

Interactive comment on “Application of runoff coefficient and rainfall-intensity-ratio to analyze the relationship between storm patterns and flood responses” by N. W. Kim et al.

Anonymous Referee #2

Received and published: 5 July 2016

General comments. The paper explores the relationship between the runoff coefficient and the rainfall intensity ratios for 50 catchments in Korea. Overall the topic of the paper is very interesting and fits for the HESS journal. The understanding of the catchment functioning conditions under different type of storms is welcome in the scientific literature for a better understanding of the hydrological processes and for an improvement of the modelling. Despite this I found two main limitations of the paper. 1) The first is a general comment about the paper organization and structure. I found difficult to follow the paper, especially at the beginning, because the authors lack to define properly its main goal. It is not clear from both the intro section and the abstract if the objective is the creation of flood time series in ungauged catchments or the analysis of

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the storm pattern and the flood response. What is a storm pattern? Define it property at the beginning. It is important. I only realized at the end that the authors refer to the direction of movement of the storm with respect to the catchment location. By reading the paper, things become more clear but still the interpretation of many terms and procedures is not straightforward. Relevant literature in the introduction is not properly described and this impedes to evaluate the real value of the study. There are many definitions and methods that to me must be clearly described. A lot of attention is devoted to the performance scores for evaluating the model skills and much less is said about RIDC and FIDC which are central in the study. When a new index is introduced, describe its actual role in the analysis (e.g., Cvol1 and Cvol2 are this and this and give information about this and this). For instance, the interpretation of Figure 2 is really difficult and it is not explained sufficiently well. Nothing is said about the location of the ungauged catchments, neither about the event selection (why only 20 events? How are they extracted?). Improve the definition of dependent and independent catchments. It is not so clear in the paper. 2) The second is more a methodological point of view. If I understood well the authors calibrated the parameters of the model on the gauged catchments and assume that those parameters can explain sufficiently well the behavior of external catchments in the same study area (the same? How far downstream the catchments are located?). Based on that, they produce the runoff time series for the other ungauged catchments. While I could partially accept this procedure for interior sub-catchments I found that extrapolate for external un-gauged catchments is too dangerous. The authors should provide sufficient evidences that this methodological choice is correct. In addition, I think that for the type of study observational data are recommended because the model can introduce additional uncertainties to the process and can significantly bias the results (for instance in an analysis in Southern Korea Ajmal et al. 2016 used ground rainfall and discharge data from 39 catchments with area ranging between 40 and 900 km² to test a new event based hydrological model).

Based on that I suggest the paper to be reconsidered only after major revisions. I have additional comments the authors could consider to improve the manuscript.

Pag. 4. 67-77. Please expand and describe the relevant literature. It is important to understand what has already been done and the main conclusions.

Pag. 4. 82-88. Focus on the real objective of the study. This is a methodological trick for compensate the absence of observations and it is not new in literature.

Pag. 11 lines 253. Why not calibrating on all the events at once? It is more reasonable.

Pag. 11 lines 271. How the parameter n is obtained for ungauged catchment? The same initial conditions is used? Due to the high rainfall spatial variability and the geophysical characteristics of the catchments it is likely that the initial conditions may vary from basin to basin. So use the same could be not appropriate.

Section 3.2. Please briefly describe what the FIDC and RIDC are, and their roles in the study.

Pag. 14 337-339. Please make an effort to describe more clearly Figure 2.

Section 3.4. I found this section very hard to follow. What Cvol2 and R3 want to represent? Please provide further details.

Pag. 17 427-429. You can say that using a modelled dataset provide results similar to the one obtained elsewhere with observational dataset but you cannot say that because your results are similar, then your assumption is correct.

Pag 18 line 437. Lowest catchment. Please define.

Ajmal, M.; Khan, T.A.; Kim, T.-W. A CN-Based Ensembled Hydrological Model for Enhanced Watershed Runoff Prediction. Water2016, 8, 20.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-194, 2016.

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