

Interactive comment on “Quantifying the effect of land use and land cover change on green water and blue water in northern part of China” by X. Liu et al.

Anonymous Referee #2

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This paper by Liu et al addresses an important research topic of our time. The approach used in this study was more of a modeling exercise where a distributed hydrological model was used to simulate hydrological processes in the 7720km² Laohahe catchment in China, with the main observed data being records from 4 meteorological stations and one river gauging station. The simulated results from the modeling exercise under different land use scenarios forms the main discussion of this paper. There are numerous typo errors that need to be addressed.

Specific comments:

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Abstract

i) The abstract contains unnecessary text that is rather burdening the document. ii) Line 18 19: The authors should indicate clearly by what percentage (significance) does the change in land use and land cover have on evapotranspiration and runoff. This is useful in the abstract.

Rest of the document:

i)Page 2428 (Line 4-7): Hydrological models are built based on experimental data. Even if models yield results faster and at less cost than experimental data, the importance of the latter cannot be overlooked. The results we get from models are not data but rather information which may or may not reflect the reality. It is useful for the authors to take note of this.

ii)Page 2429 (Line 5-6): What criteria did the authors use to choose the four periods? Is it merely a decadal time frame analysis or the authors were guided by change in spectral signatures obtained from satellite images?

-Figure 1 is not clear. The legend is not comprehensive. At least we would have expected an indication in the Figure which country the Laohahe catchment is located.

-Line 15-25: "grass land and crop land" are dominant vegetations. These are land uses and not vegetation types. I dont understand what the authors mean by "direction of national development policies".

-Where are the 19 rain gauging stations, 4 meteorological stations located in Figure 1?

iii)Page 2430 Line 1: ..annual precipitation occurs during the months from May through.... this needs to be rephrased.

-Line 15-20: The authors seems to interchange the use of the term land cover and vegetation type. The authors need to be consistent and use the terms correctly. What is the relationship between the text in line 20 and Figure 3?

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iv) Page 2431: What are the units of the air temperature, vapour pressure and wind speed? The same applies in other equations in the document.

iv)Page 2432: This paper could have benefited from a comparison of the ET estimates derived from the two-source model with the freely available weekly actual ET data from the MODIS sensor and which has a spatial resolution of 1km.

v)Page 2433 (Line 19): What is the size of the grid for the distributed hydrological model? What is the benefit of using this model compared to other distributed hydrological models, e.g the SWAT model?

vi)Page 2434: This page and subsequent describes the runoff generation mechanism in the hybrid model. It is clear that soil characteristics govern this process and unfortunately there is no soil data or information for the study area indicated in the paper. How was runoff generated in the absence of this crucial data? Uncertainty analysis of the model used should be done.

vii)Page 2437: (Line 7): The authors introduces another uncertainty in their analysis, i.e climate change. How sure are the authors that climate change has no impact on the fluxes they are discussing in this paper? Can they quantify the impact of climate change in the fluxes they are discussing in this paper?

-It would be interesting to produce a cumulative runoff map over the study area for the years 1980, 1989, 1996 and 1999 and compare with the land uses indicated in Figure 3 and the ET maps in figure 7

-A good hydrological model should capture as much as possible the processes in a catchment in order to achieve a good simulation. From Figure 6, it is clear that the model used in this study could not capture the inherent dynamics of the catchment during the dry season. Then, what benefit can we get by using this model?

viii)Page 2440: What is groundwater runoff?

ix)Page 2442: (Line 9-19): What lessons can we learn from the approach applied in this

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paper? Can the authors advise other researchers in other parts of the globe to apply this model and or approach in quantifying the effects of land use change on green and blue water?

Summary: I challenge the authors to show clearly their contribution to the knowledge base in hydrology.

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