

Interactive comment on “A spatially distributed analysis of erosion susceptibility and sediment yield in a river basin by means of geomorphic parameters and regression relationships” by S. Grauso et al.

Anonymous Referee #1

Received and published: 9 May 2007

General comments :

The paper aims to predict the amount of river sediment supply at various sections of the channel network. The methodology is based on the use of simple empirical relationships (with geomorphic parameters) within a watershed in a spatially distributed mode. The Calvano watershed in Italy is used as application case. Despite their simplicity and the lack of mechanistic basis, the empirical methods used herein are still used in engineering practices for the estimation of sediment yield. The topic is of international interest for river engineering works and the paper presents an applied approach. How-

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

ever, the methodology presents some weaknesses and the results don't present any advancement in hydrologic-erosion-sedimentation processes. The paper needs major revision especially for validating the results. My comments concern :

The objectives : The objectives of the paper are not stated clearly. It is not clear if the objective is to validate the empirical relationships and to propose comparable methods to the USLE for Italian basins, or to understand the physical processes on the Calvano watershed. It is not also clear if the originality of the paper is the application of the empirical relations at various scales corresponding to various sub-watersheds sizes. In this case, the important and difficult problem of scale effects needs to be discussed in detail function of the international literature. Another point which needs to be clarified concerns the originality of the paper when dealing with the "spatially distributed analysis": comparison of the method used herein to spatially distributed models, etc. The conclusion and discussion deal also with "flood protection". The objectives needs to be clarified in order to discuss the paper results either for technical river engineering applications or for research applications.

The methodology : The methodology used is based on simple regressions using geomorphologic parameters. The lack of mechanistic fundament of these equations doesn't enable to make physical interpretation of hydrologic and sedimentation processes as given in section 4 "Results and Discussion" (pp 638-640). The conditions used to establish and to apply equations (1a, 1b, 2a, 2b) needs to be defined clearly : climate, geomorphology, soil, land use, etc. The empirical method needs to be compared to other empirical methods in the literature. Another point concerns the sensitivity of the results on the delimitation of subbasins and on the algorithm used to subdivide the basin into subbasins. The paper can be strengthened by analyzing how the empirical relationships can be applied on virtual subbasins corresponding to various sizes and shapes.

The data : The choice of the study site and the data used needs to be justified function of the paper objectives. If the objectives is to analyze the processes on the studied

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

basin, a physically-based distributed model can help to compare empirical and mechanistic models. However, if the objective is to validate the empirical equations, the paper needs to be strengthened by using additional basins corresponding to various climatic and soil conditions, and where data are available. Another point concerns the uncertainties on data and on equations results. The uncertainty needs to be addressed when commenting numerical results in Tables.

The interpretation of the results : The paper doesn't address the domain and limits of application of the empirical method : hydroclimatic conditions, geographical conditions, where inside and outside Italy, elsewhere in the world. A question also arises is how to generalize and use the methodology in other contexts and how and when the results can be extrapolated to other sites. It is not also clear if the domain of application of the methodology is ungauged basins.

Specific comments :

The objective needs to be stated clearly in the "Abstract".

Page 629, line 20 : It is stated that the USLE is successfully applied in many parts in the world. However, the USLE can also give bad results. Please discuss function of the international literature.

Page 630, lines 1-4 : In order to avoid a long list of references, discuss separately the originality of each paper or a group of papers.

Page 631, line 15 : Check the reference Nisio et al., 1997 in the text or 1996 in the reference list.

Section 3.1. : compare the regression relationships to other empirical and physically-based approaches. What are the domain and limitation of each approach. Justify the choice of the approach.

Page 635 lines 3-7 : Explain why the regression (1a) is used for 4th and 3rd order and regression (2a) for 1st and 2nd order). The delimitation of 1st order channels can be

very sensitive to the quality of DEM and maps. How to deal with the uncertainty on Strahler ordering system.

Page 635, lines 17-26 : Explain the algorithms used in the GIS tools : how to extract channel network, and delineate subbasins? What are the parameters of these models and is there only one basin subdivision?

Page 636, line 3 : Explain what kind of geometric and topologic inconsistencies and how they were automatically removed. Are these “geometric inconsistencies” correspond to natural or artificial depressions? What is the sensitivity of the empirical equations to the GIS algorithms.

Page 637, lines 15-25 : Give the uncertainty on the test reservoirs volumes.

Page 638, line 5 : Do data enable to have the accuracy of 69.57 m³/year. The same question can be asked for all calculated values in the text and in the Tables.

Page 638, line 16 : Idem with the accuracy on 792.50 Mg/km².

Page 638, line 19 : Justify the value of 12000 Mg/km²/year.

Page 638 : How to deal with the annual variability of rainfall.

Page 640, line 6 : Justify the value of the bulk density 1.2 Mg/m³.

Page 641, lines 16-19 : The results doesn't enable to validate that the approach “can provide a tool to easily locate the hydraulic risk”.

Tables 1, 2, 3, 4 : The empirical relationships don't allow to give results with a precision of more than 1/10000 as in the Tables. The calculated values of SSY needs to be given after an uncertainty analysis as an estimated value : for example 2700 instead of 2691.90.

Figure 1 : The map of Europe and the Mediterranean region is not needed.

Figure 2 : Explain in the text the link between the geo-lithological classes and the

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

erosion-sedimentation processes.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 627, 2007.

HESSD

4, S266–S270, 2007

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper