

## ***Interactive comment on “A Process-Based Rating Curve to model suspended sediment concentration in Alpine environments” by Anna Costa et al.***

### **Anonymous Referee #1**

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In the submitted paper authors propose a new method for the estimation of the daily suspended sediment concentration (SSC). The method is based on the relationship among SSC and three variables, namely the total daily basin-averaged erosive rainfall, snowmelt and icemelt. These three variables are estimated based on the daily gridded datasets and model results. The authors in the proposed method (PBRC) do not directly use daily discharge as one of the factors influencing the SSC. The best characteristics of the response time lags are estimated using the iterative input selection methodology. The proposed model is compared to the traditional type of sediment rating curve model. The comparison is made using the data from the Alpine catchment in Switzerland. The results indicate that the proposed methodology yields better es-

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imates of the SSC than traditional rating curve and it is able to better reproduce the seasonal variability in the sediment transport.

The paper is well written and the presented topic is in the scope of the HESS journal. The paper also presents a novel concept for the SSC estimation (to the best of my knowledge) and the methodology used is clearly described. The language is understandable and the text is readable. I only have next comments/suggestions:

Page 4, Equation 1: arc and brc should be defined.

Page 5, lines 17-18: A statistical test could be used to confirm this assumption (e.g., Grubb's test for outliers). Otherwise, selection of this threshold seems arbitrary. Alternatively, authors should additionally describe their decision.

Page 5, line 23: Replace "SE the" with "SE is the".

Page 6, lines 3-4: You could mention, which spatial statistics were used.

Page 9, line 19: More discussion about the catchment time of concentration could be added.

Page 10, lines 3-4: Corresponding p-value could be added to the R2.

Page 11, section 4.2: I find this discussion very interesting. My question is: would SSC estimation results using just ERT-1 variable be much worse than using all three parameters? Additional calculations are needed in order to derive the IM and SM values. Thus, what is the trade-off between model complexity (adding additional variables) and estimation results? Authors could make a comparison or expand the discussion about this.

Page 11, line 12: Probably Figure 4a and not Figure 3a?

Page 13, lines 1-3: Sediment connectivity could be estimated using the SedInConnect tool that was developed by Cavalli et al. (2013) (reference is also cited in the submitted paper) and is available at: <https://github.com/HydrogeomorphologyTools> or

<http://www.sedalp.eu/download/tools.shtml> since DEM is available. Thus, you could confirm this hypothesis.

Page 14, Table 4: Besides these criteria you could also check the descriptive statistics of residuals because these can sometimes reveal additional information.

Page 16, lines 18-19: What about other goodness-of-fit criteria?

Page 18, line 17-19: Could this observation be confirmed with some statistical test or could maybe additional analysis proposed under comment Page 11, section 4.2 be performed?

Pages 18-19, Conclusions: Some general conclusion could also be added about the complexity of tested methods.

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