**Hydrology and
Earth System
Sciences
Discussions**

Interactive comment on "Scale effect on runoff in alpine mountain catchments on China's Gongga Mountain" *by* Y. Lin and G. X. Wang

Anonymous Referee #2

Received and published: 20 May 2010

Review of Lin and Wang, HESSD 7, 2157-2186, 2010 In this paper, the authors have developed scaling formulation to be used in the prediction of alpine catchment discharge response as a function of precipitation and temperature. The dominating hydrological processes and physical significance of the parameters involved in those processes are ignored and the scaling relationships developed are empirical. The concept and methodology, proposed by the authors, to utilize runoff scale transform model could contribute in 'predicting ungauged basins' of alpine regions.

Following are the comments for the authors.

1) Page 2158, line # 22 says: The process of transferring parameters from neighboring catchments to the catchment of interest is generally referred to as regionalization. Page 2158, Line 24 says: The choice of catchments from which information will be

transferred is usually based on some sort of similarity measure. Page 2159, line 4 says: Recent catchment hydrological studies on the scaling issue indicate that the scale effects vary significantly between different contexts and experimental methodologies.

In the above sentences, the authors talk about hydrological similarity, parameter transferability, regionalization and scaling. However, the authors have not pointed out a specific scale problem in setting a relation of the hydrological similarity, parameter transferability, and regionalization. In developing transferable hydrological model or in regionalization, one of the scale problems arises when the model application scale and parameter identification scale is not matched. For clarification, the authors may refer to literatures such as; Pradhan et al (2006, 2008).

a) Pradhan N.R, Y. Tachikawa, K. Takara, 2006, A downscaling method of topographic index distribution for matching the scales of model application and parameter identification, Hydrological Processes, 20: pp. 1385-1405.

b) Pradhan N.R, F.L. Ogden, Y. Tachikawa, K. Takara, 2008, Scaling of slope, upslope area and soil water deficit: Implications for transferability and regionalization in topographic index modeling, Water Resour. Res., 44: W12421, doi:10.1029/2007WR006667.

If possible, the authors can prove or suggest that their regression scaling model is a solution for scale problem arising from difference in the parameter identification scale and model application scale.

2) Page 2158, line 14 says: For alpine catchments, the results showed that the vegetation type and cover might be important factors for the runoff response to the scale effective. How can this significance of heterogeneity be explained if the parameters involved in Equation (4) are effective?

3) In the scaling relation for the dry season, for example in Equation (6), temperature

is the dominating input variable. There is a mixture of forested and glacier study sub-catchments. For a dry season, temperature is directly proportional to discharge in a glacier sub-catchment whereas an increase in temperature has a decreasing effect on the discharge of forested sub-catchments. How can you defend this temperature versus discharge relationship in Equation (6) for generalizing in specific type of sub-catchments, such as; only forested, only glacier?

4) It is not clear how you relate the scaling exponent derived from equation 3 and equation 5 to the derivation of equations 6, 7, 8 and 9.

5) I suggest that the authors segregate forested sub-catchments experiencing monsoon from the glacier catchment; please see comment # 3. This segregation may favor the test of self similar hydrological response.

6) It is not clear what parameter set is used in the first step of your scaling process. How did you calibrate or optimize the parametric values for different scales before fitting into your regression equation?

7) In page 2162, line # 7,8,9, 10 the authors state fractals and self-similarity. The authors do not suggest if there is a limitation where uni-fractal applies in their approach.

8) The symbol F in Equation 2 and Equation 3 seems different to me. If so please use different symbols.

9) There are some grammatical mistakes and awkward phrases. Here are some examples; a) Page 2170, line # 19. In this study, the difference between the vegetation cover rates was too large............ Difficult to understand. Please rearrange the sentence. b) Page 2167, line 25. The simulated runoff peak for catchment 1# was lower than the observed value, and the others show a different form. Please use past tense, for example; ....while the others showed a different form.