

Interactive comment on “Change in Frozen Soils and its Effect on Regional Hydrology in the Upper Heihe Basin, the Northeast Qinghai-Tibetan Plateau” by Bing Gao et al.

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Reply to the Referee Comment by Anonymous Referee #2

General comments

The authors took an distributed hydrological model to study the long term(1961-2013) change of frozen soil and its influence on hydrology in the upper Heihe basin. In general, the manuscript is very interesting to me, and the conclusions are generally convincing. Based on my personal review, this paper can be accepted for TC after revision.

Reply: Thanks for this positive comment, we will revise the manuscript by carefully following yours suggestions.

Major Comments

Comment 1. The gridded forcing data are interpolated from very few observational stations. Please add the discussions for the uncertainty from model inputs (forcing data; particularly the precipitation, and solar radiation).

Reply: The gridded forcing data was interpolated from the meteorological observations together with the outputs of a high resolution regional climate model. The interpolation method considered the precipitation–elevation relationship in the mountain region and has been validated carefully in the Heihe basin. The details of this method can be found in a recent publications by Wang et al. (2017) which has been added in the reference list of our manuscript (Wang et al. Spatial Interpolation of Daily Precipitation in a High Mountainous Watershed Based on Gauge Observations and a Regional Climate Model Simulation, *Journal of Hydrometeorology*, 18:845-862, 2017, doi: 10.1175/JHM-D-16-0089.1). We will add a discussion of the uncertainty from model inputs in section 5.3.

Comment 2. The tables can be reduced. In my opinion, Table 2 can be merged into Figure 6. Tables 3 and 4 can be merged together.

Reply: Thank you for this suggestions. We will merge Table 2 into Figure 6, and merge Table 3 and 4 into one table.

Comment 3. Figure 7: how did you get the remote sensing estimated ET, please indicate the reference here.

Reply: The remote sensing estimated ET was provided by Wu (2013) and the method for ET estimation was developed by Wu et al. (2012). We will add this information in the caption of Figure 7 “Comparison of the simulated and the remote sensing estimated actual evapotranspiration provided by Wu (2013) in the period of 2002~2012”. The following references have been added in the manuscript.

Wu, B.F., Yan, N.N., Xiong, J., Bastiaanssen, W., Zhu, W.W., Stein, A.: Validation of ETWatch using field measurements at diverse landscapes: A case study in Hai Basin

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of China. *J. Hydrol.*, 436, 67-80, doi: 10.1016/j.jhydrol.2012.02.043, 2012.

Wu, B.F.: Monthly Evapotranspiration Datasets (2000–2012) with 1 km Spatial Resolution over the Heihe River Basin, Heihe Plan Science Data Center at Lanzhou, China, doi: 10.3972/heihe.115.2013.db, 2013.

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