

Interactive comment on “Natural vs. artificial groundwater recharge, quantification through inverse modeling” by H. Hashemi et al.

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The authors thank the reviewer for his/her positive review and constructive comments to improve the quality of the manuscript. Time and effort spent on the manuscript is highly appreciated.

1) Has the river network been stable with time? Fig. 2 shows the branching of Bishehzard stream and confluence of this with Tchah-Qootch river. Did authors notice any shifting of the confluence or branching points and ephemeral streams during the study period? This may be a useful information as any change in river course might influence the ground water levels in the observation wells.

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→ The authors thank the reviewer for pointing that this. The following text will be added to the page 9772, line 4. “According to aerial photographs of the studied area, there has been no shifting of the confluence or branching points of the existing ephemeral rivers during the study period.”

2) Some details as to how the average ground water contour map was developed will be useful.

→ The following text will be added to page 9782, line 14. “Besides model calibration based on monthly observed groundwater levels, groundwater contour maps and direction of groundwater flow also were simulated. Groundwater contour map (Fig. 5) was developed at each model step taking into account the initial groundwater level in the beginning of the simulation period and water abstraction through pumping wells during each simulation period.”

3) Fig. 7: Why to show average of ground water levels of all observation wells. What about the agreement diagram for each observation well. At least, authors can show results in a table. This is essential to capture the relative contribution of artificial recharge from basins as well as ephemeral streams. Authors should present the analysis of different observation wells and reconfirm their conclusions regarding relative contributions of artificial recharge basins vis a vis ephemeral stream.

→ The authors agree. Thus a new table will be included that shows statistics of agreement between simulations and observations for the studied period.

4) Fig. 8 shows that estimated recharge for AR1 and AR2 is very close to zero. For ER (Ephemeral river), recharge seems to be very high in few cases. Can we conclude from this Figure about the relative contribution of recharge from artificial basins and ephemeral streams. If yes, what will be the associated confidence interval for such estimates.

→ The Y axis in Fig. 8 should be changed to “Estimated recharge rate (m/day)”. The

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figure shows the recharge rate which should be multiplied by the infiltration area and duration of flood in order to get the recharge volume as it is shown in Fig. 10. On page 9787 lines 18-20, it is mentioned that "the river channel area is just a minor portion of the plain (Alencao and Pacheco, 2006) that only covers about 10 to 15% of the total recharge area." In general, the recharge rate on the plain area is much lower than that of the river bed which seems to be very close to zero in the figure. However, considering the large infiltration surface of the floodwater spreading system, it results in a large volume of recharged water.

5) Fig. 9: It will be useful to mention somewhere in the text what are these ground water flow periods P1-P10

→ The authors thank the reviewer for his/her suggestion. A table showing all the ten periods will be added to the manuscript.

6) Fig. 10 shows that in year 2001, recharge volume is almost close to zero whereas between 2006-07, there is associated recharge volume. In both the cases, the amount of precipitation, however, appears to be same. Can authors elaborate on it.

→ The recharge parameter was assigned in the model based on the flood event record (not magnitude of flood). In addition, all precipitation events did not result in floods. Based on the record, only one flood was recorded in late 2001 whereas three flood events were recorded in 2006.

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