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Interactive comment on "Modeling and interpreting hydrological responses of sustainable urban drainage systems with explainable machine learning methods" *by* Yang Yang and Ting Fong May Chui

Anonymous Referee #1

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Firstly, this work is innovative for explaining machine learning predictions in hydrology forecasting. With applying AI in various fields and getting excellent results, it is a hot topic to interpret the machine learning. But this manuscript still has some questions needed revised. Generally, it is a good research point, but manuscript is hard to understand. The logic of this paper is not clear that I cannot figure out what information explained by SHAP model and what relationship of hydrological response and selected hyperparameters. I think the main question is limited input variables (only Rainfall depth). I cannot agree that the design rainfall depth features (Section 2.1.1) reflect

SuDS hydrological process. Thus, the hyperparameters of m, l, q, account_CumRain and account_season have little meaning for interpreting hydrological process in SuDS. Originally, SHAP is a game theoretic approach to explain the output of machine learning model. So maybe more physical observation variables are needed to selected as input variables. Therefore, I suggest this manuscript for Major Revision and Resubmission. Point 1:Whether the constructed data feature mining algorithm corresponds to the reference standard in the folded data part? Point 2: "The framework is particularly useful for urban catchments where the information for setting up process-based models is insufficient."ïijĹline580ïijĽIs this statement reasonable? Do similar expressions still exist in the full text? Point 3:Adding quantitative analysis to the conclusion section should be more convincing. Point 4:Compared with the commonly used urban rainfall runoff models, what are the obvious advantages of this model?

Line 620-780: It is difficult for finding the references because of improperly format. Line 9: How do you define the "fine temporal scales"? It is an important concept in your forecasting, but it is not clear. Line 131: Why you use $D_{t-a,t-b}$ for aggregating rainfall depth? In Line 84 said many observation data became available, but why only the rainfall data? Do you have other data? Line 6-14 and Line 560-595: In the section of abstract and conclusion, the quantitative results are absent and the qualitative descriptions are not enough.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2020-460, 2020.