%---------- Introduction ----------%

L39 . Could be valuable to add other papers using direct calibration. For example:

Bakker, M., Gimbert, F., Geay, T., Misset, C., Zanker, S., & Recking, A. (2020). Field Application and Validation of a Seismic Bedload Transport Model. Journal of Geophysical Research: Earth Surface, e2019JF005416. https://doi.org/10.1029/2019JF005416

Geay, T., Zanker, S., Misset, C., & Recking, A. (2020). Passive Acoustic Measurement of Bedload Transport: Toward a Global Calibration Curve? Journal of Geophysical Research: Earth Surface, 125(8), 1–19. https://doi.org/10.1029/2019JF005242

Rennie, C. D., Vericat, D., Williams, R. D., Brasington, J., & Hicks, M. (2017). Calibration of acoustic doppler current profiler apparent bedload velocity to bedload transport rate. Gravel-Bed Rivers: Process and Disasters, 209–233. https://doi.org/10.1002/9781118971437.ch8

L56-58. To my mind, Thorne [1985] has not shown that transport modes are associated to different acoustic response (it is only suggested in this paper). Please check my remark and remove this reference if this review is true.

%---------- Methods ----------%

Table 1 - When monitoring bedload, we are interested in estimating bedload fluxes (in kg/min, g/m/s or else). In the presentation of the Flume experiments (section 1.1.2), I think important to have an estimation of these bedload fluxes (even if imprecise). I believe that the number of moving particles strongly affects the modes of transport and their associated characteristics (impact velocities/angles, etc.), due to interaction between particles. This was suggested in the following paper: Gimbert, F., Fuller, B. M., Lamb, M. P., Tsai, V. C., & Johnson, J. P. L. (2018). Particle transport mechanics and induced seismic noise in steep flume experiments with accelerometer-embedded tracers. Earth Surface Processes and Landforms. https://doi.org/10.1002/esp.4495. The number of moving particles is dependent on bedload fluxes and bedload sizes. For me, it is therefore very important to give an overview of the bedload fluxes used in these experiments.

L128-130 - What are the average impact velocities of the particles in the flow (i.e. in the flume experiments)? Is it comparable to the particle velocity in the inclined chute experiments? Please add a sentence on this comparison.

Figure 2b. Add “view” to read “Cross-sectional view of the FEM model of the SPG system.”

L154 - Maybe delete “the” from “the bedload particles”.

L210 –is k_{IPM} comparable to the k_b of almost all other studies [Rickenmann et al., 2013; Wyss et al., Nicollier et al., 2021] ? Should it be recalled to trace the continuity of these works?

Equation (5) – I agree with the definition of your **centroid frequency**. However, be careful, the definition of Thorne is called “central frequency” and is not the same. The definition of the central frequency by Thorne is given by this equation:

$$\int_{f_1}^{f_c} P(f)df = \int_{f_c}^{f_2} P(f)df .$$

in Thorne [1986], Laboratory and marine measurements on the acoustic detection of sediment transport. I tried both formulations on several bedload data (acoustic and seismic signals) and observed that it gives different results. Maybe be add a small note on this remark ? “Note that the formulation of the central frequency [Thorne, 1986] is different from the formulation of the centroïd frequency (equation 5).”

L249 – The term water flow velocity is not clear. Do you mean depth-averaged velocity? Velocity close to the bed? Please precise.

L252 – Replace V_P^{Cal} by V_P^{Est}

%---------- Results ----------%

L272-275 – “Obviously, the number of effective impacts (=real impacts + apparent impacts) for all transport modes is larger than that of the real impact” Yes, it is obvious…I don’t see the point of this sentence.

L280-283 – Can you explain this result? Is it coming from the filtering method or from the video counting?

L301 – “Both the inclined chute experiments and the FEM simulations indicate that the impulse-mass coefficient k_{IPM} varies only moderately with impact angle for a given particle size” I think you should moderate this statement as you have few data concerning the chute experiments (only two different values and comparable angles). I think more adapted to delete “Both the inclined chute experiments” in order to read “The FEM simulations indicate that the impulse-mass coefficient k_{IPM} varies only moderately with impact angle for a given particle size”

L313/315 (fig. 9b) – As previously, the experimental data are not very usable (few data and no clear trend). Should be better to read something like “The FEM simulations show that the maximum amplitude of a packet $Amp_{Max,Pac}$ increases with increasing particle impact angle θ up to about θ = 60° (Fig. 9b). The inclined chute experiments do not show a clear trend.”

%---------- Discussion ----------%

L333-338 – I globally have a problem with this paragraph as I’m not convinced by the given explanations. First, for smaller particles, $r_{i,j}<1$, it means that $N_{video}<N_{filtering\ method}$ (equation 6). You write that “This is due to the fact that in the experiment, only the particle impacts that are on the SPG plates are selected. The signal that is produced by the impacts on the concrete is dampened during wave propagation and filtered using the numerical method” Do you mean that N_{video} is only computed considering the impact on the plates and that $N_{filtering\ method}$ includes some impacts that were generated on the concrete. Finally, do you mean that the filtering method is not totally efficient for the smaller diameters?

Secondly, for larger particles, $r_{i,j}>1$ means $N_{video} > N_{filtering\ method}$ (eq. 6). You write that this “is possibly (due) because of the high impact energy generated by the large particles”. I really don’t see the relation between this sentence and the fact that you found less packets with the SPG method than with the video. On the contrary, I would expect that higher energy would generate a larger number of packets in the SPG signals (and so an overestimation of the number of impacts using SPG systems). Could you precise your idea?

Finally, I wonder if the definition of the equation 6 is exact, as I would expect the inverse result (underestimation of impacts with the SPG system for small diameters and overestimation for larger diameters).

L347: should we read “over the plate” instead of “over the channel bed” ?

L388-390: “A considerable difference of $Amp_{Max,Pac}$ between the transport modes could potentially be helpful in identifying sliding particles and therefore may improve the signal conversion into fractional bedload transport rates” Yes but there is also a strong dependency of $Amp_{Max,Pac}$ with bedload particle size. This dependency (on diameters and on transport modes) make the use of $Amp_{Max,Pac}$ difficult.

L400-441: Finally, can we conclude that the centroid frequency is a good proxy for size identification? [few dependency on transport mode and on particle velocity I guess].