Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
https://doi.org/10.5194/hess-2022-112-RC1, 2022

Comment on hess-2022-112

Anonymous Referee #1

Referee comment on "A time-varying distributed unit hydrograph method considering soil moisture" by Bin Yi et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-112-RC1, 2022

Review comments on HESS 2022-112 "**A Time-Varying Distributed Unit Hydrograph method considering soil moisture content".**

The paper speaks about a very interesting study of UH concepts of runoff generation in river basins. The authors have successfully compared the performances of four types of UHs e.g SUH, DUH, TDUH (DUH with time-varying rainfall intensity); and TDUH (DUH with time-varying rainfall intensity & soil moisture). The approach has practical application if soil moisture conditions and the observed rainfall intensity are known and a set of IUHs are already developed using the past rainfall and flood events. The accuracy of the methodology is well established, hence acceptable. However, the reviewer raises the following points for clarification and, if incorporated into the manuscript, the quality of the paper will improve a lot.

Section 1 (Line 100). IA? Explain.

The Author uses equations (1), (2) & (3) for velocity computation from grid cells in the case of DUH, TDUH (DUH with rainfall intensity) and the present method considering both the rainfall intensity and soil moisture content (may be referred as TDUH-MC) respectively. Subsequently, all computations for the UH or flood hydrographs have been attempted. The paper also speaks about the traditional SUH of the two test catchments about which the author has not spoken. Please explain. Or is it Clark's approach of determining the IUH considering the timeâ□□area histogram and the attenuation of this timeâ□□area hydrograph using a linear reservoir that represents channel storage effects?

The author has commented on the assumptions of Bunster et al. (2019) regarding the watershed equilibrium condition prior to the end of excess rainfall pulse (Line 138-148). Under saturated conditions and the routing velocity-at-maximum condition, the time to peak becomes shorter, peak is higher. How the slower travel time (line 145-146) will

ensure shorter time to peak and higher peak may be justified/corrected?

Section 3:

Several approaches can be adopted to compute the runoff at the basin outlet. The author has used the Muskingum method of runoff routing. Since any natural river is multiple inflows-single outflow runoff systems with different travel times from the sub-basins to reach the outlet, the author may describe the routing method steps in more detail.

Section 5.1.1 (Line 377-382)

In the model calibration process, SUH derived from historical rainfall-runoff data was used for flow routing in the model calibration process. But different rainfall-runoff events associated with different soil moisture conditions will give rise to various shapes of UH. The author may throw some more light on the suggested routing model calibration in this Section.

Section 5.1.2

A Table for the flood event statistics used for model calibration and validation may be inserted in this section.

Section 5.2 (Line 443). Sub-basin 6 may be corrected as sub-basin 9.

Section 5.4 (Line 535). Is it Fig 10 or Fig 11. May be corrected accordingly.

The paper suffers from improper sentence formation (at few places sentences are not completed), poorly written. Sentences are not properly formed. Hence needs improvement.

Paper may be accepted if the above issues are properly addressed.