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Interactive comment on "Using the Storm Water Management Model to predict urban headwater stream hydrological response to climate and land cover change" *by* J. Y. Wu et al.

Anonymous Referee #1

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This paper assesses the combined impacts of climate and land cover changes on urban storm water hydrology in five urban watersheds in the Mid-western US using the SWMM. Building upon previous research, the current research is carefully designed, well-structured, and generally easy to follow. The results of the study would be interesting to a wider hydrologic science community. While the intention of this paper is clear, some methodological issues and assumptions of their modeling need to be stated more explicitly. The literature review and discussion could be strengthened as well to provide a rich context of the current research.

Major comments

1. The uncertainty of the SWMM parameters in future impact assessment can be better addressed. While the streamflow data were collected for about 5 months, only one storm event was used to calibrate the SWMM, and another event was used for validating the SWMM. Since calibration is done manually, it is uncertain how SWMM parameters derived from such a limited event can be robust enough to assess future climate and land cover change impacts. The authors might find the following reference useful for addressing some aspects of uncertainties in their modeling of climate and land cover impacts on urban hydrology.

Jung, I.-W., Chang, H. and Moradkhani, H. (2011) Quantifying uncertainty in urban flooding analysis considering hydroclimatic projection and urban development effects, Hydrology and Earth System Sciences 15(2): 617-633.

2. The assumption(s) of a future climate change scenario need to be stated more clearly. A future climate change scenario, namely a precipitation change scenario, was created based on the trend of mean annual increase in precipitation in the study area and was applied for one summer rainfall event. What is the rationale of using the 10 June 2011 event as a reference period climate? Is this a typical rainfall event in the study area? What is the recurrence interval of that event? Is it reasonable to assume that a precipitation increase will be uniform throughout the year in the future? Do regional climate downscaling modeling results agree with this assumption?

3. The assumptions of land cover change projection and the method of land distribution over space can be better interpreted. It appears that future land cover change impacts are only addressed through changes in impervious surface areas (ISA). As stated in line 20 of Page 7100, the authors distribute increases in ISA evenly across each watershed. Does this mean that new ISA will be distributed spatially randomly or completely dispersed? What algorithm and computing environment is used to conduct this task? It seems that the authors used a semi-distributed approach (as explained in section 2.7), but I could be wrong.

4. Additionally, how did the authors assume potential changes in storm sewer pipes network and density as urban development areas expand? Since storm sewer systems directly short-cut rainwater to streams, it is important to consider where they go underground and where they come up land surface.

5. Figure 1 can be improved. Instead of showing the whole city area, it is better to focus on the study watershed and show relative distribution of impervious surface areas in each study watershed. As it stands, it is difficult to see where in the study watershed has impervious surface areas.

6. The authors need to give proper credit to previous related work. The study of the combined impacts of climate change and land development on hydrology using hydrologic simulation models has at least a decade of history in a global literature. The authors should give due credit to the following references to draw wider international audience.

Chang, H. (2003) Basin Hydrologic Response to Changes in Climate and Land Use: The Conestoga River Basin, Pennsylvania. Physical Geography, 24(3): 222-247.

Chung, E. S., et al. (2011). The relative impacts of climate change and urbanization on the hydrological response of a Korean urban watershed. Hydrological Processes 25(4): 544-560.

Poelmans, L., et al. (2011). The relative impact of climate change and urban expansion on peak flows: a case study in central Belgium. Hydrological Processes 25(18): 2846-2858.

The authors also find the following review paper useful for the revision of their paper.

Praskievicz, S, and Chang, H. (2009) A review of hydrologic modeling of basin-scale climate change and urban development impacts, Progress in Physical Geography 33(5): 650-671.

Other comments

Page 7096, line 24. Average annual precipitation for what period?

Page 7097, lines 2-5, Table 1 repeats the same information. I suggest the authors delete the two sentences. Simply say something like "Table 1 reports study watersheds characteristics. . ."

Page 7098, line 15, Insert "comma" before "and"

Page 7099, lines 15-20. Remove the description of the NSF statistic. It is well-known in the hydrologic science community.

Page 7101, lines 7-8, Why was WS4 chosen for assessing the effects of different distributions of land cover changes?

Page 7106, lines 25-27. Remove "Given variation. . . five study watershed". This does not well connect to the next sentence.

Page 7108, line 16. This is owing to differences in the magnitude of relative changes in different projections.

Page 7109, lines 19-20. "addition of impervious surface areas. . . stream hydrology and ecology" Be careful about the interpretation of the simulation results. This is only true if you look at the outlet of the whole watershed, but maybe not necessarily at different points in each sub-watershed (ditto for conclusions point #3).

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 7091, 2013.