Hydrol. Earth Syst. Sci. Discuss., 10, C2768–C2777, 2013
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Hydrology and Earth System Sciences
Discussions
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Interactive comment on "Investigating uncertainty of climate change effect on entering runoff to Urmia Lake Iran" *by* P. Razmara et al.

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Dear Referee #1,

The authors wish to thank the reviewers for their accurate and constructive comments on the manuscript entitled "Investigating Uncertainty of Climate Change Effect on Entering Runoff to Urmia Lake IRAN ".

Most of the revisions in the article have been proposed in the following sections:

I: Abstract and Introduction sections were modified and innovations were highlighted.
II: The language of the text has been revised and many parts were rewritten.

III: The methodology of the paper was rewritten for sake of clarity.

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IV: In the Results and Discussion section, more interpretations were added. Moreover, the results were explained with more clarity.

V: Tables and figures were upgraded according to referees' comments. VI: The response to each referees' comments were carefully prepared as attached. The revised paper is also attached for further consideration.

Response to Referee 1: 1. The authors should give more explanations with regards to the selection of the two scenarios A2 and B1 for the analysis. Why were these two scenario chosen instead of the others? Are they representative of future climate changes for the study region?

Answer: No, Choosing emission scenarios of greenhouse gases (GHG) are not based on the geographical region. Instead these scenarios are globally defined. Although there are 40 scenarios for greenhouse gases (GHG) emission, due to limits arising from the high cost of creating such scenarios, only scenarios including A1B, B1, and A2 are available. This study has tried to use a high emission scenario (A2) and a low emission scenario (B1) to model future temperature and rainfall in each of the ten AOGCM models.

2. It is mentioned in Section 2 (page 2189) that the temperature observations are taken from the Urmia city station. How about the precipitation observations? Are they taken as the mean of the 15 meteorological stations in the lake area?

Answer: To obtain yearly average of precipitation in the lake basin, we used the data of sixteen raingage stations around the lake. Polygon Thiessen method has been employed to increase the accuracy because the distance of each station from the lake is not equal t and also the relative location of one station with respect to the others are not similar he mean of station precipitation isn't correct.

3. It is unclear how the downscaling of the chosen climate scenarios is done with the LARS model to generate proper daily time series of precipitation and temperature.

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Relevant details should be included in Section 3.3.

Answer: If we discussed about how to do downscaling in LARS-WG model, the paper would be too long. It was mentioned in the manuscript generally. The emphasis of referee 2 has been that some methods should be summarized.

4. The final chosen ANN model (page 2196, line 2) involves using evaporation. However, only the downscaling of precipitation and temperature of the climate change scenarios are discussed. Where does the evaporation data come from?

Answer: In the climate change studies, only temperature and precipitation data modeling are used for future period. To estimate average of evaporation of the lake, the suitable method is to use the previous statistical period's data of linear equation trend between temperature (T) and evaporation (E). Therefore, we used mentioned statistical data of 1961 to 1990 results in: $E = 10.01 + 7.41T$ We extend the mentioned trend for the evaporation simulation for the next 28 years.

5. In Section 3.3.1, it is mentioned that the difference in temperature and the ratio in precipitation between the future period and the base period are used to compute the climate change scenarios. However, Equations (2) and (3) show that the difference is used for both temperature and precipitation?

Answer: The equation (3) has been upgraded to precipitation portion equation.

6. In Section 3.3.2, what does the risk levels 25%, 50%, and 75% mean from a user/decision maker's perspective?

Answer: In this section, risk level of 25% means hard situation for the future. In this level, temperature will be greater and precipitation will be lesser. This risk level corresponds to temperature increase with occurrence probability of 75% or more and precipitation decrease with occurrence probability of 25% or less. Decision makers consider less probability for runoff in the future. On the other hand, risk level of 75% assigns easier situation and it means precipitation probability of 75% and more, and also temperature with occurrence probability of 25% and less.

7. Multiple terms are used throughout the paper for the LARS model. These include: LARS, change factor LARS, change factor-LARS, LARS-WG, among others. Please be consistent.

Answer: Yes, the paper was modified.

.8. Page 2196, Line 9-10: the first ‘validation’ should be ‘calibration’? Answer: Yes, It was revised.

9. Page 2197, Line 27: are these statistics from the calibration period or the validation period?

Answer: validation period. It was corrected.

10. Figure 2 and Figure 3: please explain the box plots, i.e., what do the stars, bars, boxes mean, respectively?

Answer: Please see the revised text. On the below of Fig. 2 & 3 was explained the means of stars, bars and boxes. In descriptive statistics, a box plot is a convenient way of graphically depicting groups of numerical data through their quartiles. Box plots may also have lines extending vertically from the boxes (whiskers) indicating variability outside the upper and lower quartiles. Outliers may be plotted as individual points. The quartiles of a ranked set of data values are the three points that divide the data set into four equal groups, each group comprising a quarter of the data. One definition of the lower quartile is the middle number between the smallest number and the median of the data set. The second quartile is the middle observation, also called the median of the data. The third quartile can be measured as the middle value between the median and highest values of the data set. The spacing’s between the different parts of the box help indicate the degree of dispersion (spread) and skewness in the data, and identify outliers. The quartiles of a ranked set of data values are the four subsets whose boundaries are the three quartile points. Thus an individual item might be described as being "in the upper quartile" âĂć first quartile (designated Q1) = lower quartile = 25th percentile (splits lowest 25% of data) âĂć second quartile (designated Q2) = median = 50th percentile (cuts data set in half) âĂć third quartile (designated Q3) = upper quartile = 75th percentile (splits highest 25% of data, or lowest 75%) âĂć Outlier = 1.5 $\sim$ 3 (75th – 25th)

11. Figure 4: what are the solid and dotted lines, respectively? If the dotted line is the model simulated runoff and the solid line is the runoff, why the simulation is always underestimating the observation? It was drown again. In this figure the difference between observed and simulated runoff was clearer.

Answer: Figure 4 was drawn again. There are many real parameters and factors that in the simulation can't be entered all of them, so always the simulation is not exactly like real data and there are uncertainty. This model, in the simulation of lowflow, has good results but the value of highflow in the simulated is less than observed. Since our study isn't highflow runoff -we study mean runoff- so our results are acceptable.

12. Finally, the entire manuscript should be thoroughly revised with proper English.

Answer: Yes, the whole text of the paper was revised.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/10/C2768/2013/hessd-10-C2768-2013-supplement.pdf

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 2183, 2013.

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Interactive Comment

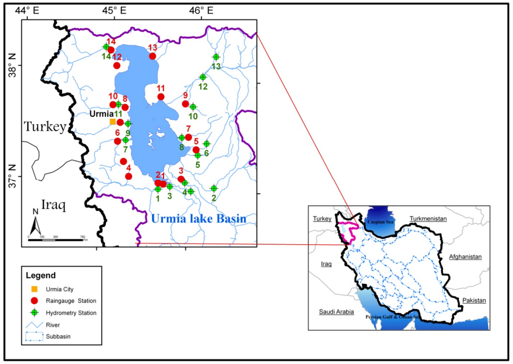

Fig. 1.

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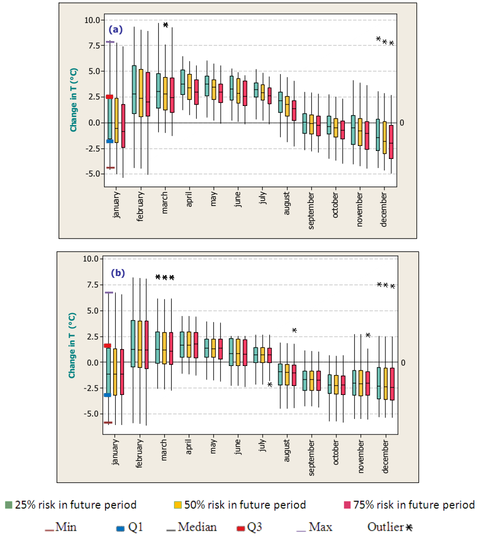

Fig. 2.

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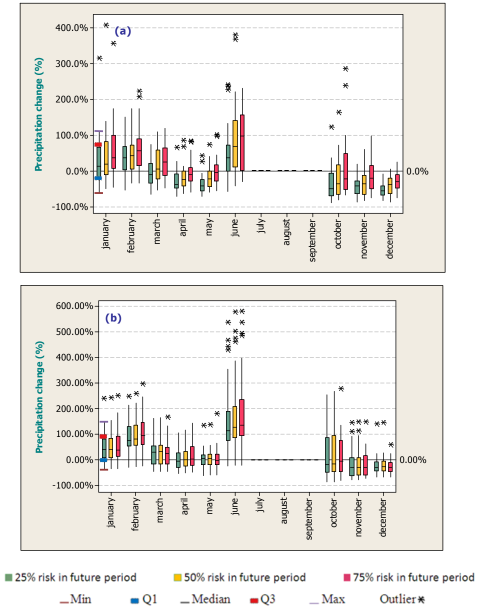

Fig. 3.

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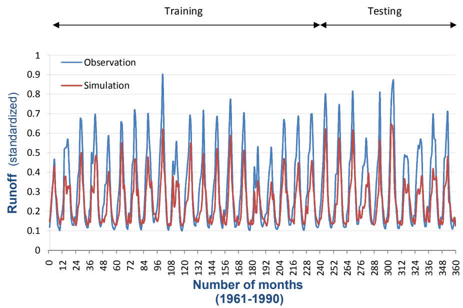
Training
Testing
Observation
Simulation
Runoff (standardized)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228
240
252
264
276
288
300
312
324
336
348
360
Number of months
(1961-1990)

Fig. 4.

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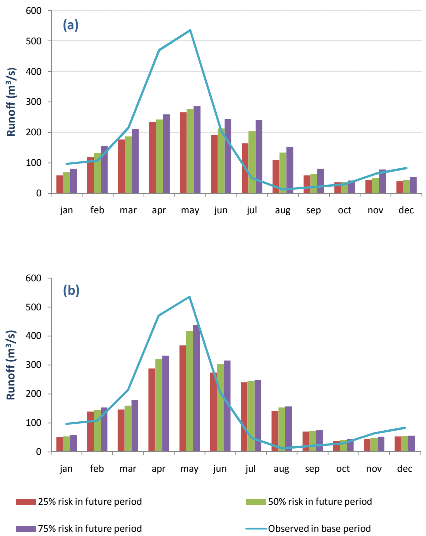

Fig. 5.