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Earth Surface Dynamics Discussions

Interactive comment on "Quantifying Thresholds of Barrier Geomorphic Change in a Cross-Shore Sediment Partitioning Model" *by* Daniel J. Ciarletta et al.

Anonymous Referee #2

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The article is well written. I appreciate the richness of results resulting from very simple equations. I think this is a good model to think about real settings. I don't have major issues with it. Instead, I have some minor comments / discussion.

1-I was confused about the parameter Dt throughout the article. If I understand correctly, this is both 1) the accommodation depth of the shoreface, 2) sandy substrate thickness, and 3) the inner profile closure depth (line 510). Can you better describe this parameter and all its interpretations early in the paper? More importantly, how does it relate to the classic depth of closure (which for century time scales should be much larger than 5 m, and much larger than 2 m).

2-Would you be able to make a comparison between your model and the model of LTA14? Is there anything that your model can do while the LTA14 can't? Can the two models be easily merged, or do they use incompatible schematizations?

3-The authors found very rapid behavioral changes triggered by small changes in parameters (e.g., SLR>5 mm/yr). Even though this is plausible, I encourage the authors to consider a limitation of their model. Their model arbitrarily and independently fixes the fluxes Qs and Qd. As a result, the model does not have many degrees of freedom. The analogy is trying to simulate hydrodynamics by imposing boundary conditions very close to the area of interest: there is not much room for smoothing them and the system has a very stiff response. In reality, the fluxes Qs and Qd should not be fixed. For example, the foredune flux should decrease when dunes are larger. Also, Qs and Qd might not be completely independent. For example, larger waves might increase both Qs and Qd. Could you comment on these feedbacks?

4-The color scheme is confusing. It goes to dark to white to black. In Fig. 8 bottom-left it seems that there are sharp discontinuities in the behavior (i.e., the horizontal streaks for Qs>30). But I think this is an artifact of the color scheme. (instead, I think that there are parts of the plot where discontinuities are real, e.g., between blue and yellow). You can check out scientific appropriate color schemes here https://www.nature.com/articles/s41467-020-19160-7

5- Fig 3,4,5,. What is the slope of the backbarrier? Is it a parameter that affects the model result? Or is it just a graphical add-on? Please specify.

Line 404. Not a good form to start a paragraph with however Line 451. Suggests that our model

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