General comments

I reviewed the paper “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 Alatorre et al. in HESS. Overall, the paper is well written and understandable. The applied methods and results are easily understandable and clearly explained in the text. I have however a number of concerns. Although results appear to be very good, I have questions on the validity of the used calibration method. The paper is well written and it has a good scientific quality. In the following paragraphs I will discuss my concerns on this paper. I believe that this paper is suited for publication after some additional analysis.

Specific comments

My main concern for this paper is on the use of the calibration dataset. The authors are using 19 cesium-derived erosion/deposition values for calibration, and a 7-year sediment yield of the catchment for validation. This kind of models is very sensitive for errors at the pixel scale, while aggregation to larger scales reduces errors largely (e.g. Van Rompaey et al., 1999). As a consequence, calibration will be largely hampered and the high model efficiency (0.8) may provide a false idea of accuracy of the model. In order to overcome the problems with cesium-data (point data) for the calibration of the model, a large number of cesium data can be used, in order to get a catchment integrated result. E.g. Van Oost et al. (2005) use 36 samples for a much smaller catchment/study area.

In addition, the difference between the calibration set (watem/sedem calibration based on the Cs derived erosion-deposition) and the “application of the model” (p 11143 r 6 – r17) is not entirely clear to me? Don’t you compare here twice the same things (Cs-derived values with the modeled values, and this for the optimal Ktc-calibrated values); and if you compare the same things, why is there such a large difference between an R^2 of 0.5 and the model efficiency of 0.8?

A possible solution for these calibration problems could be to test whether the number of use calibration points is large enough. In order to achieve this, a monte-carlo type approach can be used. A large number of iteration (n >100) can be used for which each time the Ktc factors are calibrated, each time using 80% of the input points (randomly selected). In this way the error on the Ktc-calibration values can be assessed.

A second point of concern is the application on the past land use map. For this map the study area is fully occupied by annual crops (p 11145 r 19). However, the contemporary land use contains almost no cropland (fig 2B), which may result in a bad (or no) calibration of the Ktc values for this type of landuse. This problem may by partially tackled by the abundance of other land use types with a comparable C-factor, but it will be appreciated if the authors at least mention this potential problem.

Smaller comments:

The Ktcmax and Ktcmin factor are used for crop-types with c-values which are larger or smaller than the “Ktc limit value”. The authors do not mention which Ktc limit they used, so I assume they used the standard value of 0.1. Please mention this.

On the discussion of the SDR (p 11148-11149): take care to take into account the different difinitions and calculation methods for erosion and/or export! See also the paper of Parsons (2011; Progress in physical geography).

When looking at fig 7 & 8 (especially 8A), a pattern appears with banded structures of erosion and deposition zones. Are they realistic and e.g. caused by terrace like structures in the landscape. Such banded patterns may also result from unrealistic banded patterns in DTMs. This can be avoided by applying different kernel-filters to your DTM. Such filter techniques alter the altitudes of the DTM minimally (only a few cm) but may have a large influence on the modeled erosion/deposition pattern.

Technical corrections

Abstract: please mention in your abstract the size of the study catchment

P 11137 r 5: “soil erosion and sediment transport” should be “soil erosion and sediment redistribution” as it not only models transport but also deposition

P 11138 r 16: please make clear that Ktcmin and Ktcmax are not only the two extreme values Ktc will take, they are just the two only possible values it will take!

R 20: please mention a reference for the proposition to take the ratio between Ktcmin and Ktcmax fixed

P 11140 r 3: is the mentioned slope gradient of 0.28 m/m or 28% correct? If it is correct, this is not a low slope gradient.

P 11143 r12: “5 and 2” should be “points 5 and 2” to avoid confusion

Add a clear conclusions paragraph!

Please add some information on your different land use scenarios (contemporary, past and future):

- A table with an overview of the area of each land use type (in km² or %)
- Clear maps of your future and past land use scenarios