Biogeosciences
Discussions

Interactive comment on "Sediment trap efficiency of paddy fields at the watershed scale in a mountainous catchment in Northwest Vietnam" *by* J. I. F. Slaets et al.

Anonymous Referee #3

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The present article Âń Sediment trap efficiency of paddy fields at the watershed scale in a mountainous catchment in Northwest Vietnam" investigates a major issue in soil conservation (soil erosion and sedimentation) with key implications for soil fertility and food security in high land tropical ecosystems (loss of fine soil particles in the uplands, siltation in the low lands). This paper is well illustrated and well written. Despite that I found it did not acknowledge the existing literature on the subject (impact of land use change on soil erosion in the uplands of South-East Asia with numerous papers such as by Ingram et al. 1996; Gafur et al. 2003; Chaplot et al. 2007; ………….…..) and on sedimentation in basins (Gafur et al. 2003, Lapon, 2010, Chaplot and Poesen, 2012; Schmitter et al. 2012, Nunkaew, 2012,.…………..…..) and faces a major flaw

(continuous inputs of sediments occur in irrigation canals from dam to paddy field outlet which are not considered. The authors made other methodological choices which are very difficult to defend such as the use of MIRS for evaluating sediment texture for 100 samples and Laser, an broadly accepted and accurate methods for 50 samples, while all the 150 samples could have been analyzed by laser and the whole paragraphs dedicated to MIRS modeling could have been deleted. All of this gives the impression that the authors put more emphasis on the tool they had at their disposal, going in different directions (why a sediment prediction part in this paper?) while they lacked setting up a proper experimental scheme. Below are some additional comments: Page 4 line 5 : Âń Implications of these land use changes have been studied in detail on the upland fields, and the increased erosion due to these changes are well documented." A proper literature review on these aspects should be performed

P 7 from line 10: how many samples, when, what calibration/validation procedure for the turbiditimeter? Why "and then 16 siphoning off the supernatant followed by oven-drying of the sediment at 35°C." ? does not seem standard procedure! Should have been 100°C

Why "Continuous predictions of sediment concentration were then obtained from a linear mixed 18 model (Slaets et al., 2014) with SSC as response variable and turbidity"? Prediction for what purpose?

Same for "To account for temporal correlation in the 20 observations, an error with a first-order autoregressive covariance structure was fitted to the 21 data. The response variable was log-transformed to stabilize the variance, as were the 22 predictor variables discharge and turbidity. Model fit was evaluated with five-fold cross 23 validation using a SAS macro described in Slaets et al. (2014)."

"2.4 Separating sediment sources " was not introduced There are different sources of water and sediments in the catchment as exposed by authors "ponds in the paddy area. The river receives outflow from both banks of paddy fields, and we 2 only monitored the

overland flow entering the right bank. Therefore, in order to quantify the 3 net sediment balance for the paddy fields, the assumption is made that the upland fields on 4 the left bank of the river generated the same amount of erosion as those on the right bank,"

2.6 Sediment texture with mid-infrared spectroscopy ?

As the MIRS method requires a subset of the samples to 21 be analyzed with conventional wet analytical methods for calibration and validation, laser 22 diffraction with a Coulter LS 200 (Beckman Coulter, Germany) was performed on 50 23 samples.

Laser diffraction also needs to be calibrated. Can understand why using MIRS when laser available. Lots of work for so little samples: "Sand, silt and clay were predicted from the spectral data using Partial Least Squares 3 Regression (PLSR; Wold, 1966). All spectral manipulation and model selection was 4 performed using QUANT2 package within software OPUS 7.0 (Bruker Optik, Germany). 5 Models were evaluated with leave-one-out cross validation. OPUS offers several spectral 6 processing techniques to enhance spectral information and reduce noise. The selection of the 7 most suitable method can be automatized using the OPTIMIZATION function, which selects 8 the method resulting in the highest $r2$ of observed versus predicted values after cross-9 validation. For sand, the pre-processing method was the calculation of the second derivative 10 of the spectra, which can help to emphasize pronounced but small features over a broad 11 background. After validation, an $r2$ of 0.81 was obtained. For silt, multiplicative scattering 12 correction was applied, which performs a linear transformation of each spectrum for it to best 13 match the mean spectrum of the whole set, and the model resulted in an $r2$ of 0.83. For clay, 14 no satisfactory model could be obtained, and so the clay percentage was calculated as the 15 remaining amount of sediment after subtracting the sand and silt fractions."

Table 1: 6 of water flux observations only? "Table 1: Number of observations (n), coefficient of determination (R2) and method used for 2 stage-discharge relationship (Q); and number of observations and Pearson's correlation 3 coefficient (r2) after five-

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fold cross-validation for suspended sediment concentration 4 predictions (SSC)."

How were 6 data points used to estimate yearly loads?

Table 3: Sediment inputs from irrigation water and overland flow from the 37 ha upland area 1 in the sub-watershed, and sediment export and trapping by the 13 ha paddy area (Figures 1 2 and S1). Loads are estimated as the median of the bootstrap estimates (Med), and 95% 3 confidence intervals are shown (LL=lower limit, UL=upper limit) in Mg per year. 4 Sediment load (Mg a-1) What is Mg a-1 ?

Where is dam? How can sediments not be settled in dam? Sediments obviously come from slope nearby paddy fields, how to discriminate between the two origins?

Figure 1: Sediment sources and water flows into and out of paddy rice fields in Chieng Khoi watershed. The dotted yellow arrows show the 3 irrigation channel leaving the reservoir and splitting in two, feeding the two banks of paddy rice. The rice fields subsequently drain into the river,

How many data points to generate: Figure 2: Total discharge from the reservoir irrigated to the 13 ha paddy area draining 2 between Locations A and B in the river, and total discharge exported from the sub-watershed 3 via the irrigation channel at Location 3, per rice crop (spring, summer) per year, and amount 4 of rainfall per rice crop per year.