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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.

R. Quilbé et al.

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First of all, we would like to thank reviewer #1 for his relevant comments.

They are anwered below :

General remarks

- Reviewer #1 : Unfortunately, basic information about models and calibration is hidden in companion papers in other journals or not available at all. This makes it very difficult for the reader to assess the results. This especially important because all models dealing the climate change go beyond the range of calibration (as also stated in the

paper)

=> Authors : Right. We have added information about the hydrological model calibration. Still, as detailed results are given by Fortin et al (2001b), we don't think it is necessary to go further in this paper. Regarding the erosion model, we have added some information about the calibration results in section 3.

=> We understand that the companion papers (Quilbé et al., 2007 and Savary et al., 2007) would have facilitated the understanding and the assessment of the results. Some parts of these papers will be joined to the revised manuscript for a better understanding.

Details:

1) the figures have smoothed lines (e.g. fig 5) which are not covered by measured data (e.g. between 1987 and 1990 are not covered by data). This also applies to fig. 4 - it should be clear which parts of the lines are measured! It is also not clear how the change in land use was interpolated between the Landsat-scences. The figure implies smoothing.

=> Right. We have modified fig.4 and fig.5. On Fig.5 land use evolution is now represented by histograms instead of curves. On Fig.4, the lines between the points have been removed. Data was not interpolated between the Landsat scenes.

2) it not clear how the discharge was simulated and how the single components were calibrated. Even the companion paper does not reveal all information. This is especially important as the model is not applied in other regions of the world. I would like to know how the basic hydrology works in this system (at least routing, calc. of evaporation). I want a clear statement which components (runoff, soil water, sediment?) were calibrated (preferable a table with the NS-coefficients). The corresponding sections 2 and 3 of the paper do not provide much useful information. The cited paper (Savary et al. 2007) is not available for review so the reader has to believe it or not.

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Interactive Comment

=> We have added some basic information about the hydrological model and its components in section 2, and about its calibration in section 3. However, it is impossible to describe it in detail in this paper. As it is said in the paper, a detailed description of HYDROTEL is given by Fortin et al. (2001a), and the calibration procedure and results are presented by Fortin et al. (2001b). The reader can easily consult these articles for further information. Further information have been added regarding the calibration of the erosion model. Regarding the cited paper (Savary et al., 2007), a part of it will be joined to the revised manuscript (as an appendix) for a better understanding.

3) the model only works with precipitation and min/max temperatures. What about humidity? How is evaporation calculated in the base run and the scenarios?

=> Indeed, the inputs of the hydrological model are daily precipitation and min/max temperature. Regarding air humidity, it is not used by the hydrological model since the evapotranspiration is not calculated with a Penman-Monteith equation but with an empirical equation from Hydro-Québec, which is only based on min/max temperature. This equation is described in detail by Villeneuve et al. (1998)

4) in section 5, many results of statistical tests are given - I do not think that this is a useful procedure given the uncertainties in the model itself and the autocorrelation in the land use data set (and maybe also in the climate data sets).

=> Of course, it is important to keep in mind the uncertainty linked to the models and methods used, and we have to make assumptions before interpreting the results (for instance that the GCMs used are the best ones and are representative). However we think that, when it is possible, statistical tests provide useful additional information, even if they don't get rid of uncertainty. For instance, regarding the effect of climate change on annual water discharge (section 5.2.1), there is a large variance among the different GCMs and the mean effect is slight so that it is not obvious we can conclude about an effect without performing a statistical test. The fact that the effect is statistically significant makes us a little bit more confident about the result.

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5) in fig. 9 the meaning of the upper and lower half of the figure is not clear

=> The upper half shows the results obtained with HadCM3-A2a and the lower half the results obtained with HadCM3-B2a. This has been specified in the legend.

6) section 4.2.1.: the procedures should be described briefly

=> We have added a short and general description of the downscaling methods used

7) in section 5.2.2. a reference is made to fig 4 - this seems to be wrong.

=> Right. It has been corrected and replaced by Fig. 6

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