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# *Interactive comment on* "Acoustic wave propagation in rivers: an experimental study" *by* Thomas Geay et al.

**Anonymous Referee #2**

Received and published: 1 February 2019

General comments:

The manuscript describes and discusses an important aspect of a potential new technique for bedload transport measurements in rivers using passive acoustic monitoring with hydrophones. Controlled experiments were performed in seven rivers to assess the sound propagation in stream reaches with site-specific, different morphological characteristics. Using an acoustic source with known characteristics, the attenuation of the sound was determined for different hydrophone positions along the stream channel, essentially determining the cutoff frequency and attenuation coefficients as a function of acoustic frequency. These experiments and the associated findings represent an important step towards a better interpretation and quantification of hydrophone measurements to determine bedload transport in river environments.



Specific comments:

P2L24: These two sentences about results belong rather to the abstract or conclusion section. At this point you should rather more clearly state what the objectives of this study are.

P3L22 and P4L9: The two frequency ranges mentioned are largely similar, but the lower end is different by a factor of 5. You may clarify in section 5.1 why exactly the sound source had a frequency range of 0.2 kHz to 50 kHz.

P4L31 and P7L29: As the hydrophone was fixed at a constant depth from the water surface, it had different relative positions (between water surface and streambed). Although you state in section 3.2 that you did not notice any representative differences in the results for the discharges investigated, you may comment on why different relative positions of the hydrophone may possibly not have a large effect on the results.

P7L14 and P9 top: In the context of eq. (7) you should also indicate the sound speed in water cw (which is only given in the caption of Fig. 8), and discuss the sensitivity of the cutoff frequency fcutoff to uncertainties in the sound speed in the sediment layer cs. For cw = 1450 m/s, h = 1 m, and cs varying from 1500 m/s to 1700 m/s, for example, fcutoff varies by about a factor of 2. What are reasonable bounds for the potential variation of cs?

Fig. 10, Table 1, and Table 2: The values of h/D84 in Fig. 10 are incorrect. I suggest to list these values also in Table 1 explicitly, and to indicate additionally the mean alpha-lambda values in Table 2.

Fig. 10: How was the Froude number determined? Using surface velocity? Using a mean flow depth? Please clarify.

In addition to the important comments no. 11 and no.12 of Referee #1, you should clarify how the mean values of the attenuation coefficients alpha (given in Table 2) and alpha-lambda (given in Fig. 10) were determined (e.g. over which frequency range?).

Technical corrections:

P2L2: Theoretical and experimental studies have shown . . .

P4L16: The Power Spectral Density . . . has been computed

P8L6: the attenuation coefficient varies by more than

P8L27: At “low” frequencies: please give a numeric range of f values here.

P9L5: lithology, grain sizes, porosity . . .

P9L6: but varies from . . .

P9L7: For these reasons, cutoff frequencies are rough estimates and do not . . .

P9L19: Maybe reformulate to: The possible influence of typical nondimensional numbers has also been tested.

P9L27: Also, as observed in a flume experiment . . .

P10L1: difficult to access the riverbed, and . . .

P10L13: and r the horizontal distance from: Do you really mean horizontal or rather bed-parallel, stream-wise direction here?

P10L17: This has several implications for the use . . .

P10L23: measured spectra should be corrected for propagation effects . . .

Fig. 6d: Correct to “(d) Squared correlation coefficient of the fits”

Fig. 6 and Fig. 7: Indicate that measurements refer to the Leysse river (apart from Bourget lake).

Fig. 10c: The abscissa label should read surface D84.

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