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Earth Surface Dynamics Discussions
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Interactive comment on "The influence of turbulent bursting on sediment resuspension under fluvial unidirectional currents" *by* Sarik Salim et al.

Anonymous Referee #1

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General Overview:

The manuscript reports on an investigation on the validity of using the critical shear velocity of sediment to define the point of sediment suspension. The research uses laboratory data provided from a separate study (Tinoco & Coco 2016) to assess the validity of a single, critical shear velocity in describing the initiation of sediment suspension under unidirectional currents. Although I support the approach, I do not think the manuscript, at present, contributes any new ideas to the subject. The manuscript is missing references to many key authors and papers on the subject, some notable exceptions include (Garcia et al., 1996; Schmeeckle & Nelson 2003; Diplas et al., 2008; Valyrakis et al., 2013; Keylock et al., 2014); for initiation of motion; Shugar et al.,

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(2010) for suspended sediment and wavelets; and (Falco 1991; Adrian 2007) for the structure of wall bounded flows, burst and sweeps and coherent flow structures. The lack background knowledge of the subject is demonstrated when reading the discussion section, which does not do a good job in bringing the results into the wider context of the subject.

In light of the fact that the first author is presently conducting their PhD. My decision is that the manuscript should be reconsidered after major revisions, rather than reject.

The manuscript does well at:

The description of the experimental method is detailed enough to be reproducible. Grammar and references and up to standard.

Suggestions for improvement:

For the manuscript to progress any further, the authors need to make an attempt to quantify the effect of turbulent bursting on the initiation of sediment suspension. At present the manuscript only calls into question the use of a critical shear velocity, which was originally done by (Grass 1970) (if not earlier) and an attempt should be made to define an adjustment to or alternative to using a single value for the critical shear velocity, or even for using it. A positive outcome, or an indication of where future research should lead, would make the manuscript much stronger, such as the cited paper (Tinoco & Coco 2016)

The introduction needs to be re-written, with the last paragraph, which contains much of the importance of the research integrated into the first paragraph. The fundamental physics of sediment suspension needs to be detailed, ideally with the governing equations, so a description of the physical processes operating and under investigation can be described and mapped onto the experimental methods. A paper about critical shear velocity really should contain the equations used to calculate the critical shear velocity.

At present the discussion is very weak and does not develop upon the results other

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than qualitative explanations. The discussion needs to bring in the wider literature so the implications of the results are clearer. As a general comment, throughout the discussion, vague and qualitative terms like “Considerably”, “reasonably”, and “close to” need to be replaced with quantitative values and specific reference to the results of the work. It is my opinion that the manuscript cannot progress further unless this section has been re-worked.

What is the difference (if any) between sediment suspension and re-suspension?

As the authors are using a critical shear velocity which was measured with the instruments that are used in the present study. So, why does the measured critical shear velocity of the sediment seem such a bad predictor of sediment suspension? The authors need to define in this manuscript exactly how their value of critical shear velocity was produced because at present this does not make any sense, other than their measured critical shear velocity is wrong.

Line by line comments

Page 1 Line 13: Is the manuscript about incipient motion or suspension? Page 1 Line 30: lower than what? Equations would be useful here and help define form and viscous drag Page 2 Line 1: define the Reynolds number, and particle Reynolds number with the equations and directly relate to page 1 line 30 Page 2 line 3: It might be obvious, but state which critical value Page 2 Line 5: Where does the limited applicability come from? This is a very important point and needs to be explained properly, in fact the next sentence contradicts this. Page 2 Line 10: You’ve half made the point, this needs detail. What did Dey 2011 do? How does your work follow on from those advances? Page 2 Line 11 to 20: you need to think about what point you are trying to make with this paragraph and how does it fit in with the rest of the introduction. This is background info that should come before you talk about more recent developments. Page 4 line 19: how need to show where the measured value of critical suspension velocity sits on the shield curve. What are the Rouse number for the experiments? I estimate ACV

= 3.05 and BCV to be 6.36 using a fall velocity calculated from (Ferguson & Church 2004). How are you defining suspension? It looks like you're measuring the initiation of motion rather than suspension here? Page 7-8, the paragraph on wavelets is full of incredibly vague terms and needs a complete re-write. Qualifiers such as: "Fast, slow, large, small gradually, sporadically, longer, shorter, weakening" needs removing. Make the results quantifiable and cite the figures and the data. The lists of identified events is somewhat useful and is a good attempt at quantification but it is not easy to use as a reader. Maybe a table of the data, with sweep and ejections in adjacent columns could be easier to read? Maybe colour the table cells by the value of the cell to make it easier to see the relationships. Page 7 Line 19: the sentence starting here doesn't make sense. Page 7 Line 24: multiscale and fine scale, large scale. These are very qualitative measurements! Page 7 Line 26: "highly energy turbulent events" what do you mean by this? How high is high? Page 7 Line 28: "dominant direction of flow near the bed" is that direction u, v or w? Very vague Page 8 Line 7: "common features were noticed"... no! cite the figures, maybe identify these common features on the figures.

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