Response to the comments made by Anonymous Referee #1

Dear Referee #1,

We thank you for your positive assessment of the manuscript. We appreciate your valuable comments that helped to improve the manuscript. We agree with most of your suggestions, and have made the modifications accordingly. Below, the reviewer comments are reported in italics, and our responses in normal font (blue color). We also appreciate your comment "I encourage the authors to continue their work trying to find cheaper and more portable ways to measure bedload".

Specific Comments

Comment 1: *It is unclear to me why the authors mention and include a Power Fit in Section 2 and Table 5 but then do not mention it in any of the discussions about their results.*

Response: There are two reasons why we included the power-law relations in Table 5. (i) As the correlation coefficients R are mostly quite similar for the linear and the power law-relations, indicating that a linear calibration relation provides a good description of the measurements, if the power-law exponent β is close to one and R is fairly large (as is true for many cases in Table 5). (ii) The inclusion of the power law-relations allows a more detailed comparison with earlier studies, where also power-law calibration relations were included, based either on impulse counts or on other summary values (e.g. Rickenmann et al. 2014, Habersack et al. 2017). We inserted a related comment in the revised version of the manuscript (section 3.2) to make these points more visible.

Comment 2: *Lines 284-287 talk about a variability in the kb value for the SPG and MPA systems for a certain range of masses. It is unclear what this variability is: whether it is the range of kb values for each of the Obernach experiments, or whether it is the range of kb values when considering only certain size classes, or whether it is something else entirely.*

Response: In the text of lines 284-287 of the original submission, we specifically refer to Figure 8 and the observations at the Obernach experiments, thus the variability refers to the range of "individual" k_{bi} values, where k_{bi} is defined for each individual experiment for a given size class. This larger variability of the "individual" k_{bi} values is also observed at field sites and for the mixture experiments at Obernach (Figs. 6, 11). The variability of the k_{bi} values is reflected by the position of each data point relative to a linear mean trend line in a Figure of IMP values vs. bedload mass M. We explain this issue in a clearer way in the revised version of the manuscript.

Technical Comments

Line 40 *– remove the word "this"*

Response: corrected

Line 73 *– change "to detect" to "the detection of" or similar*

Response: corrected

Line 74 *– remove the word "indicate"*

Response: corrected

Line 148 *– change "the full raw signal is" to "the full raw signal was"*

Response: corrected

Figure 6 – *The legend entries are in boxes of different sizes. This can lead the reader to think that these sizes are significant. In addition, the light green colored equation is very difficult to read*

Response: Figure 6 has been revised considering the comments made by the reviewer.

Lines 268-269: *I cannot make sense of this statement. Suggest re-wording for clarity.*

Response: We agree that the second part of the sentence was unclear. This part was deleted, and the first part was modified for better clarity (L292-294 in the "tracked-changes" version of revised manuscript).

Line 271 *– remove the words "and", "if" so the it reads "For all four sites (for the Erlenbach…"*

Response: corrected

Line 282 *– begins a long and complicated sentence. I suggest breaking it into two sentences "… by larger particle impacts. This is evidenced…."*

Response: corrected

Line 296 *– remove the word "relatively"*

Response: corrected

Line 317 *– remove one of the "that"s*

Response: corrected

Line 346 *– remove the comma*

Response: corrected

Line 352 *– remove the word "clearly"*

Response: corrected

Line 353 *– remove the word "already"*

Response: corrected

Line 359 *– needs to be reworded. For example "… occurs only for maximum amplitudes that are close …."*

Response: corrected

Line 361 *– needs to be reworded. For example "… range (500 g) were signal-saturating impacts observed."*

Response: corrected

Line 379 *– The last "and" should be "with" to match the rest of the sentence*

Response: corrected

Line 383 *– remove the word "Thereby,"*

Response: corrected

Line 394 *– remove the word "clearly"*

Response: corrected

Line 428 *– remove the word "generally" and change the word "sensible" to "sensitive"*

Response: corrected

Line 434 *– remove the word "the" between "all" and "four"*

Response: corrected

Line 435 *– remove the phrase "to the data of the SPS system"*

Response: corrected

Line 448 *– remove the phrase "at all"*

Response: corrected

Line 454 *– remove the word "a" after "MPA system led to"*

Response: corrected

Line 457 *– remove the phrase "at least"*

Response: corrected

Line 465 *– I suggest ending the sentence instead of using a semi-colon*

Response: corrected

Further changes

We have also made some further minor changes to the original manuscript. These mainly concern typos, updating references of some recently published papers, and general rewording of terms or sentences. All changes can be found in the "tracked-changes" version of the manuscript.