Hydrol. Earth Syst. Sci. Discuss., 10, C28–C31, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C28/2013/

Hydrology and Earth System Sciences Discussions

Interactive comment on "The influence of precipitation and temperature input schemes on hydrological simulations of a snow and glacier melt dominated basin in Northwest China" *by* X. Ji and Y. Luo

Anonymous Referee #1

Received and published: 30 January 2013

This paper study the influence of precipitation and temperature input schemes on a mountain basin which has glaciers by comparing different forcing data with the modified SWAT model (Luo et al, 2012,2013). The precipitation gradients were derived from TRMM 3B43 data calibration by Ji and Chen (2012). The air temperature lapse rates were derived from weather stations. The mountain region always has very limited observation data, and the hydrological process is complex when including glacier, permafrost and snow, thus it is worth to study the effect of different forcing data on hydrological model. There are some deficiencies of the paper: (1) The precipitation

gradients are only derived from TRMM 3B43 data, which didn't compare with that calculated from the data observed by weather stations in MRB and neighbor areas, or some precipitation gradients recorded by other studies in literature. (2) The evaporation observed in China hydrological station always by using evaporation dish with 20 cm diameter, which are larger than the traditional pan evaporation which observed by open water body with 20 m diameter. The evaporation calculated by Penman equation is the potential evaporation comparable with that observed the traditional pan evaporation. The authors seem neglect the difference. (3) In central Asia, the glacier accumulation and melt mainly occur in Summer (Fujita et al.,2008) , which suggested that the snowfall in glacier areas are mainly in Summer instead of cold season. Thus, the study of Wei et al (2001) is not enough to further support the lower snow ratio in more reasonable in MRB. (4) Due to SWAT is not a physical based hydrological model, the model performance can be improved by adjust parameters as did in 3.4. Thus, the authors should more focus on the influence of forcing data on the physical hydrological process rather than the NSE. (5) The conclusion part is too long.

Suggestions on detail are list below: P 811 L1 Due to thee lapse rate general means that the element decrease with the elevation, it is Ok to air temperature. However, it is not always the truth to precipitation, we generally use "precipitation gradient". L22 suggest use "precipitation" as "rainfall"

P812 L16 what's means of "markedly seasonal precipitation and very abrupt orographic Variations"?

P813 L13 Validated by what or what method?

P814 L22 "Its also covered" replaced with "The corrected TRMM 3B42" L28 "gage" replaced with 'reference"

P 815 Equation 1 seems wrong, please check carefully L10 needn't reference Neitsch et al.,2011 L15 "the altitudinal air temperature gradient" replace as ' real air temperature lapse rate", and add one reference, such as Zhang et al. 2012

P816 L4 The criteria in equation 5 probably ELn<ELn+1$\leq$ELband L11 “The MRB spatial precipitation distribution was provided” is Chinese English, not “provided”, should be “calculated from” or “obtained from” L15-L18 The two sentence are similar, reorganize to one sentence L21 not “conditions” , replaced as ‘criteria”

P817 L3 use “Evapotranspiration “ replace “PET method” L4 Why “Evapotranspiration” are in abbreviation as “PET”? I guess it is should be “Potential Evapotranspiration”

P818 L4 I’m not sure whether there are observed precipitation at KHS. If there have, it seems not need the virtual station at this elevation. If not, how to calculate MPLAPS in the scheme iii? So there need one explain in detail.

L8 using the similar method as precipitation scheme, not the same precipitation scheme

P820 L6 should “PLAPS” not “SPLAPS” L13 as noticed in Fig4, the air temperature in winter at more than 3000 m are less than -10 degree, so there is only very limited effect on winter snow/rainfall separation ,and nearly no snow/ice melt in winter.

L26 what is “the precipitation difference during the year”?

P821 L20 In central Asia, the glacier accumulation and melt mainly occur in Summer (Fujita et al.,2008) , which suggested that the snowfall in glacier areas are mainly in Summer instead of cold season. Thus, the study of Wei et al (2001) is not enough to further support the conclusion.

P822 L4 It is not very significant of glacier melt from Fig 7, thus it is better to give the number of glacier melt under different schemes L20 add “Table 4)”

P823 L5 The evaporation observed in China hydrological station always by using 20 cm evaporation pan, which are larger than the traditional pan evaporation which observed by 20 m open water body. The authors need explain this. L14 delete “distribution”

P825 L6 poor to understand

P837 The unit of air temperature lapse rate is wrong

P838 It is better to add the real water yield get from discharge record

P844 Figure 2 It seems there is one value in each altitude, and the amount points are 20. Is it the average annual precipitation of the same altitude or else? It is only grids in MRB or includes neighbor areas? Needs more clearly in figure title

P849 Figure 7 Need to give the glacier coverage of two HRU

Reference Fujita K. 2008. Effect of precipitation seasonality on climatic sensitivity of glacier mass balance. Earth and Planetary Science Letters 276: 14-19 Ji, X. and Chen, Y. F.: Characterizing spatial patterns of precipitation based on corrected TRMM3B43 data over the mid Tianshan Mountains of China, J. Mt. Sci., 9, 628–645, 2012 Luo, Y., Arnold, J., Allen, P., and Chen, X.: Baseflow simulation using SWAT model in an inlandriver basin in Tianshan Mountains, Northwest China, Hydrol. Earth Syst. Sci., 16, 1259–1267, doi:10.5194/hess-16-1259-2012, 2012. Luo, Y., Arnold, J., Liu, S. Y., Wang, X. Y., and Chen, X.: Inclusion of glacier processes fordistributed hydrological modeling at basin scale in Tianshan Mountains, northwest China, J.Hydrol., 477, 72–85, 2013. Zhang, S, Ye B, Liu S, Zhang X and Hagemann S. 2012. A modified monthly degree-day model for evaluating glacier runoff changes in China. Part I: model development. Hydrological Processes 26(11): 1686-1696.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 807, 2013.