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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Assessing the hydrologic restoration of an urbanized area via integrated distributed hydrological model" *by* D. H. Trinh and T. F. M. Chui

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The paper by Trinh and Chui describes the results of analysis of the urbanisation effect on catchment water balance in Singapore. The author used fully coupled model (MikeSHE) to simulate the impact of land use changes on groundwater recharge, baseflow and river flow within Marina catchment of 160.8 km2. They also explored how some options for water retention in the catchment can influence the resulting effects, including "green roof" and bio-retention systems. Despite the fact the fully coupled hydrological models allow assessing all components of the catchment water balance and their changes under the land use change conditions, such complex modelling is not

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commonly used for analysis of the urbanisation impact. It is good to see that such approach has been adopted in the report research. However such modelling does require a great deal of data, good conceptual understanding of the system and often is computationally intensive. As such models do not allow developer to influence recharge, runoff coefficients, etc, but only the catchment and subsurface characteristics, the conceptualisation of the catchment water balance has to be well defined, particularly when those characteristics have to be spatially distributed. The main concern about the reviewed paper is related to an absolute lack of any observation data (apart from meteorological data), and all presented results and discussion are solely based on the model outcome. This is the main limitation of the suggested results: the model doesn't seem to be validated at all. In couple models, rainfall partitioning to recharge and runoff is depended on the soil properties, and it is very sensitive to unsaturated zone parameters. Incorrect partitioning, resulting from inadequate parameters selection propagates the error to simulated river flow. How much trust one can put in the model outcomes, when no evidences were offered on wether the model treats the rainfall partitioning correctly? Even in relative terms, the analysis of difference between selected scenarios on baseflow or peak flow could be wrong. In addition the adopted modelling methodology further leads to a few questions. It would be useful to give some explanation on the simulation time step. If the input data was hourly rainfall, how these data were used for when the river routing was model with time step of 1 min, while other components of the water balance – 0.25 and 0.5 hours? Under such modelling condition, was any sensitivity analysis applied to assess 1 hourly rainfall data distribution with that hour on the simulated river flow and particularly the peak flow analysis? On the other hand what was the reason for vertical model discretisation for 45 layers? It is not particularly clear why such discretisation required. Overall the paper presents the results of an interesting modelling excise, but based on the described methodology it is not possible to judge how realistic the reported conclusions are.

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