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

General comments

This paper aims to estimate fine sediment deposition rates and their quality in the Mekong delta by: (1) quantifying the measurement uncertainties and (2) measuring the spatial variability of sediment deposition (quantity/quality) in order to identify the mains controlling factors.

The paper presents a significant field work with original measurements and analyses. But I do not recommend the publication of the paper in its present form. First, the structure of the paper is complex and not well-organized (eg. two results' sections, 7 sections). Secondly, many problems arise with the methodology and in particular the field measurements and the statistical analyses. I suggest that the paper should be resubmitted to the HESS journal after major revisions. This work should be valuable for the community: the estimation of sediment deposition rates in the VMD, their quality, the spatial variability.

To improve the paper (without many expensive new field works) I would suggest to remove the complex uncertainty analyses (or only provide rough estimation of uncertainties and the discussion) and to better describe the field methodology, your lab analyses and better discuss of the deposition rate/quality variability in the VMD in relation with infrastructures.
1. Does the paper address relevant scientific questions within the scope of HESS? Yes
2. Does the paper present novel concepts, ideas, tools, or data? Yes
3. Are substantial conclusions reached? No
4. Are the scientific methods and assumptions valid and clearly outlined? Yes
5. Are the results sufficient to support the interpretations and conclusions? No
6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes
7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes
8. Does the title clearly reflect the contents of the paper? Yes
9. Does the abstract provide a concise and complete summary? No, the results are not really presented (%uncertainty, deposition rate. . .)
10. Is the overall presentation well-structured and clear? No: mainly the Monte Carlo methodology.
11. Is the language fluent and precise? Yes, except at several sections identified below
12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes
13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Yes. The paper need to be structured with a single method section, result section and discussion.
14. Are the number and quality of references appropriate? Yes

15. Is the amount and quality of supplementary material appropriate? Yes

AUTHOR REPLY: Thank you very much for the constructive comments. Regarding the general comments, we have some arguments against the criticism, as already given in the response to reviewer 1. It should be noted that uncertainty analysis is something different than a statistical analysis of a given data set. A sound statistical analysis is composed of an encompassing dataset and the correct application of statistical methods, while a proper uncertainty analysis starts with a good understanding of the uncertainty sources. These sources are then to be estimated as good as possible with the information at hand. The key issue is rather the clear statement of assumptions taken and data and methods used, rather than statistical significance of fitting distributions to data. In most of real world application of uncertainty analysis some (subjective) assumptions have to made that cannot be proven explicitly. But this does not impair the validity and usefulness of uncertainty analysis. We argue in line with Pappenberger and Beven (2006) that it is still better to perform an uncertainty analysis of experimental data than to neglect the fact that the data are uncertain, even if all assumption taken (here the normality of the sampling error and the representativeness of the sample mean and standard deviation for the assumed normal distribution) cannot be proven by the data at hand. This certainly helps in understanding and estimating the value and use of the experimental data in further studies or for conclusions derived from the data.

The fact that the presented uncertainty analysis is comparatively complicated is a result of the necessity to remove the mat traps when water is still ponding. By this an additional sampling error is introduced, which has to be considered and quantified and finally leads to the proposed Monte Carlo method of estimating the combined sampling and wet-dry-correction uncertainty. This fact also prohibits a simple uncertainty analysis by assuming a normal distribution defined by the mean and standard deviation of the trap results over individual sampling sites. (Note: This corresponds to the intuitive way of using the mean of sampling repetitions as representative for the sampling point). The second fact is that not for all trap clusters all three traps could be retrieved after the flood event. Instead of discarding these values, because they do not fit into the uncertainty analysis procedure, we rather developed an uncertainty estimation method that is consistent with the uncertainty analysis proposed. However, we ensure that these samples are associated with a higher degree of uncertainty as the 3-sample trap clusters.

In the replies to reviewer 1 we discuss and justify why only three traps were used for each sampling location, and why we do not average over whole compartments for sediment deposition mass. As we don’t want to repeat the whole argumentation, just some short comments on this:

a) The use of three traps per sampling location is a compromise between overall number of samples that could be handled with the available resources, the spatial scale that should be covered and the problem that with a larger number of sediment traps per location the uncertainty caused by the measurement methods (epistemic uncertainty) cannot be separated from the natural uncertainty (aleatory) originating from the spatial variability of floodplain deposition.

b) We explicitly want to illustrate the spatial deposition variability in individual floodplain compartments, which are quite large (100 – 1000 ha) and are subject to a high degree of anthropogenic influence caused by the operation of hydraulic structures. If the data are aggregated over whole compartments from the beginning this spatial variability cannot be mapped explicitly.

However, in the revised manuscript we will strive to explain the assumptions and aims of the uncertainty analysis clearer, and we will also simplify the Monte Carlo method. (see in the detail comments).

Regarding to the manuscript structure, we acknowledge that manuscript is not well structured. We thus follow the requirements of the reviewer(s) to restructure the manuscript as follows:

Abstract
1. Introduction
2. Study site and site selection
3. Methodology
    3.1. Sediment trap design and sampling scheme
        3.1.1. Sediment trap design
        3.1.2. Sampling scheme
    3.2. Uncertainty analysis
        3.2.1. Uncertainty associated to trap collection in ponding water
        3.2.2. Deposition uncertainty
        3.2.3. Monte Carlo analysis
            a. Sediment mass uncertainty analysis
            b. Nutrient fraction
            c. Grain size fraction and pH
4. Results and discussion
    4.1. Monitoring results
    4.2. Varying uncertainty in datasets
    4.3. Sedimentation rates and nutrient sediment rates
    4.4. Spatial variability of sedimentation
5. Conclusions

- The result section will be re-structured into 4 parts comprising
  + Monitoring results, leading to consequent intermediate conclusions on sediment trap sampling methodology and some recommendations targeting at future sampling campaigns.
  + Varying uncertainty in datasets: results of uncertainty analysis in datasets will be presented, and the reliability ranges of the datasets will be given in conclusion.
  + Sedimentation rates and nutrient sediment rates: the average rates will present for all spatial units considered. Consequent conclusions will be about the differences of deposition rates in different spatial units, particularly the difference between high dike and low dike compartments.
  + Spatial variability of sedimentation: this subsection will focus on the sedimentation pattern in some typical flood cells, and the consequent conclusions are the effects of hydraulic structures and geographical location within the compartment into sedimentation pattern in flood plain compartments.
- We will further include the final results of average sedimentation rate and nutrient rates including uncertainty ranges in the abstract.

Major comments

P326, L15: 3 samples are not enough to lead an uncertainty analysis. At least 10 – 20 samples are required to estimate SD.

AUTHOR REPLY: Yes you are right from a purely statistical point of view, but as already argued above and particularly in the replies to reviewer 1, we assume a normal distribution for the sampling uncertainty. It is not our intention to prove this assumption by the data. We rather make this assumption as the most basic one (excluding uniform distribution) one can make without having a sufficient data set at hand to identify the underlying distribution. This is valid in uncertainty analysis, as published in a number of studies, e.g Apel et al. (2004, 2006, 2008).

P328, L14: A description of the Mekong drainage basin and a description of the economical/social issues of suspended sediment sedimentation in the MD floodplains are missing in the paper.

AUTHOR REPLY: Yes, a description of the economical/social issues of sedimentation in the MD floodplains will be added into study area section (see paragraph below), however a description of the Mekong drainage basin for a study in floodplains in the MD is not really necessary, particularly as only one season is covered in the presented study. Considering the already lengthy manuscript we would not include a description of the Mekong Basin.

"Flood control is a hot issue in the VMD, low dike protection or high dike protection are under hot debate. However quantitative studies about floodplain sedimentation and associated nutrient deposition do not exist. Thus also an estimation of the economic benefits of the floodplain inundation and natural fertilizer input be sediments vs. higher flood protection and control is missing at present. In general terms, assumed higher suspended sediments and sedimentation on floodplains with low dikes dos not only supply more natural fertilizer for agriculture, but also increase the output of wild catch fishery on floodplains over the flood season. On the other side, a high dike system enables growth of a third rice crop per year, but requires more artificial mineral fertilizers. The presented study aims to provide a first quantitative data base for the estimation of the economic benefit the natural fertilizer input via flood sediments. This may serve as a basis for a cost-benefit analysis for the construction of high dike systems."

P331, L24: What is the dimension of the trap when installed on the field? Always 30*30cm ?

AUTHOR REPLY: All the installed traps have the same size of 30*30 cm, the same material and the same design.

P332, L6: 3 samples are not enough to lead a statistical analysis.

AUTHOR REPLY: see reply above.

P332, L16: what is the dimension of the bowl-shape sampler when installed in the field (Fig 4)? It is important to estimate as it will govern your final estimation of sediment deposition rate. Furthermore, what are the variations of the bowl-shape sampler surface with the

sediment quantity deposited in the sampler during a flood? It will be probably not the same with few grams of sediment and 2000 grams (range found at Fig 4).

AUTHOR REPLY: All installed traps are flat and placed on the floodplain ground when in place, i.e. rectangular (Fig. 3, left). They become approximately bowl-shaped only when retrieved from ponding water by pulling upwards by the 8 cords (Fig. 3, right).

Fig 3: Idem. The horizontal trapping surface may decrease with an increase of the sediment quantity and sediment density (size). Did you take this process into account in your final estimates and uncertainty analysis?

AUTHOR REPLY: Yes, the bowl-shape surface area varies with different sample weights. This is considered by the range of deposited sediment in the laboratory tests. Please see at section 5.1: "Uncertainty associated to trap collection in ponding water".

P333, L15: More information is required about your lab. techniques and methodology (method, temp., duration. . .).

AUTHOR REPLY: Yes, the paragraph is rewritten:

"The overall 161 traps are comprised by 49 clusters of two or three traps and 26 "single trap clusters". In the "single trap clusters" the remaining two traps were lost or destroyed by the flood or farmers/fishers. The sample masses were measured after drying at room temperatures in the range of 30 – 35 °C until the masses did not change over several days. This took around 6 weeks. The deposited masses are sample masses subtracted by the trap weight. The trap weights were measured prior to placement on floodplains. The weight of the traps is 180 g +/- 5 g based on a weighing 10 samples. Due capacity constraints only 61 representative samples distributed over 12 compartments were analyzed for the quantification the physical and chemical properties of the floodplains sediments, , including partially destroyed samples with sufficient volume. The physical properties analyzed were the particle size distribution (sand, silt and clay fractions), while the chemical properties were pH, Total Nitrogen fraction (TN), Total Phosphorus fraction (TP), Total Potassium fraction (TK), and Total Organic Carbon fraction (TOC). The nutrient analysis provided proportional figures to the sediment masses. The analysis methods are described in Table 2.

P334, L5-10: Do you think that a dry and compacted sediment sample with large aggregates that was pull out in water can be re-suspended as easily as "natural" suspended sediment deposited in rivers? What is the duration of the experiment?

AUTHOR REPLY: I think your refer to P335, L5-10 instead of P334, L5-10.

Actually, the experiment is implemented in steps follow:

– Prepare a reservoir with dimension BxHxL = 100cmx100cmx150cm and a pumping system. Sediment for the experiment is collected from the floodplains.

– The known quantity of sediment is put into the reservoir and water is pumped into afterwards. The whole reservoir is stirred until a visible homogenous suspension is reached. The two traps are placed on the reservoir bottom.

– After 2-5 days depending on the visible settling of the sediment, the water is slowly released from the reservoir until a water depth of approximately 50cm is reached. One trap is then retrieved carefully as under field conditions from the reservoir by pulling it upwards by the 8 cords. This is the submerged retrieval.

– The remaining water is further carefully removed from the reservoir. The remaining trap is then collected after one more day. This is the dry retrieval.

– The wet and dry retrieval masses are then determined after drying at room temperature analogously to the laboratory analysis of the field samples.

Fig 6: The number of experimental plots is not enough. Sediment samples are not homogeneously distributed (dry sediment). You need the same number of replicates for each range of dry sediment mass. Furthermore, you can simplify this Fig; why using linear and exp. models. Please simplify this fig.

AUTHOR REPLY: Yes, we acknowledge this weakness in the study. 24 more experiments are implemented to enlarge the weight range and enrich the point spacing. as shown in figure 6, this enabled the continuous fitting of an exponential regression. The associated uncertainty bounds are truncated to follow the constrain that the wet collected mass cannot be higher than the dry collected.

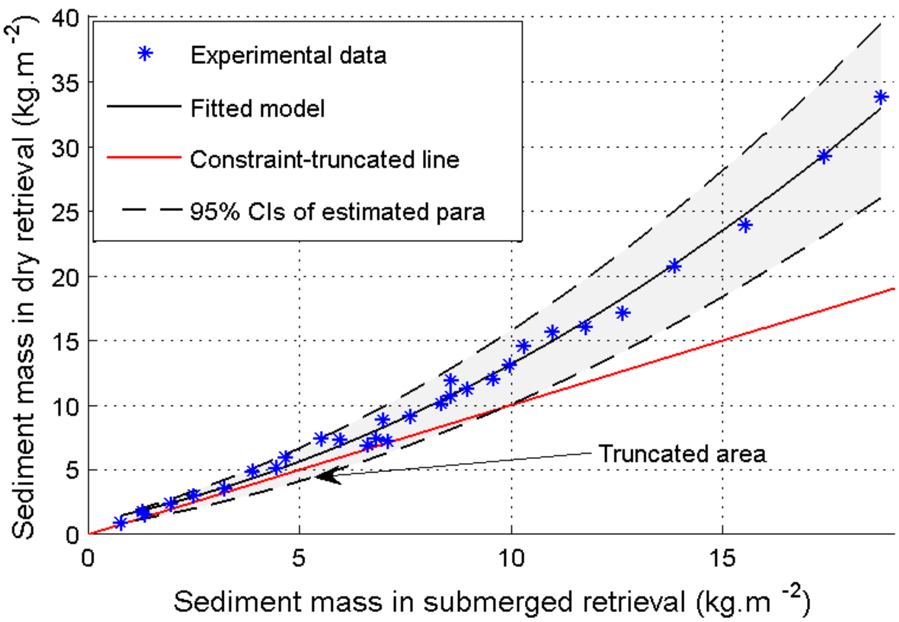

Figure 1: Fig.6: Experimental results of trap retrieval from ponding water and under dry condition. The stars are the experimental data, the black solid lins is the regression model, while the dashed lines indicate the 95% confidence bounds of the regression derived from the parameter uncertainty. The truncated domain is the area below the constrain line in red.

P335, L20: the continuity between your two equations is not verified. It is a mathematical problem.

AUTHOR REPLY: This problem is solved by the increased number of experimental points and the fitted continuous exponential regression. See reply above.

P336, L4: What about the remobilisation of sediment during the flood event (i.e. influence of the local velocity)? You should discuss this point.

AUTHOR REPLY: Yes, this certainly happens, both by natural and anthropogenic influences. However, the deposited sediments reflect the net deposition including erosion processes. If this happens on a very small scale, this could be captured by the sediment clusters and its variability. On larger scales the interplay of erosion and deposition can be captured cumulatively by the variability within individual floodplains. It can also be quantified by a mathematical description of the erosion and deposition processes and continuous measurements of hydraulic features at a given location. This is demonstrated by Hung et al. (2013).

P336, L20: SD and mean estimated with 2 or 3 samples is not relevant at all (see previous discussion).

AUTHOR REPLY: Please see the answer in the general comments.

P337, L20 and Fig 7: the MC methodological framework is not clear for me. You need to simplify your analysis and explanations.

P337, L25: all this section is not easy to read and to understand.

P338, L17: I don't understand what you've done.

P339, L10: Idem, the methodology needs to be clarified.

AUTHOR REPLY: The explanation and the flowchart of the MC framework is improved as follows:

Sediment mass

The uncertainty analysis of the sediment mass is performed in 4 steps:

Step 1: Derivation of PDFs for wet collected deposition mass for cluster traps and single traps

- Cluster traps: run PDF are based on the mean and SD of each cluster trap
- Single traps: In order to include these values in the uncertainty analysis assumptions about the real mean and standard deviation have to be taken. First we assume that the measured value can be used as an approximation of the real cluster mean.. SDs are derived from the linear correlation of the mean values to the SDs of the cluster traps. Fig. 8 shows a scatter plot of the cluster means vs. the cluster standard deviations along with the linear regression und the associated 99% confidence interval of the linear regression. A value from a single trap is associated with the standard deviation from the upper 99% confidence interval of the regression, thus ensuring that the missing trap values are penalized with a high degree of

uncertainty. This method also considers the observed trend of decreasing CV with increasing deposition mass.

Step 2: Calculate the dry collection mass

- For every trap location a wet collection mass is randomly drawn from the PDFs of step 1. From this wet collection mass the dry collection mass is calculated with randomly selected regression parameters. The normal PDFs of the parameters are derived from the confidence bounds of the parameters. Normality is chosen because the method providing the confidence bounds assumes normality (Student's t-distribution, see explanation of Eq. (2)).

Step 3: Truncate the dry collection masses from step 2 by the constraint given in Eq. (3)

Step 4: Construct 90% CI of the empirical PDFs derived from the results ofstep 3.

Nutrient mass

The laboratory results of nutrient analysis provide proportions of sediment mass (%). This means that the uncertainty of nutrient mass is related to the sediment mass. Moreover, the coefficient of variation of nutrient fraction is comparatively low, as well as the correlation coefficients between sediment mass and nutrient fraction. This implies that the nutrient compounds in the sediments are approximately homogeneously distributed over the study area. Thus the uncertainty of the nutrient fractions can be calculated over a larger spatial unit as for the deposition masses. We chose to derive the overall uncertainty over the whole study area.

Step 5: Derive PDFs of nutrient fractions based on the mean and SD of nutrient fraction calculated over the whole study area. Again we assume normality in the nutrient fraction distribution.

Step 6: Create PDFs of nutrient mass by multiplying randomly selected nutrient fraction from the PDFs in step 5 with the dry collection sediment masses from step 3.

Step 7: Construct the 90% CI for the nutrient masses from the empirical PDFs from step 6.

Grain size fraction and pH

In order to account for the observed differences in substrate and pH in the MD, the uncertainty of grain size distributions and pH is calculated compartment-wise. Variations in pH may well be caused by local redistribution of sediments. The acidic soils, e.g. in the Plain of Reeds, may influence pH, which in turn influences the grain size distribution by flocculation. Hence, in order to capture the variability of these parameters for an appropriate spatial unit, the uncertainty is evaluated for every monitored compartment. I.e. the statistical moments are calculated from compartment aggregated sample pools. Again we assume normality of the sample distribution over the compartments.

Step 8: Derive PDFs of grain size fractions and pH based on means and SD over compartments

Step 9: Construct the 90% CI from the PDFs results in step 8 for every compartment.

Finally, the results in step 4, 7, 9 are the estimated uncertainty bounds presented as 90% confidence intervals of sediment mass for every sampling location, nutrient masses for the whole study area, and pH and grain size fractions for individual compartments.

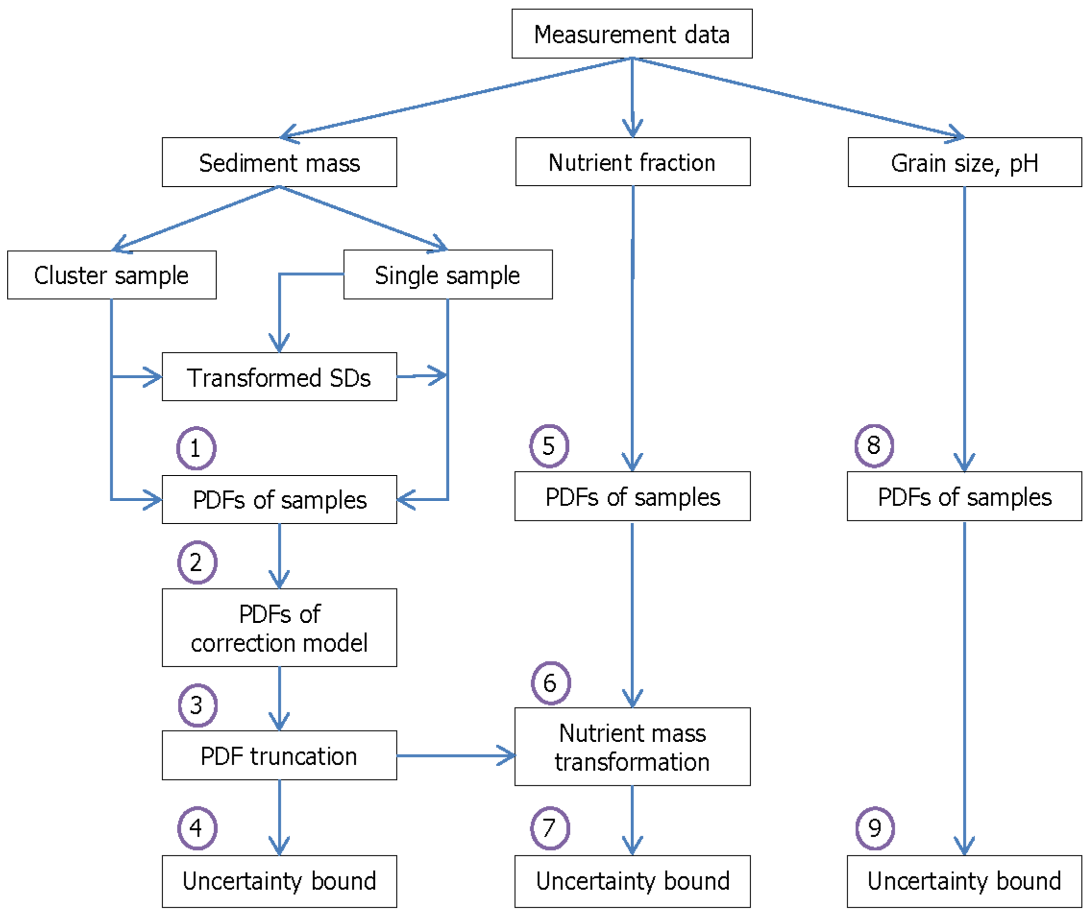

Figure 2: Uncertainty analysis workflows for sediment mass, nutrient fractions and grain size, pH.

P339, L20: What is your methodology for grain size measurements (laser?)? This measurement also introduces important bias (methodology for resampling? Aggregated grain size?).

AUTHOR REPLY: The method of grain size measurements is described in table 2: Robinson pipette method {sand > 0.063 mm > silt > 2µm clay}.

We already commented this in the replies to reviewer 1. You might be right in general, but we argue that due to the low salinity of the water in these parts of the Delta and in the Robinson pipette method, particle is individualized by H_2O_2 and deflocculated by $Na_4P_2O_7.10H_2O$ and Na_2CO_3. 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 definition above, so we do not expect a significant increase at least of the sand grain size fraction, even if flocculation should occur in the grain size analysis. Thus we did not consider this uncertainty source in the analysis.

Fig 8: I'm not convinced by this relation. It looks highly variable. What is the p-value of the fit?

AUTHOR REPLY: There is a linear correlation, although weak. The correlation coefficient is 0.65, the p-value is smaller than 0.01 indicating that the correlation significant. Besides this, the major point is that we find a model and use the upper uncertainty bound for deriving the uncertainty of the single traps. The linear correlation model is the most simple and significant one for this purpose.

P338, L4: "MC sampling of single trap data taking the measured value as mean, based on the assumption that the measurement value is a good estimator of the (unknown) cluster mean. Single trap SD is derived from the SDs and the means of cluster traps by: "This assumption is not correct when you lead a statistical analysis. You cannot use this relation to estimate CV for single sampling point and next introduce it in your MC analysis as it was a result from replicates. You should only use cluster traps (with more than 3) and simplify your analysis.

AUTHOR REPLY: This is correct inform a statistical point of view. However, in an uncertainty analysis this is acceptable, as long as the weakness of this assumption is acknowledged by a higher degree of uncertainty compared to the more reliable cluster samples. We argue that this is procedure is better than to discard the single trap data completely. In a "normal" study using single traps only no-one would discard all the data because the single data points are likely to have errors. Therefor we would keep the single trap data and include them in the proposed way in the uncertainty analysis. .

Minor comments

P326, L19: Please give your estimation of uncertainty and sedimentation rates (mean and variability) in the abstract.

AUTHOR REPLY: Yes, the final results of average sedimentation rate and nutrient rates including uncertainty ranges will be added to the abstract.

P327, L5: Provide a reference

AUTHOR REPLY: That sentence is rewritten: "the suspended sediment transport, is controlled by climate, geography, soil types, land cover, and dam construction and operation. For the Mekong the impact of reservoir construction and operation in the Chinese part (Lancang) has been studied by Lu et al. (2006), Fu et al. (2007, 2008), Kummu et al. (2007, 2010), Walling (2008), Gupta et al. (2012), and Liu et al. (2012, 2013).

P327, L15: Explain why studying floodplain sedimentation (with references).

AUTHOR REPLY: we add the following paragraph::

"In the Vietnamese part of the Mekong Delta (VMD), this interference is extraordinarily high. The VMD is known as the "rice bowl" of South East Asia. Almost the complete Delta is used for agricultural production and dissected by a dense channel network compartmenting the floodplains into compartments. The compartments are enclosed by dikes for crop (low dikes) and flood (high dikes) protection. The question of increasing the number and length of the high dikes is under debate, because it enables cropping of a third crop per year during the flood period by blocking the floodplain inundation completely. This reduces the input of sediment and thus natural fertilizers, requiring a higher input of artificial mineral fertilizers and other agro-chemicals. The importance of the floodplain sedimentation for agriculture, but also for the fishing industry and the ecosystem has been stressed by the Mekong River Commission (MRC, 2010). In addition to these ecological and economical facets floodplain sedimentation is also vital for counterbalancing deltaic subsidence. The subsidence is caused by natural compaction, but also anthropogenic causes as over-exploitation of ground water and urbanization (Syvitski et al. 2009, 2012, Wang et al. 201). These facts underline the importance of a good understanding and quantification of floodplain sedimentation

P327, L22: rather "systematic"

AUTHOR REPLY: We use the definition of uncertainty sources as defined in (Merz, B. and Thieken, A. H. 2005). Epistemic uncertainty is imperfect knowledge or, as in this case, measurement errors.

See also in P336: L13-14

P328, L14: Provide references.

AUTHOR REPLY: Do you mean a reference for P328, L13 and L20? your right, it's in Vietnamese

I will add it into the reference section:

Ve, N. B. (2009). Assessment of sustainability of 3 rice crops in the Vietnamese Mekong Delta. An Giang workshop 2009 (Vietnamese).

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

P329, L8: "during" rather than "around"

AUTHOR REPLY: Thanks your comment, "around" is surely more appropriate than "during", crops can't grow during "high stage" of floods but in "rising stage" and "falling stage" of floods (Hung 2012). Actually, paddy fields are always harvested before "high stage" and cultivated after high stage.

P329, L16:"based on"

AUTHOR REPLY: Yes, thank you.

P329, L23: A proposition: 1. Floodplain topography =>control the hydraulic patterns

2. Flood magnitude/duration 3. Suspended sediment concentration 4. Downstream water level height (tide?) 5. Dikes, hydraulic structures, irrigation channels 6. Human activities (fishing..)

AUTHOR REPLY: Thanks for your proposition. We change the listing as follows:

From P329, L23 to P330, L1 is rewritten:

1. Flood magnitude and duration
2. Distance to main rivers and associated suspended sediment concentration
3. Floodplain topography
4. Tidal regimes
5. Dikes, hydraulic structures and their operation
6. Human activities (fishing…)

P330, L8-15: move it in the method Section

AUTHOR REPLY: We move it to the section 3.1.2 of the new structure.

P330, L26: Problem with this sentence

AUTHOR REPLY: Yes, thank you, it's rewritten: “The selected sites have to be distributed in the main floodplains in the MD” instead of “The selected sites have to be distributed the main floodplains in the MD”

P333, L4-11: Result section

AUTHOR REPLY: Yes, that is moved to the first paragraph of the section 4.1 Monitoring results.

P334, L28: “These findings imply. . .” I don’t understand why.

AUTHOR REPLY: Yes, it's rewritten: “These findings imply that (a) the deposition masses contain significant high uncertainties that should be quantified, and (b) the focus of an uncertainty analysis should be laid on the uncertainty in deposition mass, as this also influences the uncertainty in the estimation of the absolute nutrient deposition.”

P335, L14: “an exponential behavior” you can provide details.

AUTHOR REPLY: This should be clear now with the new experimental data (please see in figure 1 above).

Fig 1: larger figure required or 2 fig.

Fig 2: idem

Fig 4, Fig 5: too small; do not use a line for the mean. There is not dependence between samples.

AUTHOR REPLY: The figures are enlarged, and points will be used instead of lines for the means.

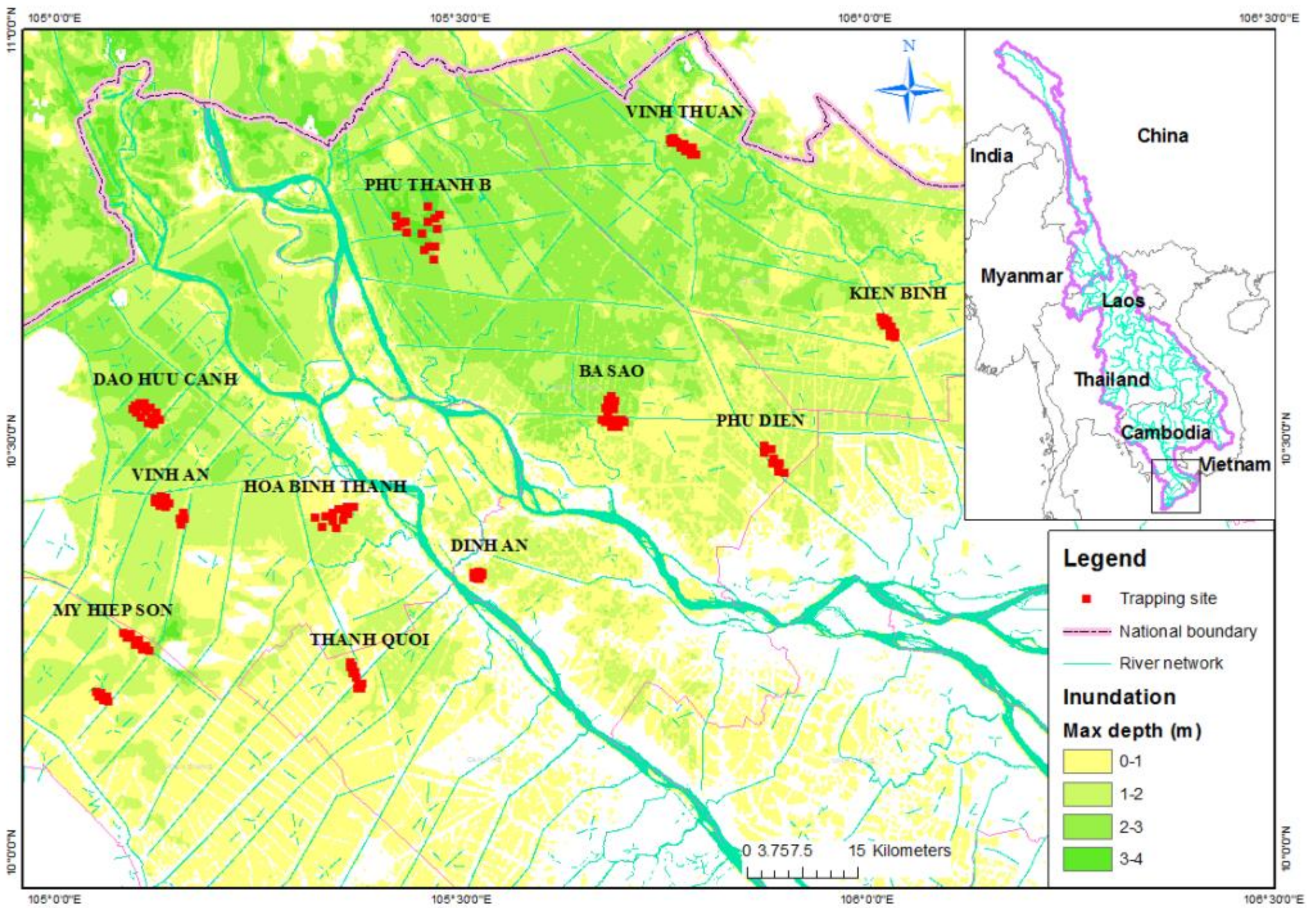

Figure 3: Fig. 1. The study area in the MD in Vietnam: the main map shows the mean of maximum observed inundation depths over 2000/2010 period, and the 11 selected sites including 19 compartments of either high dike or low dike systems. The map top right shows the entire Mekong River Basin with the Mekong delta marked by a gray box.

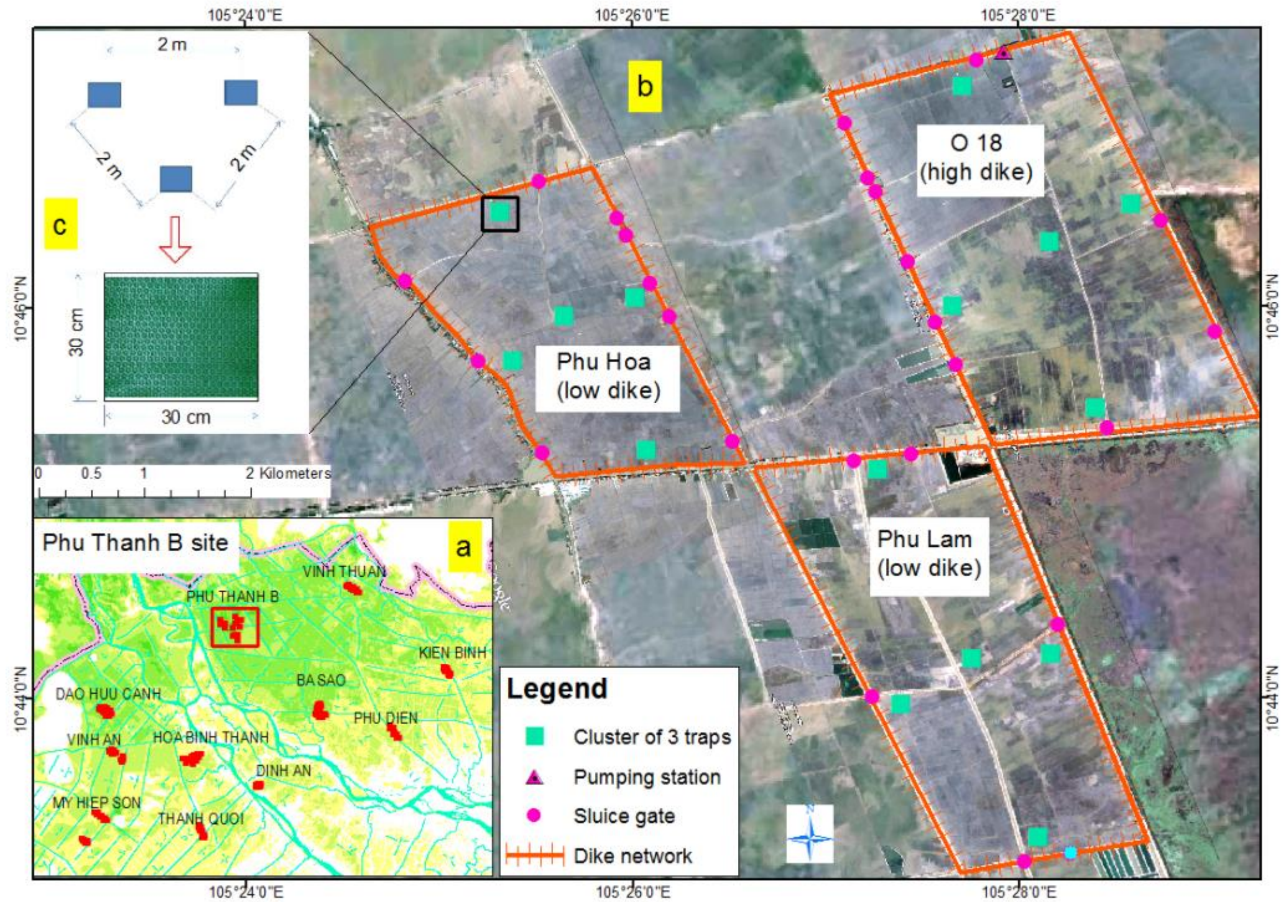

Figure 4: Fig. 2. Map illustrating the typical setup of the sediment traps in a site: map (a) shows all selected sites. The main map (b) describes the sediment trap installation in the study site of Phu Thanh B, the map (c) shows a cluster of 3 traps, the distances between the traps and the dimension of a trap.

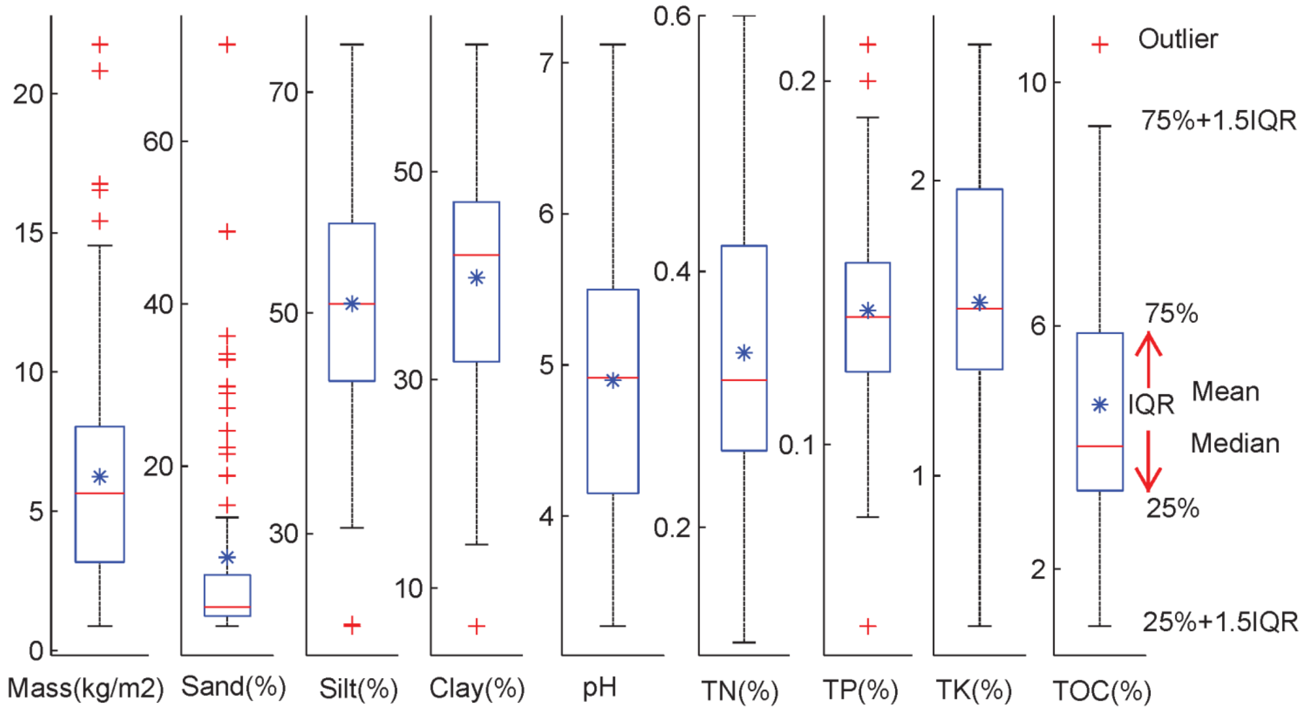

Figure 5: Box plots of all data: sediment mass (g), sediment grain size classification of Sand, Silt and Clay (%), potential Hydrogen (pH), Total Nitrogen (TN) (%), Total Phosphorus (TP) (%); Total Potassium (TP) (%) and Total Organic Carbon (TOC) (%).

Fig 7: Work flow is not very clear.

AUTHOR REPLY: The work flow chart is reworked. (please see the figure 2)

Fig 9 and 10: give only one title to the fig.

AUTHOR REPLY: We provide a single legend for the figures, but keep the individual figure titles to indicate which parameter is shown.

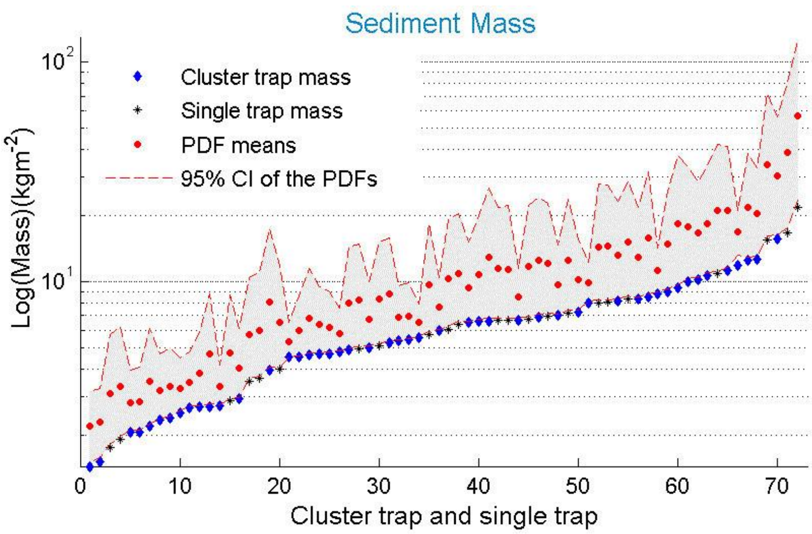

Figure 6: Fig. 9. Mean (red dots) and confidence intervals (CI, red dash lines) of sediment mass after wet-dry sampling correction and uncertainty analysis, and original trap data. Sediment masses with indication of cluster and single trap samples.

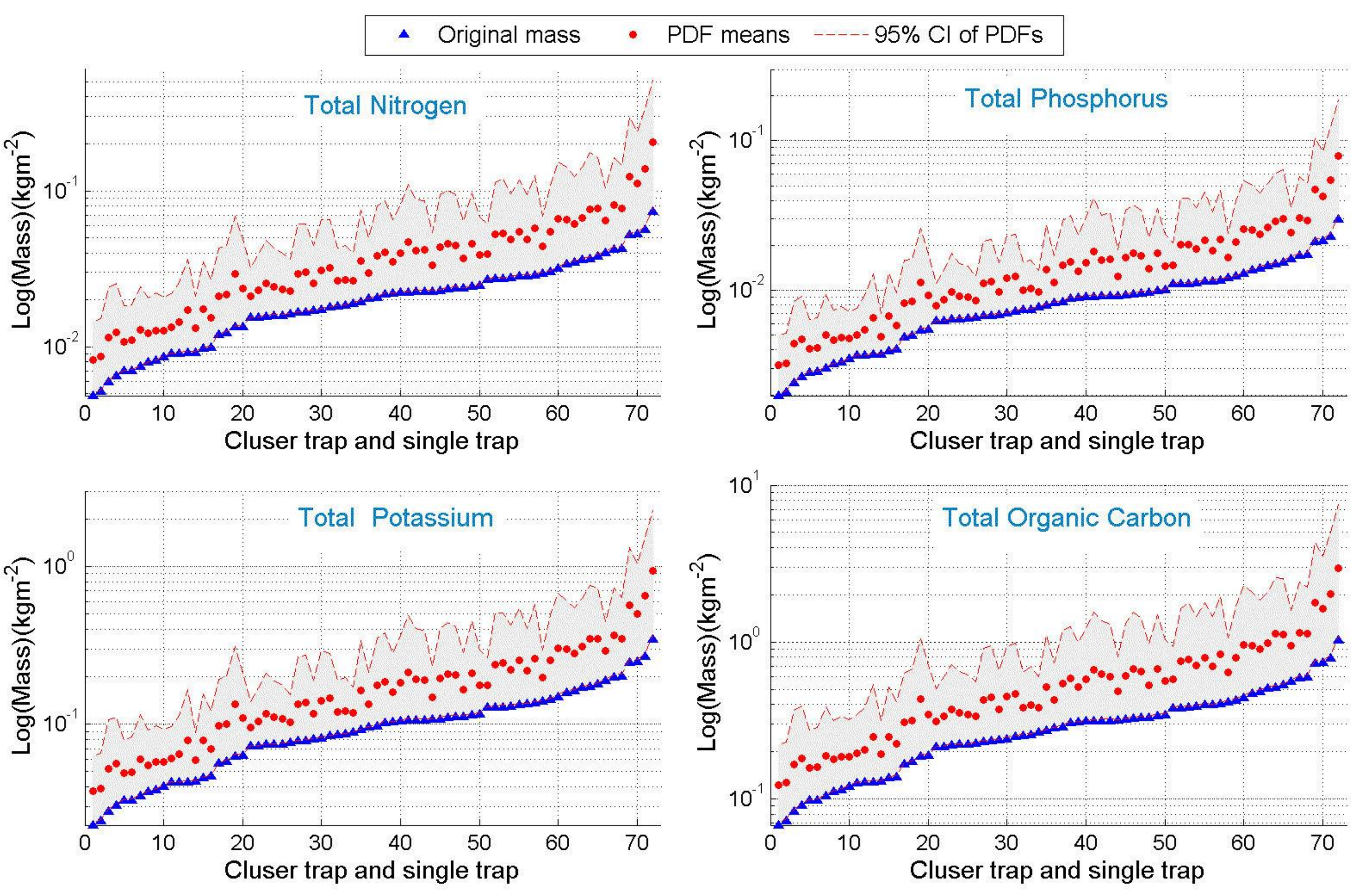

Figure 7: Fig. 10. Mean (red dots) and confidence intervals (CI, red dash lines) of nutrient masses after wet-dry sampling correction and uncertainty analysis, compared to the original sampled masses.

Fig 11 and 12: not useful

AUTHOR REPLY: Do you rather mean fig 11 and fig 13? Given the length of the manuscript we would agree that the figures can be removed.

References:

Apel, H., Merz, B., and Thieken, A. H.: Quantification of uncertainties in flood risk assessments, International Journal of River Basin Management (JRBM), 6, 149-162, 2008.

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