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Hydrology and Earth System Sciences Discussions

Interactive comment on "Hydrological responses of a watershed to historical land use evolution and future land use scenarios under climate change conditions" *by* R. Quilbé et al.

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Two reviews of the manuscript have now been achieved and published as "Referee Comments" in HESSD. The referees are acknowledged for their work and valuable comments. They both agree in finding this paper interesting and suitable for publication in HESS, despite some deficiencies. Based on these evaluations and my own reading of the manuscript, the latter is accepted with major revisions for publication in the special issue "Man and River Systems: Long-term interactions between societies and nature in regional scale watersheds".

The authors are asked to write an "Author Comment" within 4 weeks to respond to

the referee comments and attributed short comments if any, and to submit a revised version of the manuscript accordingly. In doing so, they shall address each point of the referee comments and provide a list of all changes introduced to the manuscript.

In particular, as required by both reviewers, details should be given about the model GIBSI, including the processes described in HYDROTEL and RUSLE, the calibration, its validation and the related uncertainties of the model results, the knowledge of which is essential for their correct interpretation. The authors are also asked to pay attention to the concerns of Referee 2 about the climate change scenarios. A summary of the SDSM method would be useful, and more generally, it is not enough to send the reader to other papers, especially when they have not been published yet.

Apart from the referee comments, I have some personal questions about the comparison between the impacts of land use and climate evolutions. One important result of the paper is the correlation between historical land use and water discharge (Fig. 4 and 5). But water discharge is only displayed in Fig. 5 for the 7 years when a land use map is available, with what seems a simple spline interpolation in between. The model, however, is run over 30 years, so why not show the 30 annual values of water discharge? And why not show observed discharge? If the correlation is not revealed by observed discharge, it raises a concern about the model validation. In addition, 5 of the 7 land use maps are deduced from satellite images taken in September or late August, so it is likely that LAI for instance (one of the three vegetation parameters in GIBSI, cf. p. 1340) integrates the hydrological history of the growing season. In such a case, the correlation might as well mean that hydrometeorology explains land use, as that land use explains water discharge, as concluded by the authors.

Another important conclusion of the paper is that land use change has larger impacts on low flows than future climate change. From my point of view, the main conclusion from Fig. 7 and 8 is that both impacts are small. Secondly, Fig. 9 does not support the above conclusion if one compares climate change scenario HadCM3-A2a and land use scenario B. More generally, I completely agree with Referee 2 about the need for

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an analysis of the many climate change scenarios (7+2) and their uncertainties. Such an analysis is mandatory to justify that the average of the scenarios is meaningful.

As a minor comment, additional details should be given in the captions about the climate change scenarios. Does Fig. 6 include all scenarios or only those downscaled using the delta method? In Fig. 8, indicate the correspondence between the panels and the scenarios. In Fig9, define more clearly what is Ref, Sc95, ScA and ScB, as these scenarios are combinations of both climate and land use.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 1337, 2007.