Response to Editor

by Hao et al.

Editor Decision: Publish subject to minor revisions (Editor review) (23 Jun 2015) by Fuqiang Tian

Comments to the Author (pdf): hess-2015-12-comments-to-author.pdf

Comments to the Author:

The authors made a significant improvement according to the comments. Before its final publication on HESS, the following issues are suggested to be addressed:

1) As water withdraw from the river or water transfer from other watershed could alter watershed water balance, please provide the necessary description to exclude such concerns.
Response: Thanks for your excellent suggestions. We appreciate the insights to the hydrology of the study that is highly impacted by humans. We agree that inter-basin water transfers, water withdrawals, and uses in the study basin have potential complicating the water balance estimates. However, we believe we do not think this issue compromises the key conclusions derived from our study. For example, we found groundwater levels have increased in all seasons. This is likely a result from land use change instead of water withdrawals that generally decrease water table. Future studies should pay more attention to this uncertainty.

We added Section 4.3 to address Editor's concern on water withdrawals.
We have addressed the comments in the annotated file. For the PET question, we think the increases in Temp and thus PET due to increase in sensible heat from urbanization may not necessarily increase AET since AET is also affected by vegetation amount and water availability. So we like to keep the arrow as it is.

4.3. Human factors affecting water balances

The landscape and stream networks of the QRB have been altered for thousands of years by humans. Our water balance analysis used a holistic approach to examine the natural rainfall-runoff relationships at the watershed scale with minimum attention to human water supply and use within the watershed. Currently, the QRB provides important ecosystem services such as drought/flood prevention, crop irrigation, recreation, tourism, and emergency drinking water supply to the local communities. Patterns of groundwater withdrawal from local acquirers and inter-basin transfers are changing in the study basin as the speed of urbanization increases in the study region (Du et al., 2012; Zhou et al., 2015). To meet the increasing demand on water supply and flood controls by the urbanized communities, ponds, reservoirs, and drainage canals have been built. There are over 20 small reservoirs with the basin. These landuse patterns further undoubtedly have complicated the quantification of water balances for a large basin (Hao et al., 2015) since each landuse change factor might have affected different hydrologic components. Future studies should focus on process-based understanding how land conversions affect the ET processes and this effect manifests at the watershed in affecting stormflow and baseflow. In addition, inter-basin transfers must be addressed to reduce potential water balance errors by full accounting water supply and use within and across the QRB.

2) About the ecosystem service 'urban heat island', as all the discussions on that are mainly guess, I suggest removal of the corresponding sentences while remaining some general words in the introduction part.
Response: The sentences have been deleted.

3) Please revise the annotations in the attached pdf file.
Response: Thanks for the very helpful comments. We have revised the manuscript based on these comments. Please see the attached file (hess-2015-12-comments-to-author_response.pdf).

4) Please revise the manuscript according to the new comments from all reviewers.
Response: The Reviewer's suggestions have been incorporated in the new revision.

Response to Review #1

by Hao et al.

Comments by Referee #1:

The authors properly addressed major comments as I brought up previously. I believe the manuscript could be accepted by HESS after minor corrections:

1) Please provide detailed descriptions of all your data (data coverage, source) in a table;
Response: Detailed descriptions of all data were provided in Table 1.

2) Please numerate functions in the text, also there is a typo in Line 201;
Response: The typo has been corrected.

3) Please rephrase the title of subsection 3.5, the current one is a little vague;
Response: We modified the title of subsection 3.5 as: "3.5. Contributions of LULC change and climate change and variability". Please see line 288-291, and line 141.

4) Please choose a different color to represent the trend 1990-2015;
Response: A blue color was used to represent the trend 1990-2013. Please see Figure 3.

5) Please adjusty-limit of figure 10;
Response: Adjusted. Please see Figure 10.

Response to Review #2

by Hao et al.

Comments from Referee #2:

This revision has responded to all my comments on its first version. Here I have some minor comments:

Line 195: replace "assumed that that" with "assumed that";
Response: Done.

Line 201: the equation has a typo, %ΔQlulc = (1 - ΔQclim/ΔQ) * 100;
Response: Thanks for pointing out the mistake. The typo has been corrected.

Table 1: replace the number "2.36" (i.e. Water->Forest) with "2" since all significant figures should be the same.
Response: Done

Table 3: Need double check the value of "β" (i.e. the regression coefficient on PET), is it really close to zero?
Response: We have recalculated both parameters, α=0.27, β=-0.65. A comparison between the two models was made to show the large variability in terms of detecting landuse change impacts. The comparison also indicates the importance of PET (the RR model does not consider PET) in

our study.

Fig. 10: Need double check the regression equation. It looks not right.
Response: Thanks for pointing out the mistake. The regression equation has been corrected.

Response to Review #3

Comments from Referee #3:

1. Abstract indicates "evapotranspiration (ET) decreased by 23% during 1986-2013":
It is very likely that water storage changed significantly from 1986-2003 due to land cover and land use change. So I do not think it is proper to use "P-R" as an estimate of ET for this period.
Response:
We agree that the P-Q has errors for estimating ET even for annual ET. However, we believe the long-term trend of P-Q does indeed represent the true ET trend. Water storage change in ponds, soils, and groundwater at the annual scale may contribute to the error. We argue that over the long term the trend of P-Q reflects the true trend of ET. We found a similar decreasing trend for MODIS ET, providing more confidence that P-Q is a reliable approach to detect the change in ET and provides a plausible explanation of the increase in streamflow.

2. Fig 3 is not very informative. I suggest dropping it.
Response: we would like to retain this Figure to show the increase in Temp. From Figure 3, we can see the mean air temperature (1961-2013) has increased drastically from 1990 to 2013, suggesting an increasing trend in evaporative potential during the past two decades. Given the importance of global warming and its effects on ET, we would like to present the data.

3. Fig. 4: please provide the temporal period for MODIS ET. It should not be from 1986 to 2013.
Response: The temporal period for P, MODIS ET, and PET were provided. Please see Figure 4.

4. Fig. 7: please provide the temporal period for the analysis.
Response: The temporal period for the analysis is provided. Please see Figure 7.