

Interactive comment on “Urbanization dramatically altered the water balances of a paddy field dominated basin in Southern China” by L. Hao et al.

Anonymous Referee #2

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General comments:

This study discussed the impact of urbanization on water balance in the Qinhui River basin, a region undergoing rapid development. I believe it is an interesting topic. However, I do not feel the results presented in the paper could well support the main hypothesis, i.e. decreases in ET resulted from urbanization contribute greatly to the reduction in streamflow. In the manuscript, the data were presented in an inconsistent way, and trends were compared for various different periods. There are also many general hypotheses in the discussions that have not been tested. I recommend at least major revision.

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Specific comments:

1. The land cover data statistics, which was arranged from different data sources, is somehow inconsistent, and this uncertainty should be addressed in the manuscript. For example, Fig. 2 (Section 2.1) shows 17% increases (of the total basin area) in the impervious surface areas from 2003 to 2012, while the areas of rice paddy only accounts for about half of the changes (~8% of the total basin area from 2001 to 2012). However, both the statistics in Table 2 and conclusions indicated the increase in impervious areas was mainly due to conversion of the rice paddy fields in the 2000s. Please clarify this. Also, why not give the statistics for the same period in the text for better comparison?

2. This study used multiple data sources (including land cover data, surface meteorology, streamflow, Remote sensing data etc), which were presented at various periods. This makes the paper hard to follow. Moreover, trends from different periods are generally incomparable (especially for a short period). Yet, this study compared the trends of different variables (including P, ET, runoff, LAI etc) at different periods, and used these results to support the main hypothesis, which renders this questionable (see comments #3). E.g. MODIS LAI and ET data were analyzed for the period from 2000 to 2013; river flow data were analyzed from 1986-2013 (Fig. 10) and various sub-periods from 2000 to 2013 (Fig. 7, 8 & 9).

3. The major hypothesis of this study is that ET reduction caused by land cover change is a big contributor to the increase in stream flow from 1980s to present. However, there is no independent ET data to test this hypothesis. The study used water balance (i.e. P-Q, Fig. 10) to estimate annual ET from 1986 to 2013, which may subject to great uncertainties due to likely substantial changes in the water storage. For example, the MODIS ET data (Fig. 5) somehow shows inconsistent inter-annual variability as the ET time series estimated using P-Q (Fig. 10).

4. What factors control the ET variability in Qinhuai River basin? This may need further

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clarification. - MODIS ET algorithm uses MODIS LAI data as an input (Mu et al. 2011), and therefore these two datasets are not totally independent. - Section 4.1, Line 2-3: “A decrease in ET is normally caused by an increase in P and PET”: this needs further consideration. The relationship between ET and PET/P may vary in different climate zones. The MOD16 product also produces PET; this product may be more suitable for diagnosing the relationship between ET and PET, since both variables are likely affected by the uncertainty in surface meteorology inputs.

5. How much do the changes in precipitation frequency and distribution contribute to the changes in streamflow characteristics? Should this be included in the discussions related to Figs 7-10 as well?

Minor comments: (technique corrections)

1. Section 3.2 Line 21-22: why add this sentence? This has nothing to do with the trend analysis presented here (i.e. from 2000 to 2013).

2. Please switch Tables 1 and 2.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 1941, 2015.

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