adjacent catchments that span a larger elevation gradient (from 300 to 1100 m.a.s.l.). Although these new precipitation gauges are outside the catchment boundaries (see fig 1b) the topographic effect will be better represented in the runoff ratios. This elevation gradient now represents approximately 70% of the total catchment area are rain driven (above 2500 m.a.s.l. precipitation is accumulating as snow). As also is acknowledged by the reviewer this data set and analysis covers one of the most under-represented and least accessible regions of the world. Furthermore the water shortage in this type of semi-arid region that this region represents is a major limitation for the livelihood of millions of humans, and hence the hydrological process understanding is far from being only of academic interest. In fact, few places in the world is so urgently requiring better insights into the hydrological functioning in the light of climate change as that risks to further limit the water availability in the future.

Despite its limitations, HESS can make a difference. As an open access journal – available not only in the well-established parts of the world – this paper can make an imprint on the academics and population that needs this knowledge the most.

2) The study samples 7 events following a very lengthy dry period (during the wetting up period). The study stops abruptly before the catchment has completed wetted up. The next several storms would likely have changed the findings related to the relationship between runoff ratios and total cumulative rainfall, and perhaps baseflow. In all, fewer than 150 mm of a total of some 825 mm (the mean of n years) are considered in the analyses. It is almost certain that the next few storms would change the relationships found: for example, runoff ratios would not continue you increase exponentially with cumulative rainfall (RR exceeds 100% after < 500mm). Only knowing what happens when the catchment is wetting up seems to me an incomplete story.

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Response: The focus on the first part of the season was made based on two reasons; 1. the wetting-up phase is of fundamental interest in this regions as climate change predicts dryer future conditions. If this will happen the wetting-up phase will become of even greater importance in the future as this will provide a larger fraction of the annual runoff compared to under present conditions. In fact, this is change in precipitation has already begun to happen, seen both during the first phase of the rainy season and as period as a whole (see figure 2 below). The precipitation (both during the wetting-up phase and the year as a whole), has declined by close to 30% during the almost 40 year monitoring period. 2. Runoff is dominated by rainfall between November and February, after that, snow melt from higher elevations become dominating. Including the later season would hence need to include some information of snow melt, which is information that is lacking from the catchment.

In the next version of the manuscript we will make these two points clearer and also add the information about the long-term climate data provided in figure 2 to place the scope of the manuscript in a more general context. Looking not only at study year, but the five driest years since 1975, we can see that they all follow the same general pattern with higher and higher Runoff Ratio as the larger the baseflow (and cumulative rainfall the catchment experience). We will include and expand this analysis in the next version of the manuscript.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 3787, 2014.

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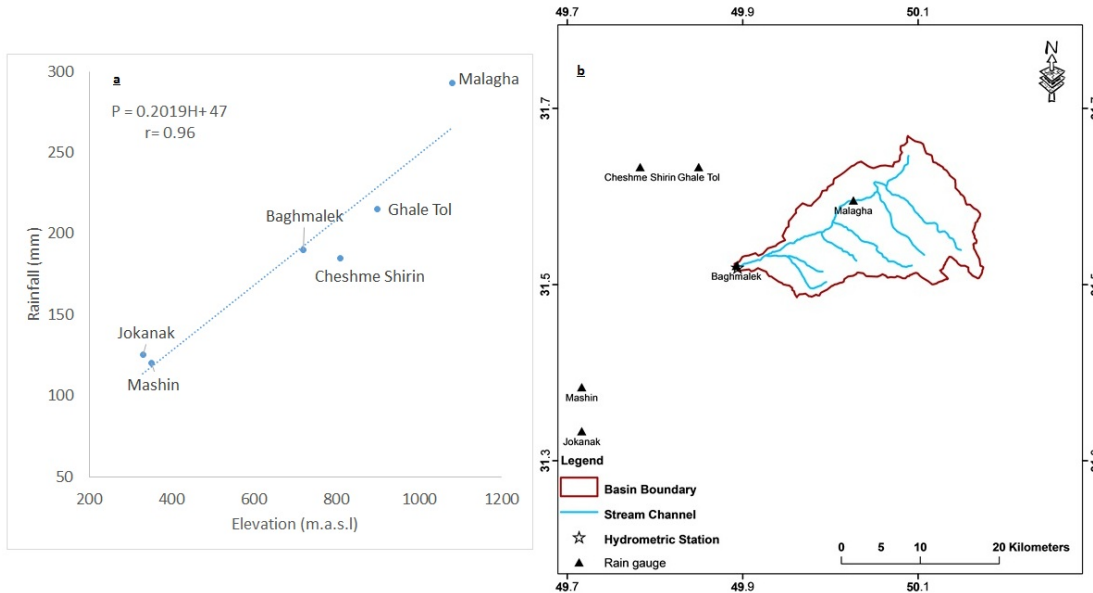


Fig. 1. a. Elevation- precipitation gradients during the study time November to February, 1b. Map including the study catchment and precipitation gauges.

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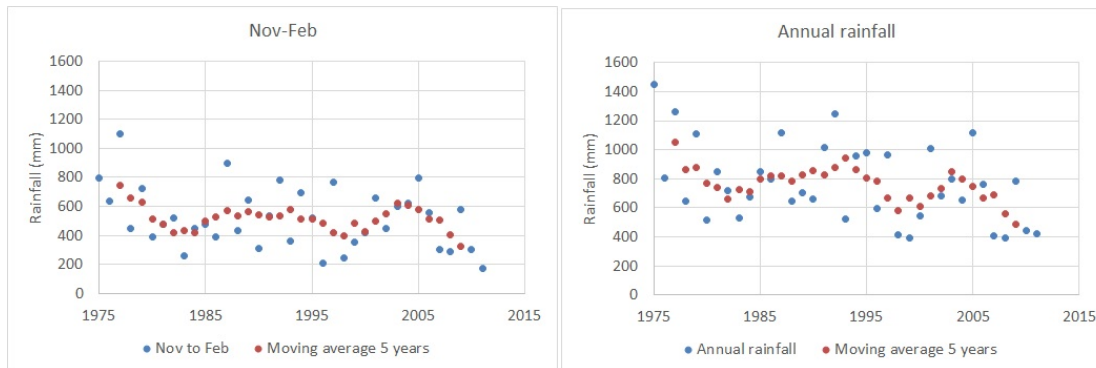


Fig. 2. Early (left) and annual (right) precipitation in the study catchment over the last three decades. The decline in precipitation of this major drinking water reservoir has great implications

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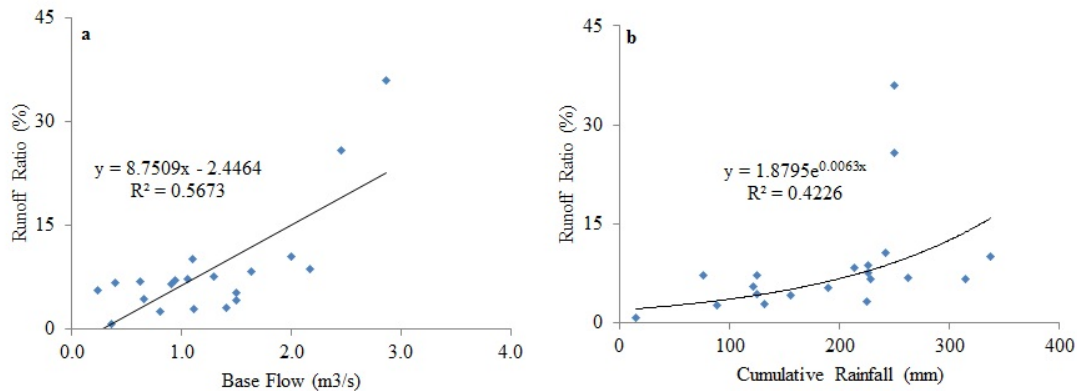


Fig. 3. The correlation between runoff ratio during the wet-up phase (a) base flow and (b) cumulative rainfall of 5 driest years (which includes the study year)

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