

# ***Interactive comment on “Impacts of human activities and climate variability on green and blue water flows in the Heihe River Basin in Northwest China” by C. Zang et al.***

## **Anonymous Referee #5**

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### Major comments

In this discussion paper, the authors applied the SWAT model to the Heihe River in China. They conducted four hydrological simulations with different settings and compared the results. The settings are different in terms of land use (1986 and 2005), climate (1986 and 2005) and expansion of irrigated area (provisional). They reported and discussed the differences in the green and blue water among simulations.

This study tried to address the consequence of water use, land use, and climatic change to hydrological cycle in a semi-arid basin, but as far as I observed, it is halfway.

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First, the authors showed only the outputs of their model without validation. At least the results for two base years (1986 and 2005) should be intensively compared with observation. Second, the authors mainly argued two points in this paper: (a) land use change alters simulated runoff (because the curve number is different) and (b) irrigation water withdrawal decreases river flow that reaches the terminal lake. Both of the remarks are too general. More concrete, quantitative, and novel findings should be reported here. Additionally, the authors repeatedly stressed that the major hydrological change in the Heihe River basin was due to the expansion in urban area, although the area for "town" and "village" accounts for only approximately 0.2% of the total basin area. I was hardly convinced that it explains the change.

The authors have succeeded in setting up their model. It would be nice that their simulation results will be well validated for various periods with different land use, irrigation, and climate conditions utilizing local hydrometeorological observations. I hope that some of the interactions between human activities and hydrological phenomena would be clearly explained by this model.

#### Minor comments

Page 9483, line 19 "This study is ...": I think this paragraphs should be moved to Introduction.

Page 9485, line 6 "concurrent increase": Possibly, it should be "concurrent decrease".

Page 9486, line 10 "where precipitation has decreased significantly": I'm a little bit confused because the authors sometimes mix up climatic variability and trend. For a trend analysis, I think the period is too short (25 years) and the statistical significance is too low (Figure 8 shows that the trend of precipitation is statistically significant for only two stations).

Page 9488, line 3 "The results imply that land use change towards urbanization has led to a major shift from green to blue water flow in the study area, while irrigation

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expansion had resulted in a shift from blue to green water flow." I think the remark is too general. I would like to see some more concrete, quantitative, and novel findings.

Table 1: What are the basin total blue and green water flows?

Table 2: The area for "town" and "village" is around 400km<sup>2</sup>, which is 0.2% of total 0.24 million km<sup>2</sup> (page 9481, line 12). I think urban area is quite minor in this basin, hence the change could be negligible.

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