The authors are thankful for the Reviewer's comments and suggestions to improve the manuscript. Significant parts of the manuscript have been modified and extended to address the main concerns, in particular the novelty of the proposed analysis and how it fits within and distinguishes from existing literature on similar subjects.

We have structured the response to Reviewer 2 in two parts:

C) addressing main concerns of the Reviewer 2, followed by
D) our response to the line-by-line comments of Reviewer 2.

Response to Reviewer 2.

C) Major modifications

The reviewer rightfully states:

C1. Some information regarding the open channel flow is missing that would be very beneficial for fluid mechanics when they require to compare the features of the flow: Reynolds number based on the wall shear velocity, particle Reynolds number based on the wall shear velocity. Other than the bulk Reynolds number, another relevant non-dimensional number is the particle Reynolds number with an appropriate velocity scale that here should be the shear velocity. Can authors compute/estimate the shear velocity using momentum balance?

We agree with the reviewer, included it (page 2, line 3).

C2. The last sentence of Introduction needs more elaboration. It is a jump to a literature without explaining it: The critical bed shear stress can also be excluded when computing the bedload grain velocity (Cheng and Emadzadeh, 2014).

We revised the last paragraph of the Introduction. Now reads:

"Conclusions reached by these authors agree that a single mean value of shear stress is not an accurate estimate for sediment transport, and further consideration must be given to instantaneous turbulent parameters for a better characterisation of flow-sediment interactions."

For details please read the full paragraph stated at page 2, line 24.

C3. A few literatures are missing in the paper:

a. Robinson, S.K., 1991. Coherent motions in the turbulent boundary layer. Annual Review of Fluid Mechanics, 23(1), pp.601-639.

b. Bagnold, R.A., 1956. The flow of cohesionless grains in fluids. Philosophical Transactions of the Royal Society of London A: Mathematical, Physical and Engineering Sciences, 249(964), pp.235- 297.

c. van Rijn, L.C., 2013. Simple general formulae for sand transport in rivers, estuaries and coastal waters. Retrieved from www. leovanrijnsediment. com.

Included (page 2, line 19; page 3, line 14; page 2, line 16).

C4. Since the experiments are occurred over flat surface, I do suggest to mention this explicitly in the title or Abstract; "unidirectional currents over flat bed"

Mentioned in the Abstract (page 1, line 12) and in the Introduction (page 5, line 16).

C5. Discussion of Figure 3 is vague! How do authors conclude that "Sufficient shear stress was produced to generate sediment resuspension"?

We have modified the discussion to clarify our observations (page 10, line 2). It now reads:

"The scatterplots of the Reynolds and TKE bottom shear stresses for the AMCV and BMCV runs (Figs. 3a and 3b) showed that higher bed shear stress (i.e. values >5 N/m^2 of TKE and Re shear stress estimations of both AMCV and BMCV runs) was produced to generate sediment resuspension (as evidenced with backscatter intensity on Figs. 4c and 5c). Such comparison of the TKE and Re shear stress methods also suggested the presence of coherent flow structures in the turbulent flow which created highly localised and persistent variability near the bed, hence affecting the bed shear stress."

C6. What do authors suggest in order to improve the current representation of the threshold? They should mention a variable that may correlate better to these phenomena than shear stress.

We suggested the following in the conclusion section of the revised paper:

"Our statistical assessment suggests that the existing definition of threshold can be improved by incorporating turbulent effects for a more accurate description of the processes involved which will result in better predictions of sediment transport. The results of this study are instrumental in resolving an important research question: how best to incorporate the turbulent bursting events into a theoretical model describing the sediment entrainment process? The analysis detailed herein on identification of bursting events and their contribution toward the near-bed Reynolds shear stress production governing sediment motion provide new avenues to answer such question, incorporating the use of wavelet analysis on time series of acoustic backscatter or signal intensity readily available from commonly used acoustic velocimetry instruments (ADVs and ADCPs) as a powerful tool for investigating such processes. The fact that a similar methodology can be applied to existing field and laboratory datasets that focused on velocity but collected an indicator of signal backscatter as part of the data record, further highlights its potential in future research to elucidate a more complete understanding of the interactions between flow and sediment transport over complex topography."

Please also refer to Response to Reviewer 1 (section A1) highlighting the objective of this paper.

D) Line by line comments:

D1. Line 26, page 7, change "energy" to "energetic".

Corrected.