

Interactive comment on “Measurement of spatial and temporal fine sediment dynamics in a small river” by Y. Schindler Wildhaber et al.

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Dear colleagues,

Here bellow comes some general and detailed comments regarding the paper submitted by Wilhaber et al. and currently in open discussion in HESSD:

On behalf of the RIVER team (LTHE, Grenoble, France), I would like to thank the authors for this contribution that has been particularly interesting to initiate a constructive discussion on fine sediment monitoring in our group.

General comments: This paper deals with fine sediment dynamics in small watersheds in Switzerland. The final objective of the work is a better understanding of the im-

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pact of fine sediment on the aquatic ecosystem, in particular on gravel spawning of brown trout *Salmo trutta*. The authors have deployed a large panel of conventional instruments as well as low-costs techniques to monitor fine sediment at high spatial and temporal scales, during two hydrological seasons. Suspended sediment concentration has been characterized with automatic samplers, turbidimeters and suspended sediment samplers. Near bed processes (sediment infiltration, bedload and bed sorting) were quantified at the three hydrological stations with sediment baskets, pressure transmitter probes, bedload traps and freeze cores.

Based on this very complete monitoring effort the authors provide an interesting quantification of sediment fluxes in suspension and near bottom. Globally, the paper could be improved by making a deeper analysis of the processes (physical and geomorphological) at the origin of the observed and quantified dynamics: what are the driving factors of the sediment connectivity, from upstream to downstream (some rain parameters, some water discharge parameters or some baseflow related parameters)? What controls the temporary storage of fine sediments in the coarse bed matrix? The authors have a nice and complete dataset that could be used to point out more clearly the hydro-sedimentary functioning of their hydrosystem. One of the most critical and interesting issue that needs to be precise is related with fine sediment infiltration. Through sediment basket analysis, the authors measure a vertical flux of infiltration, from week to week and also globally, at the end of the hydrological season. Their monitoring strategy takes into account the partition between silt and sand particles, which could be particularly useful to define the predominant phases of resuspension/deposition/infiltration, as well as sediment sorting. While the topic is clearly of interest; the authors need to discuss how sediment basket measurements can be used to characterise rigorously the processes of infiltration occurring in situ. Sediment basket is indeed a technique that consists in replacing a bed sediment sample (125 mm in diameter, 160mm in depths in this study) by a matrix where the <4mm particles have been removed. The fine sediment infiltration measured by such a system is thus representative of a maximum rate of infiltration which necessarily overestimated the

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real capacity of sediment infiltration taking place in the real bed, where particles lower than 4mm are already clogging some pores. If we exclude the upper pavement zone, where the fines particles are washed away, riverbank matrixes always contain a good proportion of sand, silt and clays so that the initial condition simulated by sediment baskets virtually never exists in the field. I guess some previous contributions on sediment infiltration have pointed out the question but it need to be discussed here in details to strengthen the analysis of the results. One potential improvement of the methodological approach could consist in following sediment basket infiltration from week to week without removing the fine sediment trapped in the basket. The initial conditions that are mainly driven by an artificial situation will diminish from week to week.

Detailed comments: We noticed many details within the core of the text. The most important are given bellow: P11317 line 20: “Thus, direct . . . deposition.”. Connecting SSload to sediment deposition over time is exactly the kind of physically-based discussion that could strengthen the paper Section 2.2. What is the depth of OBS sensors? P11322: If you analyse the vertical distribution of clay, silts and sand for both sediment baskets and freeze core samples, do you observe similarities? P11325: If you read in details Minella et al. (2008) you will see that there is no clear description of cross-section SS variations. To our knowledge the most relevant publications on this subject are the ones of Horowitz and the present study. P11326 last line. Interesting (see the previous comment on cross section variability). P11327 and P11328 lines 20-22: may be your paper should refer or speak about the washload concept. P11329 last line: by removing your sediment baskets from fines, you artificially contribute to the increase of the capacity of sediment infiltration. P11330 l11 : exponentially P11331 last line: quite Section 3.5.2 Table 9 does not exist P11332 l19: purely linked with instrumental biases or not? P11333 l23:”Fine sediment . . .site C”. You previously mentionned that SS increases downstream and that sediment infiltration is positively correlated with SS. Isn't in contradiction with this sentence? P11334: I do not feel it very interesting to go through this statistical interpolation at the end of the paper. Table 1: watershed areas are probably inversed. Fig.5: I could be nice to have the same range of x-axis fluctu-

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ations for sites A B C. Fig.7: as you have OBS series, it could be more interesting to link weekly infiltration with weekly sediment yield (in tons as the product of the water discharge with the SSConcentration).

We do hope these comments will be helpful, Nicolas Gratiot, on behalf of the RIVER team members. <http://www.lthe.fr/PagePerso/gratiot/>

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 11315, 2011.

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