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Earth Surface Dynamics Discussions



# *Interactive comment on* "The effect of ripple types on cross-shore suspended sediment flux" *by* S. R. Kularatne et al.

**Anonymous Referee #2**

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Kularatne et al. 2014 present an analysis of several field experiments to determine the role of ripple planform geometry in controlling suspended sediment concentration and the direction of the flux of cross-shore suspended sediment. I believe there is valuable data and analysis in this work but I believe more analysis must be performed to convince readers and reviewers of the arguments presented (specifically Major Comment 1; below). My recommendation is for a major revision.

âĂŤ- Major Comment 1) I am not convinced that the data presented in this paper (fluid velocity measurements at a single vertical location, and suspended sediment concentration data measured at 2 separate vertical locations) is able to be used to compute the cross-shore suspended sediment flux. My understanding of the work of van der Werf et al. (2007) is that the flux of water above rippled beds is not uniform in the vertical direc-



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tion. Therefore water velocity measurements should be located at the identical vertical position of concentration measurements to compute an accurate suspended sediment flux at a given vertical position. Furthermore a single vertical position may not give an accurate computation of cross-shore sediment flux because the flux of water is not uniform in the vertical and may actually change sign (see van der Werf et al 2007 Figure 1 and 2 for examples). Could the authors comment on this? Finally, the vertical velocity profile and the vertical suspended sediment concentration profile should vary in the horizontal direction relative to the location of the ripple crest and trough. Can the authors control for horizontal ripple position? I believe that this paper does contain interesting data that should be presented, but I am not convinced of its ability to address the cross-shore flux of suspended sediment (magnitude and direction).

Major Comment 2) Aside from mentioning in the section 2.2, the 2nd OBS located at 0.13m is unmentioned. How does the data from this sensor compare with the sensor located at 0.05m? I think that this 2nd sensor could be used to answer interesting questions related to the vertical profile of SS above different planform ripple geometries? This question might be beyond the scope of the paper as it is presently written, but including the data from 0.13m might be of value especially because it is located closer to the EMCM (@ 0.25m).

Major Comment 3) I believe the paper should incorporate more relevant research from the recent literature. In addition I would also like to see a more comprehensive introduction to planform geometry. I have mentioned several papers throughout the review that I think should definitely be mentioned (e.g., van der Werf et al., 2007; Thorne et al., 2009; Pedocchi and Garcia, 2009; O' Hara Murray et al 2011; etc.).

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Specific Comments:

Page 217; Line 1-3: I think this line might overstate the role of suspended load because we are currently able to measure suspended sediment with more ease than we are able



**ESurfD**

2, C236–C240, 2014



to measure bedload. For instance Traykovski et al (1999) suggest, from ripple migration measurements, that bedload transport is an order of magnitude more than suspended load. Tools to measure bedload are just becoming available (e.g., Hay et al., 2014), and I think this is an active research question.

Page 217; line 5-13; These lines should be modified to include recent work on low-steepness ripples, specifically that Green and Black (1999) and Cummings et al (2009) observe the presence of vortices even when ripple steepness appear to be small. Additionally Chang and Hanes (2004) show through field and modeling that vertical mixing over low slope/low steepness ripples is similar (identical??) to the vortex formation process.

Page 216-218; There are likely more articles presenting sediment concentration over rippled beds that might warrant mention in this introductory section. Specifically, I believe the authors should definitely mention work presented in van der Werf et al. (2007) and any recent work that has been developed from the 2007 study. Additionally the introduction would be strengthened if the authors presented an introduction of ripple planform geometry or 'ripple types'. A recent paper by Pedocchi and Garcia (2009) presented a useful discussion of this work.

Page 220 line 3; At what elevation is cross-shore velocity taken? If the cross-shore velocity was taken at the level of the OBS (0.05m) please explain how the velocity at this vertical location was determined from the observations at 0.25m (the level of the EMCM).

Page 221: This information is very interesting (esp. regarding the bifurcation density): Can it be presented in a more quantitative fashion (in a table? with a figure?)? This section also highlights the need for a more comprehensive introduction to ripple planform geometry (in the introduction). I believe this section needs to be presented in more quantitative fashion to be of maximal use to the community and should reference figure 2.



**ESurfD**

2, C236–C240, 2014



Page 222-223; Section 3.2; The authors should cite recent work on planform geometry (e.g., Pedocchi and Garc ÌĄÄśa, 2009). How does the work presented here relate to the prediction scheme that PG2009 developed?

Page 223-224; Section 3.3; Intuitively I believe that '. . .steeper ripples induce more suspension. . .' but I would like to be convinced of this by the data. The authors show in Figure 4 the mean value of highest one-third of SSC @ 0.05m. However what is the range of SSC values? for instance: is the maximum SSC @ 0.05m similar for all ripple types? Also this is all data rom the 0.05m OBS, how about data from the OBS located at 0.13m above the bed? I would like to see more analysis here to present a convincing argument.

Page 224-225; Section 3.4; Does your study provide any insight into which of these competing mechanisms causes high sediment suspension in the presence of wave groups? More recent work has been done (e.g., O'Hara Murray et al., 2011). What does your data show for suspension in the presence of wave groups when ripples are present? Can you could bring more of your data to this question?

Page 224-231; Section 3.5; See major comment 1 above.

Page 241: Figure 2: How many measurements of ripple geometry were averaged to develop the points and error bars?

Page 243; Figure 4: Please clarify this caption for the casual reader: I believe that the points show the mean value of highest one-third of SSC @ 0.05m and this information should be included in the caption.

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References cited in this review:

Chang, Y. S., and D. M. Hanes (2004), Suspended sediment and hydrodynamics above mildly sloped long wave ripples, J. Geophys. Res., 109, C07022, doi:10.1029/2003JC001900.



ESurfD

2, C236–C240, 2014



Cummings, D.I., Dumas, S., Dalrymple, R.W., 2009. Fine-grained versus coarse-grained wave ripples generated experimentally under large-scale oscillatory flow. Journal of Sedimentary Research 79, 83–93.

Green, M.O., Black, K.P., 1999. Suspended-sediment reference concentration under waves: field observations and critical analysis of two predictive models. Coastal Engineering 38, 115–141.

Hay,ÂăA.ÂăE., Zedel,ÂăL., and Stark,ÂăN.: Sediment dynamics on a steep, megatidal, mixed sand-gravel-cobble beach, Earth Surf. Dynam. Discuss., 2, 117-152, doi:10.5194/esurfd-2-117-2014, 2014. available at http://www.earth-surf-dynam-discuss.net/2/117/2014/esurfd-2-117-2014.html

O' Hara Murray, Hodgson D.M and Thorne P.D. 2012. Wave groups and the character of sediment resuspension over an evolving sandy bedforms. Continental Shelf Research, 46, 16-30.

Pedocchi, F., and M. H. Garc ÌĄÄśa (2009), Ripple morphology under oscillatory flow: 1. Prediction, J. Geophys. Res., 114, C12014, doi:10.1029/2009JC005354.

Thorne, P. D., A. G. Davies, and P. S. Bell (2009), Observations and analysis of sediment diffusivity profiles over sandy rippled beds under waves, J. Geophys. Res., 114, C02023, doi:10.1029/2008JC004944.

Traykovski, P., Hay, A.E., Irish, J.D., Lynch, J.F., 1999. Geometry, migration, and evolution of wave orbital ripples at LEO-15. Journal of Geophysical Research 104 (C1), 1505–1524, http://dx.doi.org/10.1029/1998JC900026.

van der Werf, J. J., J. S. Doucette, T. O'Donoghue, and J. S. Ribberink (2007), Detailed measurements of velocities and suspended sand concentrations over full-scale ripples in regular oscillatory flow, J. Geophys. Res., 112, F02012, doi:10.1029/2006JF000614.

Interactive comment on Earth Surf. Dynam. Discuss., 2, 215, 2014.