Hydrol. Earth Syst. Sci. Discuss., 8, C4720–C4723, 2011
www.hydrol-earth-syst-sci-discuss.net/8/C4720/2011/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Assessing water resources in China using PRECIS projections and VIC model" *by* G. Q. Wang et al.

G. Q. Wang et al.

gqwang@nhri.cn

Received and published: 28 October 2011

All authors do appreciate anonymous referee #1 for her/his great efforts on the manuscript reviewing. All comments from anonymous referee #1 are very valuable and helpful for us to improve the manuscript. We improved the manuscript based on fully consideration of these comments. Sorry for my late reply as I was busy with technical aid for Thailand flood forecasting during the last months. Responses to each comment are given as follow:

(1) Response to comment #1: We double checked the manuscript, some grammatical errors included but not limited some errors which mentioned by anonymous referee #1, were revised. And the full manuscript was improved in English further by Roger Calow,

an English native speaker, one of the authors of the manuscript as well.

(2) Response to comment #2: We redrew the Figure 8, to make the figure including words in the figure as clear as possible

(3) Response to comment #3: We gave an exact place for each table or figure in the context of the revised manuscript.

(4) Response to comment #4: In the revised manuscript, we explained why we choose VIC model as assessing tool in the study. "For the purpose of assessing the likely change in water resources, we should have a better understanding of changing in elements of hydrological cycle, especially, evapotranspiration. Energy flux plays a vital role in the hydrological cycle. The VIC model (Variable Infiltration Capacity, VIC) is a physically-based hydrological model, which could simulate the physical exchange processes of water and energy in the soil, vegetation and atmosphere in a surface vegetation atmospheric transfer scheme. VIC model was developed by Liang et al. (1994) and later improved by Lohmann et al. (1998) and Liang and Xie (2001). The notable characteristics of the VIC model are that it includes: (1) both water balance and energy balance parameterization; (2) two types of runoff yielding mechanisms based on saturation and infiltration excess; (3) consideration of sub-grid scale soil heterogeneity; and (4) processes of snow accumulation and melt, as well as soil freezing and thawing. Therefore, VIC model was employed in the study."

(5) Response to comment #5: In the revised manuscript, we explained the reasons that NSE and RE were employed to calibrate the model. "There are seven hydrological parameters in the VIC model which need to be calibrated with recorded daily stream flow. There are many measures available, including coefficient of correlation (R), Nash–Sutcliffe efficiency coefficient (NSE), Root mean squared error (RMSE), and Mean absolute percentage error (MAPE), to evaluate model performance, among which, the Nash and Sutcliffe efficiency criterion (Nash and Sutcliffe, 1970) is a normalized statistic reflecting relative magnitude of the residual variance compared to the measured

data variance. It is easy to compare the performance of hydrological model for different catchments with NSE. For the purpose of hydrological simulation, we not only requires a good fitness between observed and simulated runoff series, but also need a good balance of total water mass. Therefore, the Nash and Sutcliffe efficiency criterion (NSE) and the relative error of volumetric fit (RE) were both employed as objective functions to calibrate the model (Nash & Sutcliffe, 1970). A good simulation result will have NSE close to 1 while Re approaching to 0."

(6) Response to comment #6: There are many gridding methods available in literature, Zhang (2007) evaluated the performance of different gridding method and found linear distance weighted interpolation method performs well. In the revised manuscript, we cited Zhang's result to illustrate the linear distance weighted interpolation method could be used for gridding data with high accuracy. "As the VIC model is run through grid cells, the whole of China is divided into 4160 cells with a resolution of $0.5^\circ \times 0.5^\circ$. There are many gridding methods available in literature, including Method of Inverse Distance to a Power, Kriging method, Minimum Curvature method, Nearest Neighbor method, linear distance weighted interpolation method, etc. Zhang (2007) evaluated the performance of different gridding method through comparing areal average precipitations and temperatures, derived from gridding data and recorded sit data, respectively, at different scale levels, and found the linear distance weighted interpolation method performs well, with relative errors of annual precipitation ranging from -2.4% to 3.8%, and absolute errors of annual mean temperature ranging from -0.31âĎČ to 0.26âĎČ. Thereby, meteorological data at 2650 stations were interpolated for each grid cell using the linear distance weighted interpolation method in the study."

(7) Response to comment #7: Climate scenarios used in the study are newly projected result, provided by Prof. Xu, who works on RCM-PRECIS. Resolution of VIC model is consistent with that of climate scenarios used in the study. We added more description on climate scenarios. "Xu et al. (2005) and Zhang et al. (2006) used the Hadley Centre RCM system-PRECIS (Providing Regional Climates for Impacts Studies, PRE-

CIS) model to analyze changes in temperature and precipitation over the whole China under SRES (Special Report on Emission Scenarios) scenarios A2, B2 and A1B in the 21st century. Financially supported by ACCC project (Adapting Climate Change in China, 2010-2012), Xu et al improved RCM-PRECIS to project climate scenarios with a resolution of $0.5^\circ \times 0.5^\circ$, which is consistent with the one of VIC model. The projected country-averaged annual air temperature and precipitation over China under these scenarios 2 are shown in Fig. 6 and 7 respectively".

For a more clear version, please find the supplement below.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/8/C4720/2011/hessd-8-C4720-2011-supplement.pdf

---

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 7293, 2011.