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Interactive comment on "Can the growth of deltaic shorelines be unstable?" *by* Meng Zhao et al.

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Zhao et al. explore the possibility of unstable shoreline growth on fluvial deltas under adverse basement slopes. The authors first present a cross-shore geometric model that describes and quantifies how an acceleration in the shoreline migration rate (previously observed in flume experiments) can occur. The authors then extend the model to account for small oscillations in the plant-view shoreline geometry to study their effect on shoreline advance. Using perturbation analysis, the authors find the range of basement slopes, water depths, and length scales in which unstable growth can occur. After discussing potential connections with previously reported flume experiments and field observations from the Wax-lake delta, the authors conclude that shoreline instabilities due to shallowing depths, although present, most likely cannot be separated from other environmental signals.

This publication is an important contribution as it is the first one (to my knowledge) to explore and quantify the magnitude and occurrence of unstable shoreline growth due to shallowing ocean depths. I include a few comments that aim at helping improve the manuscript. After these comments are addressed, I recommend the paper to be accepted for publication.

My main question is regarding the relationship presented in line 18, page 3 (i.e., dL/dl = S_B/sin(alpha)). When alpha=90 degrees, the equation provides a relationship I believe to be correct. However, when tan(alpha)=S_B I believe the symmetry in the geometry should result in dL/dl = S_B/2. Additionally, when alpha«< , this equation suggests that dL/dl»>. I am not sure I understand why this is the case. My guess would have been that when alpha«< a change in "l" would result in a small change in "L".

My derivation results in dL/dl = 1/(1/tan(alpha) + 1/S_B). I might be wrong, but this solution seems to get the right answer in the scenarios presented above.

Although I believe this equation would not change the overall results significantly, it would affect equations (10), (12), and (13), which are part of the perturbation analysis. Thus, the equations that describe the criteria for unstable shoreline progradation would also change.

Page1: Line 6: . . . autoacceleration is required for unstable to occur. . .

Page 4: I suggest the authors clarify in Figure 1 the sign of the basement slope S_B, which is negative in this case. I would do the same for the topset slope S_T.

Page 6: Line 7: . . . to emphasize. . . Line 12: Nevertheless

Page 8: Line 8: . . . linear prediction is in excellent agreement. . .

Hope these comments help Jorge Lorenzo-Trueba

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