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Earth Surface Dynamics Discussions

Interactive comment on "Emerging crescentic patterns in modeled double sandbar systems" *by* Giovanni Coco et al.

Anonymous Referee #2

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Coco et al 2020 investigate the stability of double-barred beaches using a numerical model based on linear stability analysis. They focus on the development of morphological patterns in the two nearshore bars, expressed through the development of alternating shallower and deeper areas along the initial position of the bar crests. Building upon various findings from the literature, they choose to vary specific initial morphological and hydrodynamic boundary conditions to further investigate the variability in morphological coupling between both bars. The authors find that the depth difference between the bars determines the resulting coupling modes, with variations in wave heights playing a secondary role.

GENERAL COMMENTS

The paper provides novel and interesting insights into the variable development of mor-

phological coupling in nearshore zones. The role of the bar depth on this difference in coupling development is particularly interesting, providing an interesting analysis pathway for future modelling and field measurements of morphological coupling. However, I do feel that the authors could provide the reader with some further guidance regarding the motivation for the aim of this study (in the introduction) and the framing of their results within existing body of literature on the topic (in the discussion section). As such, before publishing, I recommend minor-moderate revisions. I elaborate on my reasoning and provide further suggestions below.

Besides elaborating on the motivation for the study and embedding of the results, it would be insightful for the reader if these authors in particular (given their shared experience with this type of model and other modelling approaches) could provide a (brief) reflection as to why LSA is particularly suitable for tackling this study. Would the use of, for example, a nonlinear model lead to similar conclusions regarding the emergence of the patterns? Why (not)? The discussion section includes a reflection on the use of LSA herein (L274-289), but please mention in the methodology section what makes LSA suitable for answering the research question.

The paper reads very well and is equally well-structured. Some minor textual corrections are provided.

OTHER COMMENTS

Abstract: Please include the aim, or knowledge gap, in the abstract. The abstract now starts with a description of the approach, followed by the description of the results in Line 5.

L9 it is unclear what is meant by "inner bar-modes are dominant" -> Please describe what "inner-bar modes" are, and also what other modes there are.

L92-96 Somewhere here, when introducing the use of the model, elaborate on the reason for opting for a model based on LSA.

L177 Transverse bars are mentioned here for the first time -> Please mention these in the introduction section as features that may appear coupled to the sandbar pattern (Ribas et al 2014, Ocean Dynamics).

L185-189 This paragraph belongs in the methods section, including figure 5. The choice for focusing on delta(D) and delta(x) should be elaborated upon, probably in the introduction (somewhere in L78-92). Why not, for example, investigate the effect of changing the cross-shore slope (which, admittedly, inherently includes changes in cross-shore distance and bar depth, but also bar volume)? For sake of clarity, it is also worth noting that delta(D) here means changing the depth of the outer bar, while keeping the inner bar depth the same.

L287-288 Here it is mentioned that "model predictions are in qualitative agreement with observations of the Truc Vert double sandbar system". How do they agree? Please explain or show by means of a comparitive figure.

L288-289 Here is mentioned that bathymetries of coupled sandbars are scarce, obstructing the comparison of the model with field observations. Could a general comparison of measured delta(D) give some insight into the validity or probability of the model results, or do you expect delta(D) to differ when bars couple? How do the findings of this study translate to future field studies? Please reflect on this.

L271-273 (and elsewhere) The model shows that large waves lead to a shoreline that couples to the outer bar. Does this correspond to the observation of coupling between shoreline embayments and the outer bar shape during a severe storm, by Castelle et al (2015)?

L293-294 "Our results indicate .. single unstable mode." -> This is indeed a key point of this study. This statement would be even stronger if it was posed as the problem or hypothesis you wish to tackle with this study (also see my comment above).

TECHNICAL CORRECTIONS

L9 two sandbars crests -> two sandbar crest

L84 THESE authors named this PHENOMENON

L93 hydrodynamic conditions and INITIALLY LONGSHORE-UNIFORM cross-shore sandbar profile (as stated in L157-158: (alongshore...considered).

L142 z_b = mean bed level, not mean sea level

L246 fastest growing mode (instead of modes)?

L266 intermediate (without –s)

Figures 4 and 6: Why do the alongshore extents (y-axis limits) of the subplots vary? Wouldn't it be clearer (calmer) to make these the same?

Figure 4, middle row: For consistency, use "outer" bar pattern instead of "offshore"

Figure 7 labels x-axes and Figure 8 titles: for consistency, use small x (instead of X)

Figure 10 Mention somewhere that the colors refer to the modes in Figure 9.

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