Response to Reviewer's Comments on

Sedimentation monitoring including uncertainty analysis in complex floodplains: a case study in the Mekong Delta.

By Nguyen Van Manh

The present paper addresses the problem of sedimentation monitoring in deltas. It is based on an intensive field campaign, during which 450 sediment traps were distributed strategically in the complex floodplains of the Mekong delta. At the end of the field campaign, 171 traps were recovered and various water and sediment properties were measured. This large scale campaign thus provides an unprecedented dataset spatially distributed over a wide delta.

The work follows two complementary objectives: (i) to propose a methodology to monitor sedimentation and evaluate the trustworthiness of sediment traps (ii) to assess the pattern of sedimentation in the Mekong delta, which is known as the most complex channel network in the world. These two objectives are of a broad international interest and the paper could potentially provide a good piece of work. However, in its present state the paper fails in reaching fully the two objectives:

(i) To address the first objective, the authors have combined some laboratory investigations with statistical analysis (quantification of individual errors, propagation and quantification of the overall uncertainty). The methodology proposed is scientifically sounding but the number of runs performed in the laboratory and the number of samples in each field clusters are very limited. This greatly weakens the robustness of the approach. Concerning the laboratory measurements, they do not seem to present any technical difficulties and it is somehow surprising that the authors did not conduct more runs. About 30 runs would be sufficient to have a statistically significant estimation of the loss of sediment from submerged traps. The evaluation of the deposition uncertainty through statistical characterization is more critical. The authors underline the need of characterizing clearly small and large scales variabilities as well as their associated errors. Unfortunately the sampling strategy is not correct to apply the chosen statistical method. The authors propose to generate Probability Density Functions from two to three

individual values. This number of individual samples is clearly insufficient to get robust PDFs estimates. The way the authors are justifying this strategy (lines 20-25 p336) is not really convincing. While the authors have an important number of sediment traps at their disposal (171), I am quite sure they could propose alternative strategies which would be better. Maybe the authors should focus their approach on the characterization of the uncertainties by functional compartments, as discussed in some paragraphs. The lack of statistical significance discussed previously as some direct impact on sections 5 and 6 and limits the relevance of the deduced interpretations/conclusions.

AUTHOR REPLY: Thanks for the constructive comments and suggestions.

It is generally known that floodplain sedimentation has a large spatial variability. To capture this with any monitoring scheme is a challenging task, not only because of the high spatial variability, but also due to the known uncertainties in the monitoring methods. However, these uncertainties are hardly ever acknowledged and almost never quantified. Our aim is to differentiate between natural variability (aleatory uncertainty) and the measurement error (epistemic uncertainty).We are aware of only one study acknowledging both uncertainty sources to a certain extend (Baborowksi et al., 2007). Here 5 repetitions were taken for each sampling point. However, the authors did not present the results of the repetitions, but only the mean values for each point. I.e. the uncertainty of the measurements is not quantified. In addition is has to be noted that the study covers an area of 0.2 km^2 only, which is smaller than the smallest floodplain compartments in the Mekong delta presented in this study.

We argue that it is necessary to make an attempt to quantify the uncertainties in the measurement of floodplain sedimentation, given the high uncertainties, both aleatory and epistemic, involved. This, of course, requires some assumption to be made. The basic assumption we are making is, that the variability in floodplain sedimentation monitoring by the sediment traps follows a normal distribution. We further assume that the three traps per monitoring points provide an estimate of the moments of the assumed underlying distribution. These assumptions cannot, as the reviewer correctly states, be proven by the limited number of traps per point. However, we argue in line with Pappenberger & Beven (2006) it is better to acknowledge the uncertainties in data and models, even by subjective assumptions, than to neglect the uncertainties completely and present data as deterministic and precise, while they are clearly not. However, the assumption should be stated clearly, so that they are well understood and can be discussed. This will be improved in the revised version of the manuscript.

This means that the author is principally right in stating that the uncertainty distribution of a single sampling point cannot be robustly estimated given the sample size, but from our point of view this criticism is not valid in the light of an uncertainty estimation procedure. And besides this general, more theoretical aspect, there are also practical constraints to "robustly" estimate the uncertainty distribution of floodplain sedimentation points. Considering an ideal but practically never feasible situation with >30 repetitions per sampling site, there is still the problem of the high spatial variability of floodplain sedimentation. 30 traps and more would cover an area of > $20m^2$. On this spatial scale the natural spatial variability in floodplain deposition has to be considered as well, thus the ideally derived uncertainty estimate would incorporate aleatory as well as epistemic uncertainty components. ,I.e. the measurement uncertainty cannot be distinctively estimated in this case, although the statistical fitting of the distribution would be robust. But this is in turn exactly what one should try to achieve.

This argument can also be applied against the suggestion of aggregating all the samples within one compartment to estimate the uncertainty distributions. Doing this the natural variability of the floodplain deposition (= aleatory uncertainty) and the measurement error (=epistemic uncertainty) would be mixed. In the estimation of the spatial variability within a floodplain compartment we use the mean of each sampling site for interpolation, which is a valid and published approach (Baborowski etal. 2007), that is not impaired by the above discussion about the estimation of the measurement error.

Thus, in summary we argue that the proposed approach is both valid and useful in quantifying the epistemic uncertainty of floodplain sedimentation mass measurements. We will put more emphasis on the explanation of the approach and assumptions in the revised manuscript.

The other and quite valid issue of having too few samples for establishing the relationship between wet and dry retrieval of the samples has been improved by repeating the experiment with more samples covering a wider sampling rate. With these samples a continuous exponential relationship could be established. More details about this are provided below and in the response to reviewer 3. Based on this improved relationship the Monte Carlo uncertainty analysis was also repeated.

(ii) The second objective concerns the spatial distribution of sedimentation in the Mekong delta. At the beginning of the paper, the reader expects to obtain a quantification of the sedimentation in the Mekong delta. Because of the very high variability at small scales, this goal can not be reach. The discussion of spatial pattern is thus reduced to the presentation of some results for three sites chosen among the twelve sites monitored. This is quite disappointing and finally, the paper does not provide a clear strategy of monitoring, as initially expected (minimal number of traps per sites and/or functional zones, etc.). I am convinced that the paper as a good potential, but in its present stage, some major modifications regarding the statistical approach and the structure of the paper should be addressed.

AUTHOR REPLY: Yes, we admit the fact that initial ambition was to capture not only small scale sedimentation pattern, s but also for the whole Mekong Delta for a single flood event. However, the measurement results showed very low large scale spatial correlation of the sedimentation. This has to be attributed to the complexity of floodplains, the large number and extend of hydraulic structures and the large anthropogenic influence on the inundation process, rather than to the chosen monitoring strategy and uncertainty analysis. We will elaborate on this fact more in the revised manuscript and indicate this in the abstract, goals and title.

We will also add a recommendation on the minimum number of monitoring points in typical floodplain compartments.

Please, find here bellow detailed suggestions and comments:

327-22: epistemic, are you sure it is appropriate, isn't endemic?

AUTHOR REPLY: We mean here is measurement error, which is termed epistemic in the uncertainty literature (e.g. Merz, B. and Thieken, A. H. 2005). Please see also p 336: lines 13-14.

327-25: I understand clearly that mat trap can be interesting for quality analysis because you collect some material. I am not convinced of the usefulness of this technique to quantify the sedimentation (can not capture the cycles of erosion, deposition; can be saturated if sediment deposit exceed one to two centimetres, etc.). Do you have some experiences/references on this point? Could you comment?

AUTHOR REPLY: The advantages of mat trap to quantify riparian sedimentation are well discussed in Steiger (2003), but also many other studies use mat traps to quantify sedimentation in floodplains (e.g. Asselmann and Middelkoop, 1995; Steiger et al., 2001, 2003; Middelkoop et al., 2005; Buettner et al., 2006, Baborowski et al., 2007).

The application of mat traps for the quantification of sedimentation in floodplains in the Mekong Delta is even more appropriate because:

- The flow velocity is very low in the floodplain compartments (average discharge ≈ $1m^3/s \div 10m^3/s$ (Hung al. et., 2012), compartment cross sections ≈ (1km ÷ 5km) => $V \approx \frac{1 \div 10\ m^3/s}{(1000 \div 5000) * 0.2\ m^2} = 0.05 \div 0.01\ m/s$)
- The floodplain surface is consolidated, dried during harvest period and strengthening by rice root and grass root before being inundated. These conditions can be well copied by artificial turf mats.

Consequently, erosion of ground surface just only happened in small area close to sluice gates with high velocity are occurring. These areas were not equipped with mat traps. Hung et al. (2013) also showed that cumulative sediment measured by sediment traps are in combination with time continuous measurements of turbidity, water depth and temperature enable the quantification of critical floodplain sedimentation and erosion parameters. Thus we are highly confident in the usefulness of mat traps to quantify sedimentation in floodplain in the Mekong Delta.

328-1-5: Note that Altus systems have been deployed in estuarine areas and provided some quantified information on sedimentation and erosion. Maybe you should add some references on this technique.

AUTHOR REPLY: The Altus system has surely potential for monitoring floodplain sedimentation. We see two issues that are likely to limit the use of the system in studies similar to the presented:

1. The given accuracy of the system is given is 2 mm according to the data sheet. This somehow limits the applicability in this (and likely many other floodplain sedimentation studies), as the average deposition in the Mekong Delta is about 9.5mm/a in this study (section 6.2) and 6 mm/a

(Hung et al. 2013) with the measurement error is on average 33%. However, the measurement accuracy could be considered in a similar way as here proposed.

2. I don't know the prices in detail, but I think it is fair to assume that the required budget for a large scale study like the presented cannot be obtained with a research grant. But for detailed point studies, e.g. like the one in Hung et al. (2013) this might be an interesting instrument, as it enables the recording of time of erosion and deposition. Thanks for hinting us on this system, which we were not aware of.

328-19: not found in the reference section

AUTHOR REPLY: is it likely at 328-20? (MARD report 2011), your right, it's in Vietnamese

It will be added into the reference section:

Vietnamese Ministry of Agriculture & Rural Development: Water resources planning of the Vietnamese Mekong Delta adaptation with climate change and sea level rise. Report (in Vietnamese), http://www.vncold.vn/Web/Content.aspx?distid=2927 (last access: 2013 April), 2012.

328 – 27: a^{-1}, all along the document you use this. I think that y^{-1} is more appropriate.

AUTHOR REPLY: Well, we are undifferentiated in this. The Latin "a" is as well used as the English "y" as symbol for year. But if you prefer "y", we will use this symbol.

330-26 "The selected sites have to be distributed the main floodplains in the MD" unclear for me. A word is missing?

AUTHOR REPLY: Your right, "The selected sites have to be distributed on the main floodplains in the MD"

331-8: Hung 2013b, if you intend to resubmit the paper, I would be please to have a copy of the recent publications of your group (and the submitted publications).

AUTHOR REPLY: All the papers are accepted and online available now:

Hung, N. N., Delgado, J. M., Tri, V. K., Hung, L. M., Merz, B., Bárdossy, A., and Apel, H.: Floodplain hydrology of the Mekong Delta, Vietnam, Hydrological Processes, 26, 674-686, 10.1002/hyp.8183, 2012.

Hung, N. N., Delgado, J. M., Günter, A., Merz, B., Bárdossy, A., and Apel, H.: Sedimentation in the floodplains of the Mekong Delta, Vietnam Part I: Suspended sediment dynamics, Hydrological Processes, n/a-n/a, 10.1002/hyp.9856, 2013.

Hung, N. N., Delgado, J. M., Günter, A., Merz, B., Bárdossy, A., and Apel, H.: Sedimentation in the floodplains of the Mekong Delta, Vietnam Part II: deposition and erosion, Hydrological Processes, n/a-n/a, 10.1002/hyp.9855, 2013.

331: probably here, you could indicate in the text the number of traps collected.

AUTHOR REPLY: The number of collected traps is mentioned in the end of that section 333-10

331-24: did you weight all traps individually? This could be potentially a source of error.

AUTHOR REPLY: No, all the traps are almost identical in weight because they are made of the same material and are of the same size. Differences in trap weight are thus caused by possible manufacturing variances in the turf only. We checked this by randomly selecting 10 traps and determined their weights. The mean trap weight is 180 g, while the range within the 10 samples is small (175 -185 g).

333-10: you speak about 161 traps in the text and 171 in the table.

AUTHOR REPLY: You are right, 171 traps were collected.

However, please note that there are 171 collected samples, but just 161 samples could be used to measure the weight (sediment mass).

333-25: 500g. Please, also give all weight in g.cm-2 or in mm of deposit. How long did you dry the traps? For hundreds of grams of material, I guess it can take quite a long time?

AUTHOR REPLY: Thanks for the suggestion. We will use $kg.m^{-2}$,

And correct, it took nearly two months to dry the samples.

334-8: how do you define the outliers? Depending on your choice for the outliers, Fig.4 can be very different no?

AUTHOR REPLY: The outliers are identified by exceedance of the interquartile range (Q1 = 25^{th} %, Q3 = 75^{th} %, IQR = Q3-Q1). Outliers are outside of the range (Q1 – 1.5 IQR, Q3 + 1.5 IQR).

Yes, when we change the outlier detection method, the results are likely to be different, but the relative comparison among the datasets will not much change.

334-12-17: The text and Fig.5 are not very clear. The figure contains a lot of information that could be synthesized to get the message clearer. I expect that this is the section where you discuss the variability from various spatial scales and compartments.

AUTHOR REPLY: Yes, this is the figure illustrates the variability of the monitoring points for sediment data and within floodplain compartments for the remaining parameters. The figure will be enlarged (see below) and moved to the results and discussion section, where it will contribute to the discussion of spatial variability.

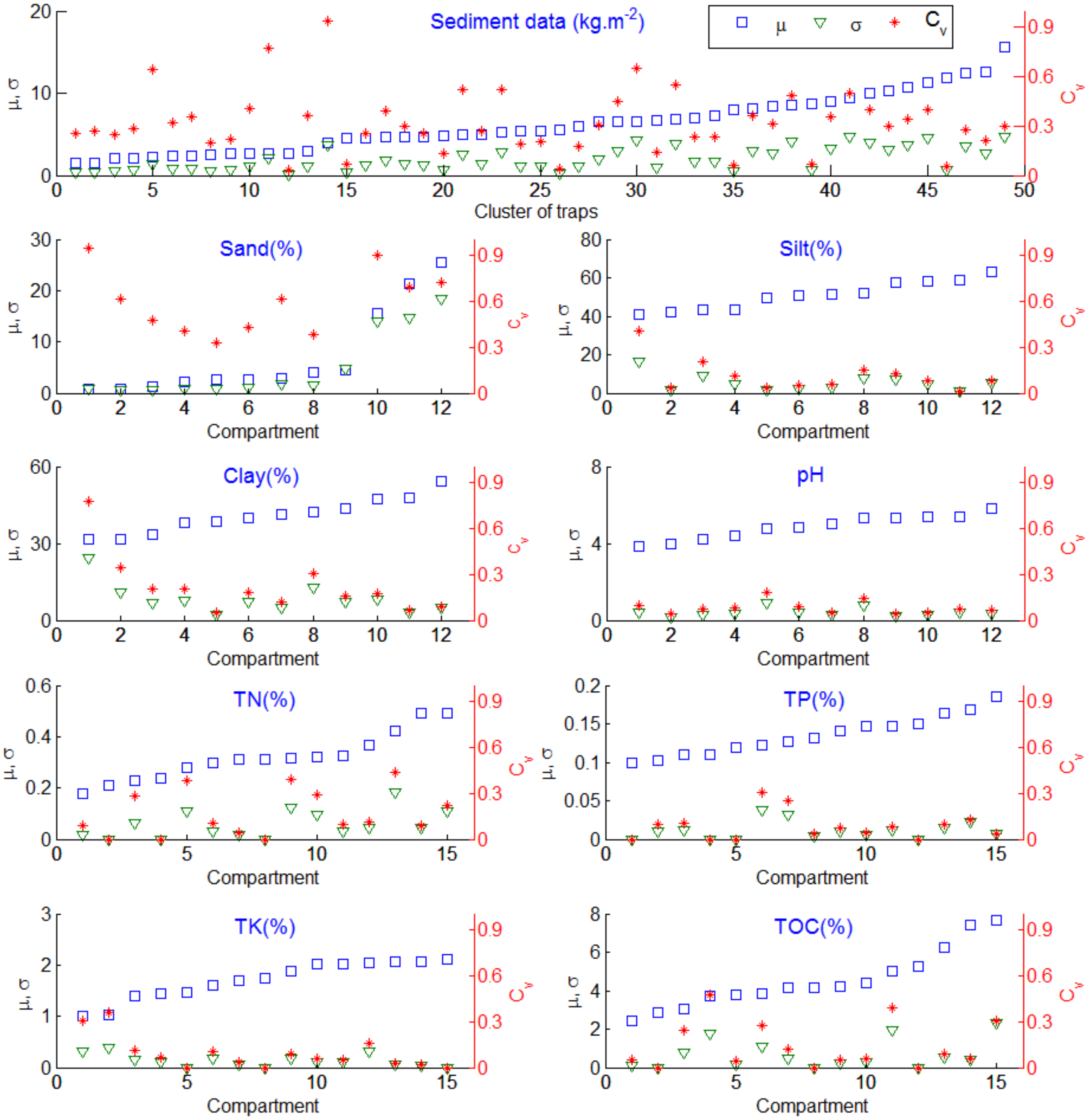

Figure 1: **Fig. 5.** The means (μ), standard deviations (σ) and coefficient of variation (V) of sediment weight on cluster traps, pH and nutrient data in compartments.

334:22: Personally I do not see any trend for CV with the increase of the deposition mass.

AUTHOR REPLY: You are right, we meant the variability of CV. The statement will be reformulated to: “The deposition mass data shows an interesting trend in declining variability of CV with mean deposition.”

336:1-2: As nutrients are mainly fixed on clays and silts, it looks strange to have no correlation with sand content (higher sand content, lower nutrient content).

AUTHOR REPLY: 336: 1-2 content is not relevant to the content you mentioned above.

Regarding to your point, you can see in the scatter plot below that the nutrient content is not correlated to the sand fraction. It is true that the nutrients are fixed on clay and silt, but this does not mean in turn that the nutrients automatically inversely correlated to the sand fraction. Sand constitutes a fraction of the sediment, but the nutrient content is dominated by the other fraction. Inverse correlation can therefor occur particularly with sand fractions, but this does not hold for low sand fractions as the figure below shows.

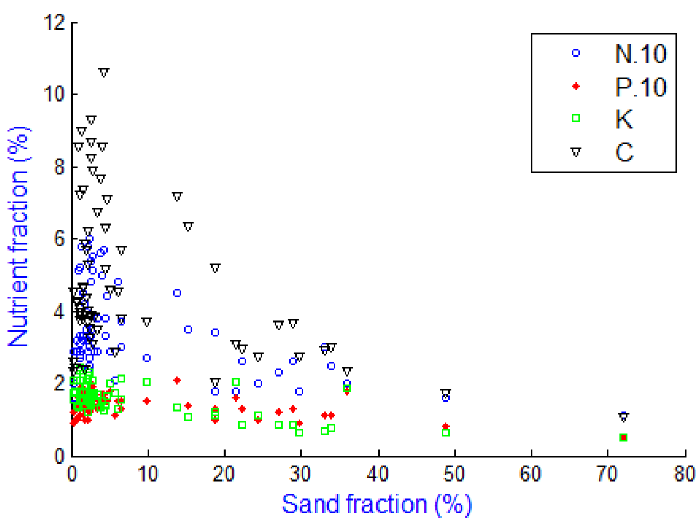

Figure 2: Sand fraction versus nutrient fractions, higher sand fractions with lower nutrient fractions.

Section 5.1: It would be far better to have much more runs. Maybe, you could express the mass in link with the depth of sediment deposition. When it reach 3cm, you reach the thickness of the traps!

AUTHOR REPLY: We acknowledge the weakness in this part of the analysis and repeated the experiment with more samples (32 in total now).

The section 5.1 is rewritten as follows:

Trap removal from ponding water will always produce less (or equal at best) sediment mass compared to dry trap collection. Sediments can only be lost, not gained by trap removal from ponding water, as water flowing from the trap will carry parts of the deposited sediment when the trap is pulled out of the water. In order to quantify this loss, experiments were conducted in a small reservoir, where traps with known and equal dry weights are immersed. After complete mixing and following settlement of the now suspended sediment, one trap is pulled out of the water by the strings. Following the removal of one trap, the water is carefully removed from the reservoir until the remaining trap can be removed without pulling it through water. The sediment masses in the traps are determined by weighing after drying of the removed samples yielding sediment masses of wet and dry collection conditions. The tests were performed with 32 different initial sediment masses equivalent to reported annual deposition masses of 0.07÷21 $kg.m^{-2}.y^{-1}$, as referenced in Fig 4 and in Hung (2013). The constraint is represented by the truncated line that the wet collection mass cannot be higher than the dry collection mass. The results of this test are shown in Fig 6.

The regression model: $y = 0.0561x^2 + 0.6659x + 0.9141$ (1)

With constraint: $y \geq x$ (2)

In which: x: Wet retrieval sediment mass ($kg.m^{-2}$),

y: Dry retrieval sediment mass ($kg.m^{-2}$)

The 95% Confidence Interval (CI), also shown in Figure 6, is computed as $\mathrm{CI} = \mathrm{para} \pm \mathrm{t}\sqrt{\mathrm{S}}$, in which $para$ denotes the estimated parameters, t depends on the confidence level, and is computed using the inverse of Student's t cumulative distribution function, and S is a vector of the diagonal elements from the estimated covariance matrix of the coefficient estimates (Mendenhall et al,. 2009).

The exponential regression models describing the data can also be justified by the trap removal procedure. When a trap is removed by pulling it upward with the strings, the mat forms a bowl-like shape. When there is only little sediment in the trap and the trap is removed carefully, only little sediment is re-suspended by the outflowing water. However, the higher deposition masses are, the closer the deposited sediment is to the brim of the “removal bowl”, thus causing higher losses by the outflowing water or even direct losses in extreme cases. The uncertainty of the model is captured by the confidence intervals. In the following this sampling uncertainty is called “wet-dry correction model”. This uncertainty source represents an epistemic uncertainty source according to Merz and Thieken (2005).

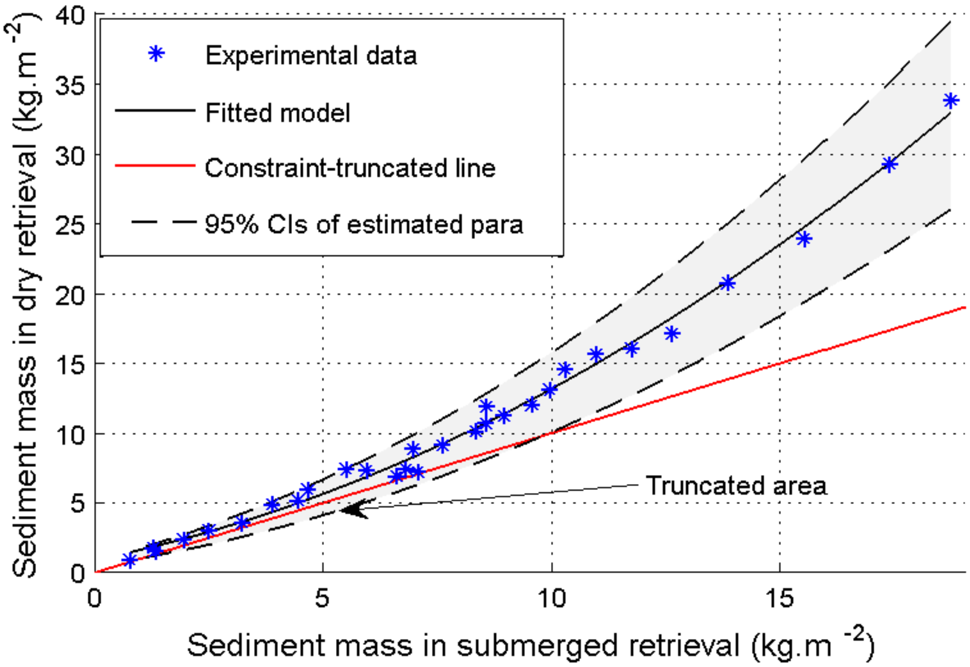

Figure 3: Fig. 6: Experimental results of trap retrieval from ponding water and under dry condition. The stars are the experimental data, the black lines are the regression model and the 95% confidence intervals of estimated parameters. The truncated domain is the area below the truncated line in blue.

Section 5.2: As already indicated in the general content, it has no sense to run some pdfs functions deduced from 2 or 3 samples.

AUTHOR REPLY: we disagree, see the answer in the general comments

337-5: normal distribution: same comment than previously! If I remember correctly my statistical courses, a pdf need about 30 points to be statistically relevant and stable.

AUTHOR REPLY: please see the answer in the general comments

337-8: not markedly skewed. How do you remove the outliers? If you consider all the points, it becomes skewed.

AUTHOR REPLY: The sand fraction is markedly skewed, the skewness is +2.5. The other parameters are hardly skewed ($< \mp 1$), just the sediment mass shows some skewness (+1.2) if the outliers are considered. But the point we want to make is that the spatial sand fraction not normal, which is quite reasonable and had to be expected in such a large scale study due to the high dependence of the sand deposition on the flow velocity. The definition for the outliers is given above already. Please note that the outliers are not removed in the uncertainty analysis.

338-19: Once again, how many points do you consider to obtain your pdf?

AUTHOR REPLY: Here we consider the uncertainty stemming from the fitting of the (now) exponential regression function of the wet-dry-correction. As shown in the figure 3 of this reply above, the regression is not perfect, thus the calculation of the dry deposition mass from the wet samples by the equation is also associated with uncertainty. This is quantified by the parameter uncertainty of the regression function. Here each parameter is described with a mean and standard deviation. The mean is the estimated parameter value in equ. (1) of this reply, while the standard deviation is derived from the uncertainty bounds in figure 3 of this reply. Normality is assumed here, as the confidence bounds se are estimated by the Student's t-distribution. This procedure and assumption is standard in generating confident bounds for regressions. Another example of using this technique can be found in Apel et al. (2008).

339-22: flocculation can strongly modify your evaluation of the proportion of clays, silts and sand. What you measure and discuss in the paper is the effective/aggregated size and not the absolute/dispersed one. This needs to be clear for the reader.

AUTHOR REPLY: You are right, it is effective grain size we are talking about.

341-10-15. Unclear

AUTHOR REPLY: It's rewritten:

In terms of relative uncertainty sediment mass and TOC holds the smallest bounds and largest bounds, respectively. The variability ranges from 20% (sediment mass) to 100% (TOC) of the mean in the upper bounds, while the lower bounds are 20% (sediment mass) and 50% (TOC) of the mean. Generally an increasing trend of relative uncertainties with increasing means can be observed.

However, it should be noted that this part and the associated figures will be removed from the manuscript according to suggestions from reviewer 3.

341-16-17. I believe that errors can even be higher than these estimates

AUTHOR REPLY: This might well be in general, but the analysis demonstrated here leads to the given statement. We are glad that you made this comment, because it illustrates the normal data dilemma: If the uncertainty is not quantified by well documented methods, it is easy to state that one believes this way or the other. But neither can be proven, if uncertainty analyses are not performed. This is exactly the benefit of the proposed methods: It provides quantified information on experimental data uncertainty with (after the revision hopefully) understandable and traceable methods and assumptions. One can argue against the methods or assumptions applied, but not against this statement derived from the results. In other rather prosaic words, the uncertainty of experimental data is dragged from the realm of believe in the direction of quantitative knowledge. Ignorance is not bliss, to talk with Pappenberger and Beven (2006).

341-21. step change. It is not rigorously a step, but an inflexion with a change of slope.

AUTHOR REPLY: You are right, it's a discontinuity point between 2 models. However, that discontinuity disappeared with the single exponential model to be presented in the revised manuscript, using substantially more experimental data sets (32 in total, 24 more as in the discussion version).

341-28. Sand highest uncertainty. Maybe in link with the flocculation processes.

AUTHOR REPLY: This might play a role, but the natural rapid deposition of sand on floodplains in combination with the high anthropogenic influence in the Mekong Delta should outweigh this effect by far. We will acknowledge the possibility that a certain proportion of the sand fraction might in fact be flocculated smaller grain sizes. However, the sample preparation including treatment with hydrogen peroxide and the deflocculant tetrasodium pyrophosphate should ensure that existing flocs are destroyed and further flocculation is prohibited.

342-12. When you estimate the deposition thickness how do you proceed? What is the density of sediment you are considering?

AUTHOR REPLY: Thickness = dry sediment mass (kg/m^2)/ dry bulk density (kg/m^3)

The average dry bulk density was taken from literature: 1.2 ± 0.1 kg/m^3 (Xue, Z., 2010)

345-4-5. Please add some errors: X+-Y

AUTHOR REPLY: We will do as suggested and give the derived uncertainty bounds as error ranges, e.g. 14.4(-5.5 +7.8) $kgm^{-2}a^{-1}$ and 6.3(-1.6 + 2.4) $kgm^{-2}a^{-1}$. Please note that the uncertainty bounds are not symmetric.

345-10-14. During the interpretation, you should remind that traps are not reproducing the cycles of erosion and thus can diverge from the observed annual sedimentation

AUTHOR REPLY: Yes, you are right theoretically. However, due to the strong seasonality of the floods in the Mekong Delta we capture the whole period of floodplain inundation per year. The traps provide thus an estimate of the net deposition per year including erosion periods. This was illustrated and quantified by Hung et al (2013), who calculated the net seasonal (i.e. annual) floodplain deposition by time varying deposition and erosion depending on hydraulic conditions and suspended sediment concentration on the floodplains in the Mekong Delta.

345-15. were monitored instead of weres.

AUTHOR REPLY: Yes, thank you.

345-17. that lead to completely

AUTHOR REPLY: Yes, thank you.

Table 2. As you use Robinson pipette technique to estimate grain size, aggregation will shift your results to higher grain size.

AUTHOR REPLY: We disagree. We used hydrogen peroxide to destruct organic matter and tetrasodium pyrophosphate to disperse particles. Thus flocculation cannot occur in the analysis. Moreover, it is also reversed by the treatment described above. In addition, citing Hung et al. (2013), the apparent flocculation grain size under field conditions is optimally estimated as D_{50}=40µm. This is still silt according to the Wentworth grain size chart, so we do not expect a significant increase at least of the grain size fraction, even if flocculation could occur in the grain size analysis.

Table 3. Sand in %?

AUTHOR REPLY: Yes, Sand (%), thanks

Table 4. Please remember that it is per year.

AUTHOR REPLY: Yes your right, that data is in flood 2011, so the unit will be "$kgm^{-2}y^{-1}$" and "mmy^{-1}"

In general, I believe you have too many figures which are not always clear.

AUTHOR REPLY: Yes, the figures will be simplified and explained better.

Fig.1. The complete watershed, delimited in purple appears to be separated in two subparts (north and south). Why this delimitation?

Fig.1. Your legend considers altitude up to 12m; the 4-12 m is beyond the range of observed values and should be removed.

AUTHOR REPLY: The division line showed the separation between the upper and lower Mekong basin, i.e. the Chinese Himalayan part and the SE-Asian part. However, we removed this line in the revised manuscript. The legend was also updated to a range of 0m to 4m. Please see the new figure below.

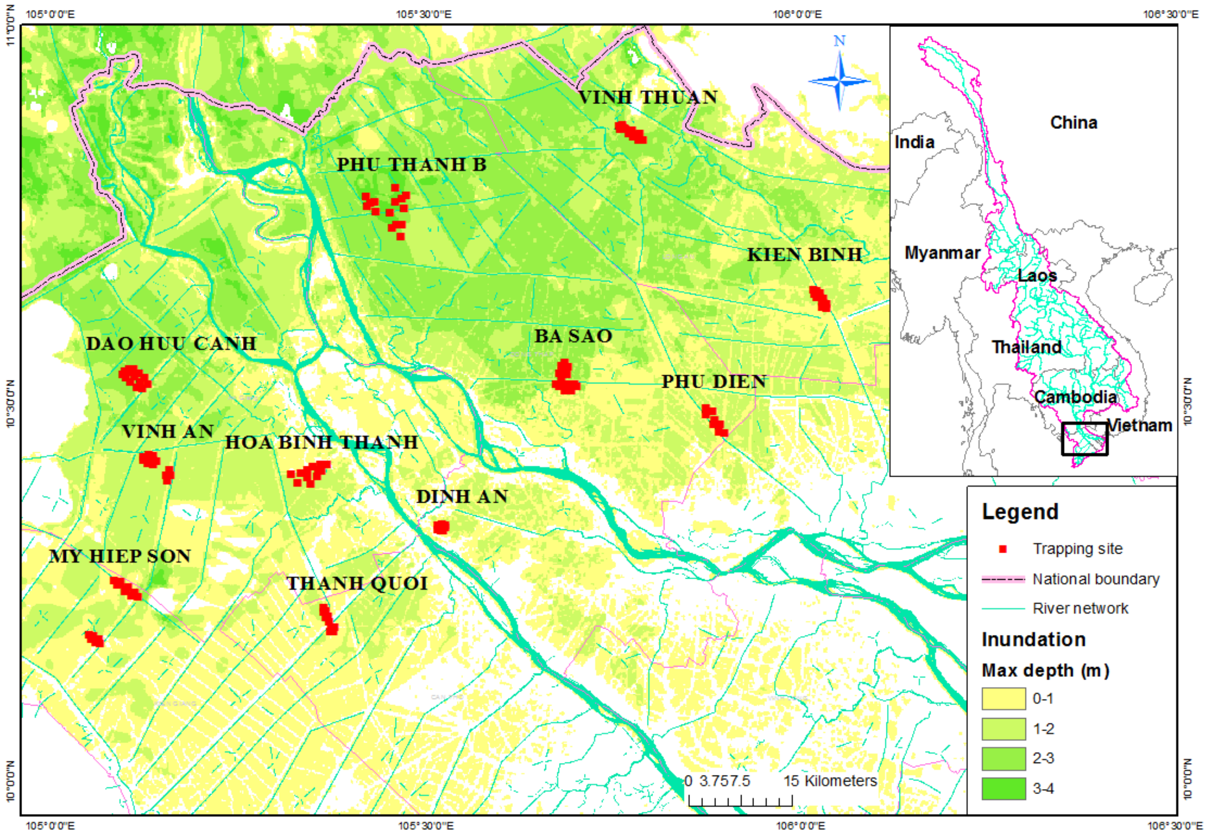

Figure 4: **Fig. 1.** The study area in the MD in Vietnam: the main map shows the mean of maximum observed inundation depths over the period 2000-2010, along with the 11 selected sites including 19 compartments of either high dike or low dike systems. The map top right shows the entire Mekong River Basin.

Fig4. Define outliers. On the right axis, what means +1.5IQR?

AUTHOR REPLY: The IQR will be label on the right axis, IQR is interquartile range [25th %, 75th %], the outlier [25th % - 1.5IQR, 75th % + 1.5IQR], see the figure below.

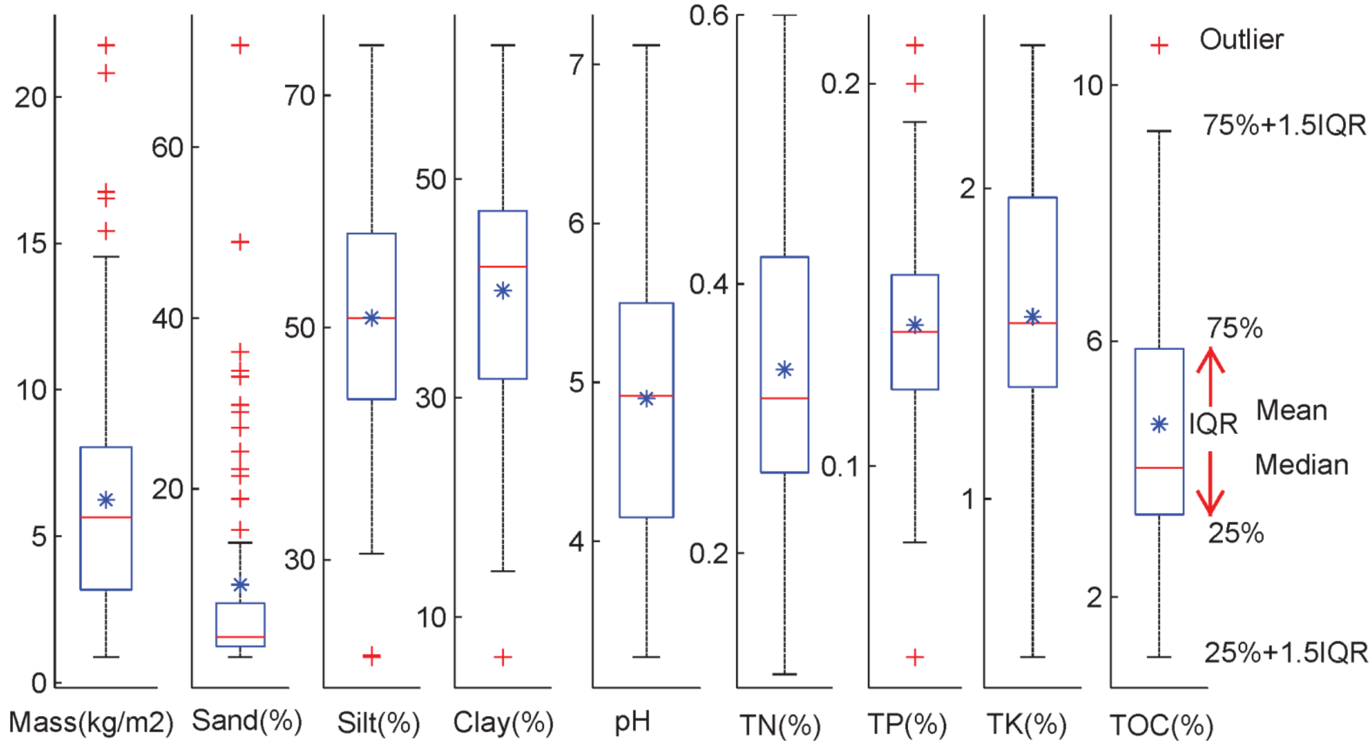

Figure 5: **Fig. 4.** Box plots of all data: sediment mass (g), sediment grain size classification of Sand, Silt

and Clay (%), potential Hydrogen (pH), Total Nitrogen (TN) (%), Total Phosphorus (TP) (%); Total Potassium (TP) (%) and Total Organic Carbon (TOC) (%).

Fig5. Coeff. Of Variation CV. I do not find this figure clear.

AUTHOR REPLY: We harmonized the range of the CV-axes for all plots to allow easier inter-comparison, please see the figure 1 in this reply.

Fig6. I do not understand how you designed your laboratory tests: few points, not regularly distributed?

AUTHOR REPLY: The poor experiment design and results for the wet-dry-correction were caused by the fact that we performed the experiment in parallel to the analysis of the trap analysis, i.e. without knowing the range of deposited sediments of all traps collected. We therefore took the range from a previous floodplain sedimentation study in a small part of the Mekong delta, which turned out to cover a smaller range that we observed. Thus we repeated the experiment with a larger sample number (see replies above. Basically, the experiment is conducted in the following steps:

- Prepare a reservoir with dimension B.H.L = 100cm.100cm.150cm and pumping system, prepared sediment is taken up from floodplains.
- Put sediment and pump water into the reservoir, stirred the mixture before placing 2 traps into the reservoir.
- After 2-5 days, slowly release water in reservoir until approximately equal to the water depth 50cm in floodplains when retrieve traps, pull out one trap (called submerged retrieval).
- Slowly dry out the reservoir, the remained trap is collected after one day (called dry retrieval)
- Measure the sample masses and deposited masses after dry in room temperature.

You could also see the upgraded Fig 6 above (figure 3 in this reply) with significant number of extra runs. We also describe the procedure more clearly in the updated manuscript.

Fig.10. Here you assume no SD for the nutrient, am I wrong?

AUTHOR REPLY: Fig.10 presents the final propagated results of the uncertainty analysis in terms of mean values and 90% CIs of the nutrient content derived from the sediment deposition masses. This is then compared to the nutrient mass (gram) before the uncertainty analysis including the wet-dry-collection uncertainty. This causes the higher mean values after the uncertainty anaylsis.

References:

Baborowski, M., Büttner, O., Morgenstern, P., Krüger, F., Lobe, I., Rupp, H., and Tümpling, W. v.: Spatial and temporal variability of sediment deposition on artificial-lawn traps in a floodplain of the River Elbe, Environmental Pollution, 148, 770-778, http://dx.doi.org/10.1016/j.envpol.2007.01.032, 2007.

Pappenberger, F., and Beven, K. J.: Ignorance is bliss: Or seven reasons not to use uncertainty analysis, Water Resources Research, 42, W05302, 10.1029/2005wr004820, 2006.

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