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Solid Earth
Discussions

Interactive comment on "Optical method for measuring bed topography and flow depth in an experimental flume" *by* A. Limare et al.

Anonymous Referee #1

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GENERAL COMMENTS: This paper summarizes a technique for obtaining bed topography measurements at high resolution using an optical moire method. Since the field of experimental geophysics is experiencing a boom right now, and much of the information that is required to develop and test theories is that of topography, this work should be of broad interest to many researchers. I know personally at leas a dozen laboratories doing geomorphology experiments that use laser profilers or laser lines and cameras, with impose strong limitations on resolution that are overcome here. The paper does a decent job of outlining the principles and methods associated with using this procedure. I admit that I am not familiar at all with the moire method, but after reading this paper I have a decent idea of the principles, even if I could not reproduce their method in my laboratory based on what is presented here.

An overall feeling I have, however, is that the paper occupies an intermediate ground between a thorough methods paper (like a recipe book for others to follow and reproduce the technique presented here) and a results paper (showing what this method can do and how it advances our scientific understanding). It is clear from its style that this paper is meant to be a methods paper; that said, however, the methods could be a bit more complete. The authors make use of some well-established techniques, and some that are novel - it is difficult for the uninitiated reader to separate the two. In particular, the authors use the Light3D software - it is hard for me to know whether I can just go out and buy that software and it does all of the calculations presented here for me, or whether the software just does some small piece of the work. I guess what I am saying is that a slight re-structuring might help a lot: (1) Explain the "theory" first, as already in the paper (2) Explain the Light3D software next, and exactly what it does (3) Explain any modifications to the theory and/or software

I don't see this as major, however; most of the ingredients are already here. Rearranging these a bit, and adding a few more explicit points, will make this more like a recipe that others can follow step by step.

SPECIFIC COMMENTS: As I am not an expert in these optical methods, it is difficult for me to assess the technical aspects of much of this paper. That is why my main requests are to be a bit more explicit in the method. That said, a technical comment by Cochard was posted in the online discussion of this paper, and it seems to me that some of his comments should be addressed more explicitly than the authors did in their response. In particular, some clarity regarding the moire method, the cosine fringe patterns, and what the authors are actually trying to recreate in terms of their fringe patterns projected on the experiments seems warranted. Also, since there appears to be some choice in which methods/algorithms are applied for things like phase unwrapping, it would be useful for the authors to present more justification for their choices.

I know this is more of a methods than results paper, but the results and their implica-

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tions could be discussed a bit more. For example, many have done experimental work on braided rivers. Can you be specific about what measurements you have obtained using this method that are different from previous measurements? In presenting your elevation data, what can you see that others haven't, and what will this allow you to do that others haven't? It seems to me that one thing you can do that others can't, since you have high temporal resolution as well, is map dynamics. This is really the main point here - all the stuff in St. Anthony Falls Lab, for example (Jurassic Tank, Stream lab) uses a time of travel laser line. They have produced topographic maps that look at least as good as what you present in this paper - but what they do not have is the time resolution that you guys have. I think a representative difference map (a topo plot at time 1, a topo plot at time 2, and then a difference map using these two) figure would really help to show researchers the power of this approach. Rather than just saying that one can compute erosion rates, you can show a map of erosion/deposition rates and qualitatively point out "hot spots" of activity in braided river dynamics. This will get people really excited.

The slope distribution plot is confusing (see below).

TECHNICAL COMMENTS: p. 8: end of first paragraph should say "(Bremand, 1194; Servin et al., 1999; and references therein).

p. 12: "...constant head tank tank..." - remove redundant word.

p. 13: "...projector/camera system is is adjusted..."

p. 14: "...data was also collected...". Should be "data were" because 'data' is plural.

p. 15: "...raw images as input data regardless which..." - should be 'regardless of'.

p. 15, two sentences later: should read "As in any triangulation method, shadow zones may appear."

Figure 8: for part b, the plots are elevation profiles, NOT slope profiles (right?). As for c, what is plotted is unclear. What are slope values at the edges of channels? How

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are channels chosen? Are these slopes measured in the downstream or cross-stream direction? How might they be useful?

Interactive comment on Solid Earth Discuss., 3, 187, 2011.