Response to reviewer 2

Summary: The paper titled 'Integrating smartrock and seismic monitoring to investigate bedload transport dynamics during rapid increase of stages in ephemeral streams' by Matanya Hamawi et al., investigates the bedload transport in two different ephemeral streams using smartrocks and seismic measurements. As main results, the authors observed three different scenarios:

At shallow depth, a rapid increase of stage enhanced higher bed material and vibrational movements compared to steady flow [1], while at intermediate relative depth, this rapid increase in water level decreases the effect on bedload activity [2]. However, at greater relative depths, the bedload movement is enhanced again [3]. The paper is well-written. It tackles an interesting problem related to sediment transport dynamics and measurements during different floods/unsteady flows. I believe this study is suited for publication after some improvements.

We thank the reviewer for the positive and constructive summary of our manuscript and for recognizing its contribution to understanding bedload transport dynamics under unsteady flow conditions. We appreciate the assessment that the manuscript is suitable for publication following improvements, and we address the specific comments below.

[1] From lines 55-57. What are the limitations presented in the previous studies performed in ephemeral rivers (in arid and semi-arid regions)? It would be better if the authors could briefly explain them in this part.

The text has been revised to explicitly clarify the main limitations of previous studies in ephemeral rivers, highlighting the short-lived and highly variable nature of flow events and their implications for data availability and measurement constraints. A statement was also added to emphasize that the method has not yet been specifically evaluated during rapid increases of stage.

[2] Line 73 – The authors used the term 'different morphologies'. Can you be more specific? What are the differences between the two studied sites?

The morphological differences between the two study sites are specified in detail in the Study Area section, where each site is described separately.

[3] Lines 72-73: ‘we aim to develop a more comprehensive understanding of how rapid increase of stage influences bedload transport processes’. Which processes are you referring to?

The text has been revised to remove the ambiguous term “processes” and to more clearly state the scope of the analysis by focusing on bedload transport dynamics during rapid stage-rise events.

[4] Lines 75-76. I would suggest rephrasing the last sentence of the introduction.

The last sentence of the Introduction has been rephrased to more clearly and concisely highlight the contribution of the study.

[5] I suggest adding the timeframe (instead of winter) to lines 80-81.

The sentence has been slightly rephrased to improve clarity. However, we retained the reference to the winter seasons, as the monitoring was conducted exclusively during these periods, when flood events are likely to occur in these ephemeral channels.

[6] Lines 161 - 162 – The authors compared the results with the steady flow. How do you define/measure the data on the steady flow condition?

In this study, steady flow refers to periods with no appreciable increase in water level, in contrast to the rapid stage-rise events analyzed, for which the rates of increase are reported in the results section (with a minimum rate of 1.1 cm/min).

[7] Lines 193-194. It was not clear to me how you selected the threshold values for each site. I suggest briefly explaining it.

The text has been revised to clarify how the threshold values were determined by explicitly indicating that they are based on the 99th percentile of pre-event envelope velocities, with a reference to Section 2.2 for the full methodological description.

[8] Line 210 – I suggest to be more specific on the amount of (or %) of increasing compared to steady flow conditions.

The text has been revised to include a quantitative comparison between rapid stage-rise and steady flow conditions. Specifically, we now report the mean ratio of 3.2 for depth bins ≥ 0.1 m and indicate that, in Nahal Yatir, differences reach up to two orders of magnitude, thereby providing a clearer measure of the observed increases.

[9] Figure 5 and lines 213-214 : After line 214, the authors need to explain each one of the stages, and how they separate those regions (even though you discuss it later).

The classification into stages is based on the variation of the gyro velocity ratio between rapid stage-rise and steady flow conditions, as described in the preceding sentence. For clarity, we have added a brief statement in the final sentence to explicitly refer to this relationship.

[10] Figure 6 – How did you define the quasi-steady flow conditions?

The term “quasi-steady flow” was used unintentionally. We intended to refer to “steady flow” throughout, and the text has been revised accordingly to ensure consistency and avoid confusion.

[11] From figure 9, it seems to have very similar values compared to steady flow conditions on stage 3. I suggest adding some thoughts on that in the results section as well.

The text has been revised to clarify the behavior observed in Stage P3. We now explicitly note that, in Nahal Yatir, the increase in seismic energy ratios during this stage is more moderate compared to Stage P1.

[12] Why not add the same two images for both sites in Figure 11? Instead of adding in the SI.

The figure for Nahal Anim were not included in Figure 11 because, at this site, the smartrock represents a relatively large fraction of the bed material size. Consequently, the direct correlation between seismic energy and smartrock measurements is less representative than in Nahal Yatir. Nevertheless, similar trends are evident in the corresponding figure presented in the Supplementary Information.

[13] In the last part of the discussion, I would consider adding some explanation on the limitations using the gyro velocity information, as it adds an external source of motion (vibrational).
The text has been revised to make this point more explicit.

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