

## ***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 #1**

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This paper presents an interesting case study on hydrological scaling in an alpine catchment. The scale issue in hydrological processes of the mountain catchments is of critical importance for hydrological modeling in ungauged mountain catchments because these basins are more terrain-complex and usually more heterogeneous and data sparse. This paper introduced an effective method for scaling the dominant hydrological processes at different scales and for different environments through temperature (rainfall) -runoff relationship. The scaling models indicated a higher simulation efficiency and precision between the observed runoff and the calculated runoff in China’s Gongga Mountain. The paper is also clearly presented and well organized.

My recommendation for the paper is to be accepted with some minor revisions. My comments on the paper are as follows

Major comments:

1. This authors did a good job in establishing the relationship between temperature (rainfall) and runoff at different scales, but the considerations of underlying properties /soil characteristics (moisture and soil type) and the processes of glacier and snow freezing and thawing is not enough, which also have important influences on the runoff processes in the study area. Personally, I am also very curious about the impact of glacier and snow runoff on the scaling.

2. The applicability of the regression methods to other catchment is suggested to be discussed.

3. It is suggested to have someone who has a good knowledge of technical English writing read the paper and revise the grammar

There are also some minor comments as listed below.

In the Introduction.

1. The main scale methods in hydrological application are suggested to be reviewed.

2. P4, Line 14. 'The objectives of the present study were (1) to ascertain and quantify the scale effect for seasonal hydrological processes, and (2) to establish quantified simulated models containing parameters that link processes to the scale in seasonal runoff processes in the alpine watershed.' I could not understand the meaning of these two sentences. It seems the objectives need to be clarified.

In Materials and method.

3. P5, Line 14 . "This observation system contains four catchments, one groundwater observation site, one forest runoff field, and one meteorological station." Does the author mean that in each catchment there is a groundwater observation site and a meteorological station?

4. P5, Line 21 "The air temperature and precipitation observation locations were lo-

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cated near the outlet section.” Does the air temperature and precipitation observation obtained from meteorological stations at each catchment? How many meteorological station contain in the observation system?

5. P4, Line 14 . “The data sets were normalized, and each parameter in ak was regressed as a function of scale k”. It is not clear that which parameters was regressed as a function of scale K in Eqs 6, 7, 8 and 9. The detailed introduction should be provided, because this is a critical point in this paper.

In the Section of Results

6. It is indicated in Figure 2 that there is a lagging effect between the temperature and runoff. The peak of runoff is in September but the maximum temperature is in July. Can this effect be captured by the regression equations in the paper?

7. Table 4. I am wondering why the Nash coefficient of the whole year is larger than those of the dry and wet seasons.

8. I am wondering why the Nash coefficient of daily mean runoff simulation is larger that the Nash coefficient of monthly mean runoff simulation? Generally this is not realistic.

In Discussion and conclusions

9. Page 13. line 16. “Gao et al. (2002) researched the hydrological process in the research area on Gongga Mountain.” → Gao et al. (2002) studied the hydrological process in the research area on Gongga Mountain.

10. P14, Line 28. ‘Merz et al. (2006) indicated that the soil and land use characteristics had a low degree of impact on runoff processes.’ Is this true? More discussion is needed.

11. The authors stated that the different underlying properties lead to difference of the simulation runoffs in four sub-catchments. But this statement is in contradictions with the authors’ other statements in the paper. See my major comment 1.

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12. What is the meaning of “Comparing the monthly simulation results with the daily simulation results, the simulated daily runoff agreed with the monthly runoff.”

Tables

13. Table 1 and table 2 can be merged together.

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