

## **Referee comment on the paper:**

### **The impact of roads and sediment basins on simulated river discharge and sediment flux in an experimental catchment designed to improve ecosystem services**

By Sandra Isay Saad, Humberto Ribeiro da Rocha, and Jonathan Mota da Silva

#### **General comments**

After an initial evaluation I consider that this manuscript is not suitable for publication. Not only are the objectives of the paper not very well defined, but the basic data and the technics employed for analysing the results are deficient, ending with a set of rather unsupported scientific conclusions.

In terms of the journal's principal review criteria, it is considered that the manuscript is deficient in terms of scientific significance (it does not represent a substantial contribution in terms of new concepts, ideas, methods or data), scientific quality (approach and methods applied are not conclusive, absence of an appropriate amount of references) and presentation quality (methods, results and conclusions presented in a very unclear and poorly-structured way, inclusion of irrelevant and/or confusing figures, misuse of technical terms, constant errors in spelling and grammar, extremely ambiguous explanations, etc.).

#### **Specific comments**

In short, the paper attempts to utilize both, a dataset collected in a small catchment in Brazil and an existent hydrological and sediment model, to quantify the annual streamflow and the soil loss during four hydrological years, along with the catchment's soil trapping capacity, including the effects of roads and sediment-traps.

Considering the enormous variability in streamflow but, most importantly, in suspended sediment concentrations in the river (which is usually associated to continuous records of a more easy-to-measure variable like turbidity), the amount and quality of the data presented is poor as to allow an appropriate integration and quantification of the annual water and sediment yields in this small catchment.

On the conceptual side, the authors intend to use data and compare results from very different time scales (from instantaneous or point observations to annual estimations), which compromises the associated calculation uncertainties, and the accuracy and precision of the respective comparisons and conclusions.

Modelling results at the annual scale using methods like the Universal Soil Loss Equation (USLE) are not directly comparable with quantifications from continuous field measurements that could be accounting for process-based events like peak flows, unless special considerations are made. In addition, the authors never mentioned in the manuscript that the USLE provides estimations of sheet erosion only, and that transported erosion (sediment yield) is only a fraction of total erosion (which includes sheet, rill, interrill and gully erosion). Some other methodological deficiencies are

not further commented like. For example, the use of an indirect method to assess the USLE's erosivity factor "R", which certainly compromise the quality of the estimations of annual erosion rates at such small scale. Other difficulties are not mentioned by the authors, like that of utilizing a particular GIS-based routine to assess the length – slope gradient factor (LS) at the catchment scale.

The modelling exercise is not well structured and the objectives are unclear. The flowcharts of calculations from observed and simulated data (Fig. 16) proved that calculations were made in one or another direction, without a clear idea of what its purposes were.

The calibration method seems conceptually unacceptable, since it merely consist in playing with the values of a relatively well defined land use property (the crop factor of pasture), to force the model to produce the desired output.

The conclusions are not relevant, and many of them even acknowledge the significant deficiencies in the data and methodology employed. Sampling and uncertainty is a major problem here, while explicitly expected modelling results could never lead to valid conclusions (i.e., the supposedly proven effects of roads and sediment traps on actual sediment yield in the catchment based only on the results of a model that was explicitly programmed, executed and forced to produce such results). Other unsupported conclusions like that the InVEST model is appropriate "for the mean and current state of the watershed" is not precise and, anyway, not proven according to independent observations or any validation methods accepted in hydrological sciences.

### **Technical corrections**

I considered impractical to include technical and typographical corrections to this manuscript, or any typing suggestions, considering they would be too many. I rather encourage the authors to reformulate the paper in both the conceptual and technical aspects, and to fully rewrite it according to a typical structure and style of such a scientific document.