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Hydrology and Earth System Sciences Discussions

Interactive comment on "Soil erosion and sediment delivery in a mountain catchment under land use change: using point fallout ^{137}Cs for calibrating a spatially distributed numerical model" *by* L. C. Alatorre et al.

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Reviewer: The authors calibrate a spatially distributed catchment erosion model using internal soil erosion data (from 137Cs measurements) and validate it using independent sediment yield data for the catchment outlet. It is frequently stated that spatially distributed models should be tested against internal data and not solely the outlet response. Testing solely against outlet data indicates the ability of a model to reproduce the integrated catchment response but does not guarantee that the model is repre-

senting internal conditions correctly; e.g. it might be possible to simulate an apparently correct outlet response on the basis of compensating errors in the internal simulation. Too frequently, though, internal data are not available for model tests. Thus the authors' study is highly commendable and is a rare example of the ideal approach to testing a catchment scale erosion model. The paper should be published, subject to minor corrections as follows.

Authors: We acknowledge the work done by the reviewer. We have gone through all his specific comments and have ammended the original manuscript when necessary. In the following lines we provide answers to the specific comments.

R: 1) Page 11141, line 10. It would be useful to have at least a summary of how the RUSLE parameters were evaluated for the Arnas catchment.

A: We have added a bit more information at this point, but we believe the details of the procedures used are better suited for a supplementary material to not overload the manuscript with technical details that are out of the main scope of the paper.

R: 2) Page 11141, line 5. Should there be a reference to Table 2 somewhere here?

A: We have decided to remove Table 2 from the main manuscript, since the same information is provided in the supplementary material, section 1.6.

R: 3) Page 11141, line 11. Should there be a reference to Fig. 2 somewhere here?

A: We have included a reference to Figure 2 in the text.

R: 4) Page 11141, line 16. Where was the reference 137Cs inventory taken? On a flat area not affected by erosion or deposition?

A: The reference inventory was indeed taken on a flat area not affected by erosion processes. We have included a reference to this fact on the text.

R: 5) Page 11142, line 7. Just to be clear, were the point 137Cs estimates compared with the model simulations for the 5-m x 5-m model grid square corresponding to the location of the 137Cs measurement? This should be stated. Given that the model grid square is unlikely to be an exact topographic representation of the catchment at that point, would it be more appropriate to use the average model simulation over a larger number of grid squares?

A: The point 137Cs estimates were indeed compared with the model simulations for the 5x5 m grid cell corresponding to the location of the Cesium measurement. We have stated that in the text. We understand the reviewer's concern about one grid cell not being representative of the erosive processes at that point, and we find the proposed methodology very interesting and possibly useful for further studies. However, we did not find necessary repeating the calculations of this study, since our results were nevertheless significant.

R: 6) Page 11142, line 8. The Nash-Sutcliffe method is more commonly used to show the fit of simulated time series rather than point events. It would be better to use a more appropriate test such as the mean standard error.

A: It is true that the Nash-Sutcliffe (NS) statistic has been mostly used in hydrological simulations with time series, but nothing prevents its use as a model efficiency statistic as long as there are measured data for the modelled data to compare with. Besides the NS statistic, we also used the relative root mean square error (RRMSE) as a goodness-of-fit indicator. We consider that these two statistics combined provided a good description of the model performance.

R: 7) Page 11143, line 6. The comparison in Fig. 5 could be read as suggesting an independent test of the model. The sentence should therefore be revised to note that the Figure shows the results of the calibration and therefore it is to be expected that there is a strong relation, but it is not an independent test.

A: We understand the reviewer's concern about Figure 5. We have rephrased the figure caption and the text in the manuscript to stress that what is shown is not the result of an independent test.

R: 8) Page 11143, lines 8 and 22. Figure 4 is referenced after Fig. 5, which is incorrect. The figures should therefore be reversed.

A: We have corrected this mistake in the revised manuscript.

R: 9) Page 11143, line 24. The failure of the alternative calibration, based on outlet data, demonstrates the importance of using internal data. The authors could emphasize this point some more.

A: This is indeed a major result of our work, and we would like to stress it as a take-home message. We have stressed this idea in the abstract of the manuscript.

R: 10) Page 11143, line 18. Which seven years were used for this calibration (give the dates)?

A: We have indicated the time span of the hydrological monitoring in the revised manuscript.

R: 11) Page 11144, line 10. It should be acknowledged that, according to Fig. 6, the model underestimates high sediment yields and overestimates low sediment yields. The implications of this for the scenario simulations should be discussed in subsequent

sections.

A: We have acknowledged this in the comments derived from Figure 6.

R: 12) Page 11146, line 6. Are these sediment yields plausible? Have similar values been measured for heavily cultivated catchments elsewhere in the general area?

A: Yes, they are plausible. A comparison with independent measurements is done in the discussion section, a few pages later.

R: 13) Figure 3. The contour values are almost too small to read. They should be in a larger font.

A: We have corrected this in the revised manuscript.

R: 14) Figure 5. The caption should explain the dashed line.

A: We have added an explanation to the figure caption.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 11131, 2011.