

***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.***

**S. Grauso et al.**

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We are grateful to the Anonymous Referee #2 for his constructive review. We particularly appreciate his recognition of the potential practical value of the approach. The main criticism of the Referee is concentrated on the reliability of the validation data. We were realistic in admitting that these data are affected by uncertainty. However, we would like to point out that cumulative data of SSY are rare and always uncertain. In this respect, we would like to emphasise what we have written in the paper (p. 637, line 11-13): the data, in our opinion, allow one to carry out a meaningful evaluation of the model performances, as for a catchment which is subjected to a significant soil

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erosion. In order to be more clear about this issue, we would like to make clear how the data were derived.

For the reservoir 20-Pineto, the initial design storage capacity was 35.000 cubic metres, while after 5 years the local administration estimated a residual capacity of 30.000 cubic metres. The residual capacity was evaluated through direct measurements of water depths in different locations of the reservoir.

The reservoir 119-Atri had a design storage capacity of 70.000 cubic metres. After 35 years, the owners of the resevoir estimated a storage capacity of 67.500 cubic metres, again with direct measurements of water depth.

The siltation of the reservoirs 147-Atri and 141-Atri was estimated by evaluating the voume of the sediments that were removed during dredging.

These are classical measurement methods for determining reservoir siltation.

We believe the data are of course uncertain, as they were derived through point measurements of the reservoir geometry or assessment of the sediment volume removed after dredging. However, we wish to emphasise that any hydrological measurement is affected by uncertainty and we wanted to be clear in admitting the limits of our data. We feel that it is now necessary to stress that these data constitute a good piece of information. We did not exhaustively described in detail how the data were estimated for the sake of manuscript brevity. We are willing to provide more details and to perform an evaluation of data uncertainty.

We do not think the level of uncertainty is as such to make the data unreliable for validation purposes, as they depict a situation which is consistent with direct measurements operated in similar catchments (Ciccacci et al., 1980; 1987). Moreover, we think it is important to note that the modelling results are coherent with the situation depicted by the data. If one looks at table 5, columns 8 (estimated SSY) and 9 (predicted SSY) a consistent comparison can be carried out. In particular, it is interesting to note the

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capability of our approach to predict the high siltation occurred in reservoir 147-Atri. We believe that an average error of 36% is a potentially interesting result when dealing with reservoir siltation estimates.

The weakness of this evaluation is in the considered value of lacustrine sediment density, which, in absence of direct measurements, was attributed by taking into account a presumed theoretical value (1.2 g cm<sup>-3</sup>) attributable to soft fine-medium coarse sediments (non consolidated). To this aim, we could effort to consider different results from different density values ranging from a minimum (less consolidated sediment) to a maximum (more consolidated sediment), that is, from 1.2 to 1.8 g cm<sup>-3</sup>.

We recognise that the evaluation of data uncertainty and the information content of observed data is a subject that can be affected by a very high subjectivity. This is clearly shown by the strong debate that is currently on going within the hydrologic community about uncertainty quantification in general. We recognise that the uncertainty in SSY measurements is much higher than the uncertainty associated with many other hydrogeological observations. Therefore we admit that our opinion is subjective as well.

The Referee is correct in noting that to collect more validation data is not possible. However, we would like to emphasise that it is possible to study the sensitivity of the model performances depending on reasonable hypothesis on data uncertainty. This further development can be done by following the classical approaches proposed by the hydrological literature (sensitivity analysis and GLUE-like studies), therefore showing that the presence of uncertainty does not make the model results inconsistent with the siltation data. We are willing to carry out such evaluation if the Editor feels that it would increase the value of our study.

In the same way, we are willing to substantiate the value we assumed for the lacustrine sediment density.

Finally, we would like to comment about the validity of the regression relationships. A concern of the Referee is the lack of an extensive validation. We believe the validity of

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the methodology was already discussed in detail by Ciccacci et al. (1980; 1987). However, if the Editor feels that the effectiveness of the technique needs to be substantiated again within the present study, we may report the results of a jack-knife validation that we performed by using the data of the 20 catchments considered when deriving the relationships themselves. We believe this is a meaningful and extensive proof of the validity of the approach.

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