Many thanks to Nicolas Gratiot and the RIVER team for the very constructive comments. They are a great help to improve the manuscript. Below you will find our detailed response (in red) to their comments (black):

Here bellow comes some general and detailed comments regarding the paper submitted by Wildhaber 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 impact 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 improve by making a deeper analysis of the processes (physical and geomorphologic) 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)?

Author reply: Yes, you are right, those aspects would be interesting. Unfortunately we do not have discharge measurements and precipitation data in high spatial resolution. We also believe that taking all those factors into account would go beyond the scope of the manuscript.

What controls the temporary storage of fine sediments in the coarse bed matrix? The authors have a nice and complete datasets that could be used to point out more clearly the hydro-sedimentary functioning of their hydrosystem.

Author reply: Sediment infiltration is mainly driven by a high amount of suspended sediment in the stream water (Section 3.5.2.). Above a certain water level, we found an equilibrium of sediment input and scouring (Section 3.2). Vertical hydraulic gradient also controls the temporal storage of sediments. In upwelling zones, less sediment gets accumulated than in downwelling zones (Section 3.5.3.). We will try to discuss those measured factors more clearly and deeper.

One of the most critical and interesting issue that need 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 characterize 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 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.

Author reply: Yes, we totally agree with you that the sediment infiltration measurement is connected with some fundamental problems. Their usability strongly depends on the purpose of the measurement. With the infiltration baskets one can e.g. assess the time needed for siltation of a freshly cut redd. In addition, they are a quasi standardized method to obtain relative differences of fine sediment infiltration per week between sites. A weekly sediment infiltration value is assessed, which is spatially and temporally comparable between sites. But those values are not comparable with natural conditions due to the reasons you've mentioned above.

To study sediment infiltration close to natural conditions, Greig et al. (2005) assessed the temporal sediment accumulation by installing multiple small, porous infiltration pots. At each time step (2 weeks), two small pots were randomly removed. This allowed seven measurements during the spawning period. Problems concerning this method could be the spatial variability among the pots and the loss of pots at high flow (once lost, lost forever, the problem we had with the accumulation baskets). We will discuss these points in section 3.2.

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.

Author reply: Yes, maybe this would be a possibility. But while measuring the infiltrated sediment, the sediment structure would be disturbed as well. We believe that reaching natural conditions is not possible, even when the fine sediment gets refilled. In addition, one could not distinguish newly infiltrated sediment from the infiltrated sediment in the past, since one has to take erosional and depositional processes into account. Thus, the difference between the amount of fine sediment between one week and the past week would not equal the sediment infiltration during the week. We will add those points to the discussion in section 3.2.

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

Author reply: The connection between SS load and sediment infiltration was made in Fig. 7 and Table 8, where a significant relationship between SS load as well as SSC_{NTU} with sediment infiltration can be seen. With small SS we have rather sediment depositional processes, with higher SS, erosional processes increase (mainly at site B und C). We will add a discussion about this in greater detail in section 3.5.2 and in the conclusion.

Section 2.2. What is the depth of OBS sensors?

Author reply: The OBS sensors were mounted in about 20 cm depth, about 5 cm above the riverbed. We will include this information in the manuscript.

P11322: If you analyze the vertical distribution of clay, silts and sand for both sediment baskets and freeze core samples, do you observe similarities?

Author reply: While emptying the sediment baskets, the sediment layers get disturbed. Thus, we were not able to measure the vertical distribution of the fine sediment in the baskets.

P11325: If you read in details Minella et al. (2008) you will see that there is no clear description of crosssection 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).

Author reply: Yes, you are totally right. Minella et al. (2008) describe the cross section SS variation in their introduction, but they did not actually measure the cross section variation in their study. We will change the citation to Horowitz et al. (1990) and Spreafico et al. (2005) (a report from the Swiss federal office for water and geology where, amongst others, the cross section variation of 65 rivers was analyzed).

P11327 and P11328 lines 20-22: may be your paper should refer or speak about the wash load concept.

Author reply: We believe that introducing the wash load concept here would be too confusing, especially because the precise definition of wash load varies in the literature (e.g. Hyoseop et al., 1986.; Yuill and Gasparini, 2011). In addition, it would be difficult to define which part of the measured SS or SSC_{NTU} accounts for the wash load and which for the bed-material load.

Einstein (1950) defined the wash load as the grain size of which 10 percent of the bed mixture is finer. In our case, that would be at site A: 0.89 mm, site B: 0.86 mm, site C: 0.72 mm (assessed from the freeze core samples). There is no significant difference between the sites. This means – according to the wash load concept - sediment < 0.8 mm are not significant represented in the deposited material and get just washed through the channel. This is not true for our accumulation baskets. We have 6 – 17 % of sediment < 0.25.

P11329 last line: by removing your sediment baskets from fines, you artificially contribute to the increase of the capacity of sediment infiltration.

Author reply: On page 11329 we are talking about the accumulation baskets. In those baskets, the fine sediment was only removed at the beginning. The effect of the initial removing of the fine sediment on the total accumulated sediment is described on line 17, p.11329 and following.

P11330 l11 : exponentially

Author reply: Yes, you're right. Thanks for that.

P11331 last line: quite Section 3.5.2 Table 9 does not exist

Author reply: That must be a typesetting error. We wanted to refer to Table 8. Thanks for that.

P11332 l19: purely linked with instrumental biases or not?

Author reply: Yes. What we describe there is an instrumental bias. We will emphasize this better.

P11333 l23:"Fine sediment : : :site C". You previously mentioned that SS increases downstream and that sediment infiltration is positively correlated with SS. Isn't in contradiction with this sentence?

Author reply: We do not believe that this sentence is contradicting. Yes, we found a positive correlation between SS and sediment infiltration within a week. At site A we also found a positive relationship between SS and sediment accumulation. But there is no relationship between SS data of all three sites and sediment accumulation data of all three sites. We believe that the reasons for these differences are higher resuspension and scouring due to a higher bed shear stress above the redds due to higher water level at the downstream site C (Table 1). We will emphasize this point stronger.

P11334: I do not feel it very interesting to go through this statistical interpolation at the end of the paper.

Author reply: We agree. We will eliminate the equations 2 to 8 and only indicate the R^2 and p of the relationships. As such, we will reduce the emphasis on the statistic.

Table 1: watershed areas are probably inversed.

Author reply: Yes, you're totally right. Thank you!

Fig.5: I could be nice to have the same range of x-axis fluctuations for sites A B C.

Author reply: Yes, we will change the x-axis to the same range for all sites.

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).

Author reply: Unfortunately we have only water level measurements at the three sites but not discharge measurements. Consequently, we can not calculate weekly sediment yield. In addition, we noticed a better correlation between SS load in the SS samplers and sediment infiltration than SSC_{NTU} and sediment infiltration (see page 11331, line 21 and following).

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