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Hydrology and Earth System Sciences Discussions

Interactive comment on "Exploration of land-use scenarios for flood hazard modeling – the case of Santiago de Chile" *by* A. Müller and F. Reinstorf

Anonymous Referee #1

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The authors present a standard application of HEC-HMS in assessing the impact of various land-use scenarios on peak flows during extreme precipitation events. The paper is fairly well written, with grammatical issues throughout the context. I have several major comments as follows.

1. Precipitation forcing. Using precipitation observations from a single site to force the model over the whole study area (elevation varies in a large range) might be problematic. Apparently, the impact of precipitation could be more significantly than that of land-use changes. With that said, using precipitation data with higher spatial resolution likely leads to more dramatic changes in peak flows than the land-use scenarios considered in the study.

2. Sensitivity analysis. Except for precipitation, model parameters could also overrule land-use change in terms of altering flow peaks. Therefore, parameter sensitivity should be evaluated comprehensively. There are several shortcomings of the current sensitivity analysis: a) no credible flow observations available; b) analysis focuses on individual parameters only, the combined effects of multiple parameters are not investigated; c) no detailed results presented (e.g., model results with and without I_a optimized).

3. Scenario definition. The scenario development section is not self-explanatory. Particularly, it is unclear how scenario I relates to climate change. Does climate change result in the transferring of vegetation to barren land (as told from the table in Fig.3) and long drought periods (L21, P3994)? Also, comparing to 2009 land use, scenario III has more intermediate built-up areas (0.81 kmˆ2, which accounts for 2.2% of the total area of the study basin). Physically speaking, this 2.2% change in land-use very unlikely leads to such changes in peak flows as presented in Table 7 (for example, for 10-year event, there is 7.3% increase in flow peak). Those changes in Table 7 are caused by different parameters (which not appropriately reflect the land-use change) applied, which is a main science flaw of the study (also refer to comment # 2).

4. Flood hazard. The description on flood hazard is quite thin (section 6.3). The physical connection between peak runoff and flood hazard needs more clarification. The interpolation in section 6.3 is confusing and not convincing. Nothing from section 6.3 is presented in the conclusion section. In addition, the authors mess up the study area and the city. Evidently, the study area is largely undeveloped (with 0.02 kmˆ2 built-up out of 36.72 kmˆ2). There is no way that the peak flows derived from this study area can be extrapolated into other areas. As such, the title ("flood hazard modeling", "Santiago de Chile") largely overstates the work.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 3993, 2011.