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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 #1

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General comments:

The manuscript "Emerging crescentic patterns in modeled double sandbar systems" by Coco et al. is based on a systematic linear stability analysis of the development of crescentic patterns at double-barred beaches. The authors show that the cross-shore distance and particularly the crest depth difference between the inner and outer bars is critical to occurrence and type (out of phase vs in phase) of coupling and preferred spacing of the morphodynamic instabilities. I really enjoyed reading this manuscript and I thank the Editor for inviting me to review this one. Although there has been quite a bit of work published on the modelling and observation of coupling patterns of double-barred systems, including mine, this work provides a wealth of interesting material and new insight into the influence of both wave conditions and mean profile

characteristics on emerging coupling patterns. I therefore recommend publication after some modifications have been made. My comments are reasonably minor to moderate and should be straightforward to address, see below.

Specific comments:

Abstract: The sentence "For intermediate differences between the two sandbars depths, patterns on both longshore bars appear to be fully coupled" was quite unclear to me before going through the manuscript, and it should therefore be slightly rephrased as by "fully coupled" the author mean something more like the 2 bar patterns grow at a similar rate.

Introduction: This is a very nice section providing background on coupling patterns. I think, however, that the authors should make clearer that nothing has been done on the influence of the distance between the bars, and crest depth difference (although for the latter it is tentatively said), in other words, the authors may put more emphasis onto what is new in their contribution. I was not comfortable with the use of the word 'geometry' in this section. To me the sandbar geometry refers to the barline (2D horizontal) and does not include depth, I would rather talk about 3D morphology, but I am not English native so my comment may not be relevant. The authors should also refer to the work of Garnier et al (2013, GRL) when dealing with bar straightening under obliquely incident waves. I also recommend to indicate that the authors will stick to shore-normally incident waves in the last paragraph of the introduction section.

Numerical Model: Please double check all notations: for instance L142 zb is not the mean sea level (zs in eq (1)) but the mean seabed elevation, h in eq(12) is not defined it should be the bathymetric perturbation (deviation from the basic state). It would be nice to add a short paragraph with the equation of the perturbation and indication of how \tau is computed (why referred to as growth time rather than e-folding time in most papers?). I understand that this is given in earlier papers, but that would help the reader to have a standalone paper.

Results: * I encourage to modify Fig. 4 to improve readability of arrows and perturbation with for each mode the left-hand panels water depth with iso-contours and right-hand panels perturbation h (not contoured) with currents. Please also indicate the time at which the different bathymetries have been plotted. * L198: “When the coupling between sandbars is obvious” I guess that the authors used some kind of more or less objective threshold in terms of ratio of perturbation amplitude at the inner and outer bar to discriminate between “obvious” and more “subtle” couplings, please clarify. * L200: the same applies here, did the authors use a some kind of threshold in term of perturbation near the shoreline, e.g. at a given basic state iso-contour ?

Discussion: * Dealing with the limitations of the study is half of the discussion, I advise slightly to shorten the limitations, which should start as a new paragraph L270, and/or extend the first part of the discussion * In the limitations part, the authors may add a couple of sentences on the fact that coupling at half of the outer bar wavelength (Castelle et al., 2010b) cannot be reproduced here. * My own ’empirical’ knowledge of double barred beaches I’ve been to along different coasts is that out-of-phase coupling is much more common than in-phase coupling, this also applies to shoreline-sandbar coupling along single barred beaches. The numerical results here indicate the couplings are about equally distributed between in-phase and out-of-phase. I do not necessarily ask the authors to discuss this, because my qualitative observations may be biased and they may not think the same, but I am curious to know what the authors think about the coupling type predominance and potential mismatch with model outputs.

Technical corrections:

The authors may consider adding ’linear stability analysis’ and/or ’under shore-normally incident waves’ in their title.

The paper is written in very good English, however there are a few typos here and there (L116 missing bracket, remove comma at the end of equation (6), add ’.’ before

’Following’ L147, uncapitalize ’X’ of the 3 top \Delta X in Fig. 8, idem in Fig. 7, ...) and I recommend a very last proofread.

Remove or increase label size in Fig. 6 (cross-shore/longshore distance, iso-contours)

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