Earth Surf. Dynam. Discuss., 2, C203–C206, 2014
www.earth-surf-dynam-discuss.net/2/C203/2014/

Earth Surface Dynamics Discussions

Interactive comment on "Sediment dynamics on a steep, megatidal, mixed sand-gravel-cobble beach" *by* A. E. Hay et al.

A. E. Hay et al.

alex.hay@dal.ca

Received and published: 18 July 2014

Note: Each of Reviewer's comments is in double quotes, and is followed immediately by our response in plane text. For clarity, each of the Reviewer's comments has been numbered.

1. "P120 Line 13-15; Because of the punctuation I am unclear as to which studies correspond to wave forcing measurements from buoys and pressure sensors. Perhaps a parenthesis should extend from the Allan ref. to the Dickson ref.?"

Yes, parentheses are definitely required here. Done.

2. "P121 Line 17-25: I understand this paragraph to mean that the grain size analysis is contained, in significant detail, in the Stark et al. manuscript which is submitted.

It would be helpful to include slightly more quantitative information in this paragraph because the sedimentological metrics are so significant in this work, for instance: is the distribution unimodal or bimodal and what are the grain sizes at the peaks?"

Agreed. We have added a statement indicating that the distribution was unimodal but skewed to larger sizes, and now include the values of D16, D50 and D84 based on the lumped average of all the sieved samples from the active beach face.

3. "P124 Line 20-21: It is interesting that the ripples continue to decay during ebb tide even as the significant wave orbital velocity is tending to increase."

Yes, we agree that this is an interesting observation.

4. "Fig 14 caption: In panel a, please specify if 'x' is alongshore and 'y' is cross shore (or vice versa)"

Done.

5. "Page 125, Line 1-11; The fining of the lower beach face is quantified using the photographic method of Rubin (2004) and sieve analysis. I have two comments here:

A) Basic results from the sieve analysis are presented here. Are results from the sieve analysis presented in more detail in Stark et al Submitted? (if so please cite so the reader can followup for more detail)"

Done, as indicated in our response to the Reviewer's comment 2. re p.121.

"B)Later in the paper, (Page 127, Line 18-19) the fining of the bed is discussed as a 'veneer'. I can intuitively understand how this would be the case using the mechanisms discussed, but it would be interesting if the authors could present this information in the results section. Did you quantify the depth of the veneer in the field?"

We did, as had been and still is indicated in the Discussion of the Erasure stage. We don't present this in the results, it is true, the reason being that the result is not very quantitative, as it is a visual observation. In the 2013 experiment we took sediment

ESurfD

2, C203–C206, 2014

cores and sectioned them in the vertical for sieve analysis, and when completed these new results will give a quantitative measure of the veneer thickness and size composition.

6. "Page 128; Line 5âËŸAËĞT Is the aspect ratio eqn describing ripple steepness? if so 'eta' should be in the numerator (or is this a different metric?). Also, Clifton and Dingler (1984) report 'typical' steepness of 0.15 with the range being as high as 0.22."

Yes, the numerator should have been eta_0, the ripple height. This has been corrected. Thank you for spotting the error.

7. "Page 128; Line 4-5âËŸAËĞT The proportionality constant K is (likely) a function of grain size (Becker et al 2007, paragraph 26 of that study; Cummings et al. 2009; Goldstein et al 2013). This inverse relationship likely makes your observations less anomalous. However the previously mentioned studies are all in well sorted unimodal sediment ('all bets are off' in mixed sed.). . . With that being said, I think you make a convincing case that the ripples are out of equilibrium (smaller) b/c of the unsteady flow conditions and the very short evolution time (_20 mins). Therefore I don't feel the need for these papers to be included in your work necessarily, I just want to alert you that they exist (my apologies if you know of them already). As a side note the time scale for ripple formation (the immersion of the instrument frame) could be a valuable data point for quantifying ripple evolution vs. forcing conditions (Davis et al., 2004), though there must be an assumption of a flat bed (c.f., your discussion of the IK06 observations)."

In fact, we were not (at least the first author was not!) of the Cummings et al. paper and thank the Reviewer for drawing our attention to it. The observation therein that equilibrium vortex ripple wavelengths are shorter for coarse than fine sand – K ca. 0.4 rather than 0.6 – is certainly interesting, and we now cite this paper in the discussion. We were aware of Becker et al. paper, but the value of K they obtain – ca. 0.1 – is so low that we wonder whether there is something else going on: the carbonate sands perhaps?

ESurfD

2, C203–C206, 2014

However, this question prompted us to carry out these calculations explicitly for the 3 cases which the ripples were best defined – i.e. at least 4 contiguous ripples with comparable heights and wavelengths. We have added Table 1 containing these results. Importantly, our observed wavelengths are, if anything, longer than expected based on $K \sim 0.6$, not shorter. The difference is due to the fact that new estimates are based on the forcing parameter values – wave period in particular – at times closest to the time of ripple formation on the flood tide, rather than 5 to 7 s values representative of the entire experiment which we had used before. The actual peak periods are shorter. The text pertaining to vortex ripples in the Discussion has been modified accordingly.

8. "P129 Line 7-9 âËŸAËĞT The concordance between Fig 16 panels, the caption, and the in text description of the figure panels should be checked."

Good point. We see that there would/could have been confusion between the abcd in the text, and abcde in the Figure. It was not meant that there should be a 1\;1 correspondence. We have changed the text from abcd for the 4 stages, to I,II, III, IV, so as to eliminate the possible confusion.

Interactive comment on Earth Surf. Dynam. Discuss., 2, 117, 2014.