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Hydrology and Earth System Sciences Discussions

Interactive comment on "Study of frequency pattern of coherent turbulent flow over ripples using image processing with implication in river restoration" *by* A. Keshavarzi et al.

Anonymous Referee #2

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The paper presents experimental measurements over two artificial ripples in a laboratory flume. The measurements were performed with a 50Hz three component ADV probe and a 25Hz CCD camera. The former yields time resolved velocity components at different positions and the later produces image differences to identify the location where either sediment deposition or sedimentation has occurred. As main findings the authors observe that the probability of bursting events, which are defined by quadrant analysis, do follow in some way the bed geometry and claim that this finding is supported by image analysis.

In the following I will briefly outline why I reject the publication of this paper.

Already the title is problematic. Turbulent flow is turbulent. It cannot be particularly more or less coherent. If anything, it can host structures, which require precise definition that may be spatially or temporally coherent in some way.

The language is hard to follow and at times even incomprehensible. The introduction is not giving an informative overview and then a precise description of the investigated research question. It rather lists rather common and known facts.

The experimental setup and reasoning is not well described. How are the artificial ripples produced? How is the sand deposited? How is it made sure that the ripples are always covered with a layer of sand? How is it argued that the experimental setup is relevant for any other situation in the laboratory or in nature (the plots of figure 6 show a different behavior for first and second ripple, so the results cannot be of general nature)? How can a Kolmogorov scale be given? If so, for what location, (eta=(nuˆ3/epsilon)ˆ0.25, and the rate of dissipation=epsilon is a function of distance to wall)? Why is the coordinate system not chosen to follow the terrain? How is it actually chosen? Rather than telling me that a code is written in C++, I would like to know on what principal it works. How are depositions discriminated from entrainment events? Why should black and white be an indication? It just does not make sense. As an example of the presented reasoning, which in my view is questionable, I mention the last 5 lines of section 2 on Material and Methods: It is written that in order to minimize the lateral wall effects, measurements are taken only in the middle. In my view however, it is mandatory to show how the profile varies over the later direction to justify why measurements from the middle are representative for a lateral homogeneous flow. The last three lines of the same paragraph are simply wrong, it is not enough to understand turbulence in 2D. Turbulence IS 3D and so are the associated structures. Such stream-wise structures are known to have a lateral distribution.

In the results section I actually do not see many results that are also novel. Yes, the

burst event probabilities are seeing the bed form. On the contrary it is hard to imagine hoe this should not be the case. But what is learned from this? I am afraid that I fail to understand. I also do not see how the presented work could help in practice. The image analysis is not described, but it seems little more than subtracting one image from another and claiming that white spots are deposition and black spots are entrainment events. Why? Many scenarios are possible for each gray tone change, as it is not clear which color particular grains have. Or is it a monolayer of sand? If so, how is it maintained?

In summary, I do express my full respect for the performed work in the laboratory, as I know how much hard labor is involved in collecting O(100) measurement points. On the other hand this does not automatically make the research question and rationale behind it novel or interesting. It was clear before that turbulence and its structure (whatever that is) plays a role in sedimentation and bed formation and that the bed form acts back and the turbulent flow. Other than this obvious fact, the presented paper adds very little if any understanding of the involved phenomena. I am afraid that I suggest rejection of this paper.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 7845, 2011.