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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Prediction of geomorphologic parameters of catchment without GIS to estimate runoff using GIUH model" *by* P. Keshtkaran and T. Sabzevari

Anonymous Referee #2

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This paper introduced an interesting (but not novel) idea to estimate the stream-order-law ratios and Geomorphologic parameters (GP) in ungauged basins for the application of GIUH model. Regression equations of stream-order-law ratios and GP were firstly developed in nine catchments and then evaluated in other three catchments. The performances of GIUH model using estimated and calculated stream-order-law ratios were compared in term of simulating runoff events. However, I find this manuscript in some aspects rather poor. From a more scientifically and technically rigorous perspective, this manuscript needs to be significantly improved. One of my major concerns is that the manuscript is not well written, with lots of ill-formulated sentences that are not easy to follow. Please keep in mind that quality is paramount, schedule is secondary, and

reviewers and editors really hope authors improve the quality of manuscripts as best as they can before submission. I think the authors even did not read the manuscript thoroughly before submission. It looks like the paper was finished in a short time and submitted hastily. Another major concern is about the scientific merits of this work. First, I do not agree that digital elevation model (DEM) is not available in most catchments. For example, the Shuttle Radar Topography Mission (SRTM) provides global elevation maps in a resolution of 3 arc second (even 1 arc second in some countries), which has been widely used for hydrological application. The products can be downloaded without charge from websites such as http://srtm.csi.cgiar.org/. Second, the authors repeatedly reiterated that it takes a long time to compute stream-order-law ratios based on DEM with GIS. My question is how long time do you think it is too long to wait, one day, one week or one month? The study catchments are all smaller than 600 km2 in this work. Computing stream-order-law ratios with GIS for catchments with such a small area could take only few hours. Considering stream-order-law ratios are constant at long time scale, we do not need to re-compute their values when using GIUH in various time periods. The results also indicate a 10% larger error for peak flow obtained by the proposed method, then why not just wait for few hours (or days) to reduce this error. The authors also highlighted that some stream-order-law ratios should be calculated manually by GIS users. Actually, most GIS software (e.g., ArcGis) are open platforms to develop new toolbox. GIS users can write scripts (in Python or in Arc workstation) to calculate the related variables automatically, and transfer to following users. Laziness is not a sufficient reason to reduce the accuracy of model simulation.

Special comments: 1. Line 38-40: Why are these sentences here? How do these sentences relate to the former and later paragraphs? 2. Line 45: You have 'first' here, then where is 'second'? 3. Line 49: You introduce the calculation of GP using GIS in former sentences, but here you go back to the application of GIUH. 4. Line 54-76: Application of GIUH model is not the main point of this work. The main point focuses on the estimation of stream-order-law ratios when using GIUH. Hence, there is no necessary to list so many references on the application of GIUH. But please

provide more references about the estimation of stream-order-law ratios in previous application of GIUH. If I am correct, the GIUH model was proposed by Rodriguez-Iturbe and Valdes in 1979, while the first study to calculate stream-order-law ratios based on DEM was introduced by Lee (1998). What methods were used to estimate stream-order-law ratios during 1979-1998? Are there any methods similar to the proposed one in this work? 5. Line 77-85: This paragraph needs re-organization, taking my second major concern into account. Moreover, you list many disadvantages of the GIS-based method, but not any advantages. If it is so time-consuming, then why someone used the GIS-based method in their areas? Also, please provide a review on the application of GIS-based method in existing literatures. 6. Line 86: What is the full name of SPSS software? Can you give some geostatistical references that use this software as well? The question is why use SPSS? 7. Line 95: It is abrupt to see this sentence here, without any related expression before. Why should analyze the sensitivity of stream ratios? What the relation between this topic and the main story of this work? 8. Section 3: It looks like you are introducing the equations for stream-order-law ratios, not geomorphologic parameters. 9. Section 3: Listing these equations one by one makes the manuscript too prolix to read. You can summarize them in one table. 10. Line 176-179: There is no necessary to repeat the ideas again. Moreover, these words are hard to follow. 11. Section 4: You just introduce the study catchments in this section, it is not 'case study'. It is better to summarize all study catchments in Table 1, including the size, reference, and geographical extent. 12. Figure 1: Why only Kasilian and Gagas? If you do not have the map for Heng-Chi, please delineate it from the SRTM DEM. The maps of Kasilian and Gagas could be originally delineated from DEM as well. 13. Line 212-216: What are the 80 watersheds and 37 catchments mentioned here? You told that you obtained these equations based on nine catchments listed in Table 1. 14. Line 212-216: What is the input data for the software? Did you use the calculated stream-order-law ratios from DEM to determine the coefficients in the equations? If yes, then DEM data is needed to apply your method in other catchments, as you cannot expect that these equations can be applicable to any catchments in the

world. 15. Section 5: Same to comment 9, there is no need to list the equations one by one, but summarize in one table. 16. Section 5: So many assumptions adopted here. Are there any references to support your assumptions? 17. Section 5: You just write out these equations followed by correlation coefficients, without any figures to show the match between the estimated and GIS-based stream-order-law ratios and GP. I really doubt the credibility of the correlation coefficients. 18. Line 252: What is "simple topographic maps of the catchment", do you think this kind of map are of course available for most catchments? My concern here is how to calculate the area and river length for the application of your regression equations in other places. 19. Line 252-262: Add a sub-section 5.6 for these words. 20. Line 252: You often have a mixed use between subcatchment and catchment. Please check the manuscript thoroughly and make sure all the using are appropriate. 21. Line 328: The word 'observed' is not appropriate here. How to observe the stream ratios? 22. Section 7: There are two points in this section. One is the comparison between estimated and GIS-based GP. The other one is the comparison of GIUH performance using estimated and GIS-based stream-order-law ratios. I think it is better to divide this section into two sub-sections. 23. Table 2: How to calculate the Error here? 24. Line 409: How did you calculate the average error? 25. Captions for tables and figures are too simple to explain the implied information. Give full names of all the abbreviations in captions. 26. I do not like the structure of this manuscript. It is a bit fragmented. The authors should develop a 'Methodology' section to summarize the work procedure, and introduce the estimation of regression equations, the verification procedure and the calculation of metrics in more details, without repeating in following sections. In general, this paper is far away from publishable in HESS from my taste. The structure is fragmented, the English writing is wordy with lots of the ill-formulated sentences. My major concern is that the scientific contribution of the proposed idea to the application of GIUH in ungauged basins should be rather limited, considering the widely and easily using of DEM data and GIS software.