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Earth Surface Dynamics Discussions

Interactive comment on "Comparison between experimental and numerical stratigraphy emplaced by prograding bedforms with a downstream slip face" *by* E. Viparelli et al.

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Authors' Comment to Dr. Martin's Interactive Comment on "Comparison between experimental and numerical stratigraphy emplaced by prograding bedforms with a downstream slip face"

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We sincerely thank Dr. Martin for this review and comments. We appreciate his concern that the implications of the work are understated and we acknowledge that we should expand the introduction and the discussion sections. We respond in detail to the points that Dr. Martin raises below.

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1) We agree with both the reviewers: the title of the paper will be modified. As suggested by Dr. Kleinhans we propose the following title “Comparison between experimental and numerical stratigraphy emplaced by a prograding delta”. Further, we will add a discussion on how the present model formulation can be extended to stacked delta complexes and downstream migrating bedforms with a downstream slip face. The Ferrer-Boix et al. (2013) experiment was designed to analyze the stratigraphy emplaced by a Gilbert Delta in the case of constant base level.

2) We agree with the reviewer. We will add an opening section in the introduction on how the model results may help in the interpretation of fining in past sedimentary environments.

3) We agree and thank the reviewer for this comment. A discussion on how the modeling framework can be extended to the case of stacked Gilbert deltas and prograding dunes should be added in the introduction section.

4) Since both the reviewers suggest exploring the model sensitivity to the bedload formulation, we propose to run the model with another bedload formulation. At the moment the model is set up to run with the following bedload relation: Parker (1990), Wilcock and Crowe (2003) and Ashida and Michiue (1972). Since the bedload relation used to validate the numerical model is a modified version of the Ashida and Michiue bedload relation (Viparelli et al., 2010a), we propose to compare the numerical stratigraphy of Figure 8 with the numerical stratigraphy obtained with the surface based version of the Ashida and Michiue formulation (as in Parker, 2004). We prefer not to implement the Houssais and Lajeunesse formulation, as suggested by Dr. Martin, because it is derived for the case of a bi-modal sediment mixture, whereas the sediment mixtures of the Ferrer-Boix et al. (2013) experiment was specifically designed to be unimodal (Viparelli et al., 2010a).

5) We thank Dr. Martin for his grammar and detailed remarks. In particular, we are more than willing to a) modify the verb tense in sections 2 and 5; b) clarify the notation

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of figure 3, where ξb denotes the water surface elevation above the datum at the brink-point. The flow is assumed to be steady and not uniform, thus the backwater equation is integrated from downstream with the boundary condition, ξb = constant; c) rephrase the expression “diameter of the active layer” to explain that we refer to the diameter of the particles in the active layer and not to the active layer thickness; d) define Δ as the thickness of the slip face deposit relative to a vertical coordinate; e) specify that the model allows for a sloping basement and that Figure 1 is simply a schematic representation of vertical sorting on a slip face. We will also further expand the description of the initial and boundary conditions, since we assume that the delta is prograding on a basement with the same grain size distribution of the parent material, i.e. the initial condition of Ferrer-Boix et al. (2013) experiment, and not what is generally observed in the field; f) emphasize that the agreement between numerical predictions and the experimental data shown in Figure 7 is very difficult to obtain with a 1D active layer model. We agree with the reviewer that the streamwise changes in the grain size distributions of Figure 7 are minute. However the point is not to show the streamwise changes in grain size distribution of the topmost part of the deposit, but to discuss the limitations of the surface based bedload transport model. In theory, we should have compared the grain size distributions of the active layers. In practice, due to the lack of active layer measurements, we compare the grain size distributions of the thin delta top deposits. Due to the numerical procedure for the storage of stratigraphy and due to the core sampling experimental procedure, both the numerical and the experimental results are likely affected by the fine sediment stored in the uppermost part of the slip face deposit. g) correct the references to Fig. 10 and not Fig. 8 on page 1171.

References

Ashida, K. and M. Michiue, 1972, Study on hydraulic resistance and bedload transport rate in alluvial streams, Transactions, Japan Society of Civil Engineering, 206: 59-69 (in Japanese). Ferrer-Boix, C., J. P. Martin-Vid and G. Parker, 2013, Bed material sorting in a prograding delta composed of sand-gravel mixture. Submitted to

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Sedimentology. Houssais, M. and E. Lajeunesse, 2012, Bedload transport of a bimodal sediment bed, Journal of Geophysical Research: Earth Surface, 117, F04015, doi: 10.1029/2012JF002490? Parker, G., 1990a, Surface-based bedload transport relation for gravel rivers, Journal of Hydraulic Research, 28(4): 417-436. Parker G., 2004, 1D Morphodynamics of Rivers and Turbidity Currents, copyrighted e-book downloadable at http://hydrolab.illinois.edu/people/parkerg //?q=people/parkerg/. Viparelli, E., Haydel, R., Salvaro, M., Wilcock, P. R., and Parker, G.: River morphodynamics with creation/consumption of grain size stratigraphy. 1: laboratory experiments, Journal of Hydraulic Research, 48 (6), 715-726, 2010. Wilcock, P. R. and J. C. Crowe, 2003, Surface-based transport model for mixed-size sediment, Journal of Hydraulic Engineering, 129(2), 120-128.

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