

Anonymous Referee #2

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General Comments: This manuscript by Ashton et al. discusses the importance of feedbacks between the headland, neck, and hook on the control of spit shape. Most previous studies have highlighted alongshore sediment transport and wave refraction as the first-order control, so the modeling results of Ashton et al. are certainly thought provoking and unique. The manuscript is very well written, novel, and contains interesting conclusions. The scientific methods and assumptions made are clearly outlined, and the results, interpretations, and conclusions from the modeling effort are sound. The authors thoroughly describe the literature and conclusions of previous workers studying spits in an inclusive manner. The figures are of high quality, and clearly describe the different model runs. There are few grammatical and editorial errors, so the authors have done a nice job preparing the manuscript. Overall, my only comment to consider is largely to include real-world observations, and justify some of the assumptions made.

Specific comments: As I mentioned above, my main comment for the paper is that I think the authors should relate their assumptions to real-world observations. I realize this is a good modeling paper and it is certainly not the focus/aim, but it would be beneficial if the authors could convince the reader that some of their assumptions are in fact observed.

Response: As we discuss also with Reviewer #1, we agree. Detailed wave-climate analysis is ongoing and beyond the scope of this paper. However, these comments have brought to our attention that we have overlooked many straightforward comparisons with the natural examples in Figure 1. We have also added

Changes: We include wave roses for Figure 1. We have added text to highlight connections between natural examples (primarily images in Figure 1) and model results in Section 4.:

“Basic trends of hook growth, neck erosion into preexisting deposits (i.e. beach ridge truncations), and overwashing necks are apparent in natural examples (Figure 1).”

In section 3.1, the authors could justify the wave statistics. Some discussion of storms should also take place here. Also, the wave symmetry and the ratio U should/could be justified to some degree. In the systems for figure 1, what are the observed parameters? In section 3.2, there is no mention of storms and the role they play in spit evolution. What happens if there is a storm changing the wave conditions for one of the modeled days? Also, I would welcome a section (even if it was brief) with some connections to the natural world with real-life examples/observations from spits. Again, I understand this is an exploratory model approach, but it would allow readers to make some relevant connections.

Response: We now include wave climates for the natural examples as demonstration of natural wave climates. Unfortunately, U and A are model parameters and are not meant to directly correspond with parameterizations of natural wave climates, but visual comparisons can now be made between model wave climates and those in Figure 1.

In terms of storm statistics, because alongshore transport goes as \sim wave energy, storms themselves do not dominate long-term signals of plan-view shoreline evolution. Storms

are of course included in the wave roses in Figure 1. We also discuss when presenting the model assumptions.

Changes: We discuss the role of storms within the time integration of the model in Section 3.1 We include wave roses for Figure 1.

“Similarly, the influence of storms on alongshore sediment transport is spread across time, integrated over the long-term wave climate.”

I offer some more specific comments below:

Page 522, first paragraph: Some mention of storm statistics (or them being ignored here) is warranted.

Response: Good point.

Changes: We now discuss in Section 3.1.

Page 522, second paragraph: Here is where it would be helpful to have some real-world examples you could point to. Do you see erosion of previous deposits for established spits?

Response: We now point the reader to clear long-term erosional and depositional trends that can be seen in the plan view forms of natural examples in Figure 1, including Cape Cod and the Ebro delta.

Changes: We discuss erosion and accretion patterns visible in the plan form images. We include wave roses for Figure 1.

Page 522, line 20: I realize this is an assumption, but how often is the backbarrier and shoreface depth the same in nature? Also, figure 3 shows a different scenario.

Changes: We now make clear that it is more often the case that a backbarrier is shallower than the shoreface. Section 3.1

Page 523, first paragraph: What happens if you vary A or U? What is the justification for using it in this instance?

Response: Following also suggestions from Reviewer #1, we motivate our choice of A and U. Model runs for varying A and U are shown in Figure 15, although we do not explore this case in detail.

Changes: We motivate choice of A and U in Section 3.1.

Page 523, second paragraph: But, many of the spits you show have significantly higher elevations than 1 m.

Response: We agree. The simulations presented here use simplified dynamics to gain understanding of the general shape of spits. The parameters we varied broadly covers the spread of natural spit morphologies (Fig. 1). Future studies will be directed towards

understanding the effect of spit height, closure depth and other wave climate statistics on spit morphodynamics.

Changes: We have clarified that these are oversimplifications in Section 3.1: "These geometries are of course oversimplifications of natural cases, for example backbarrier regions typically are shallower than the open ocean coast."

Page 524, first paragraph: Again, a discussion of storms would be good here for the deep-water wave characteristics.

Response: For natural examples, wave climate analysis directly accounts for storm inputs. In this section, we only address model conditions (which do not include storms), so a discussion would be out of place here.

Changes: We discuss the role of storms within the time integration of the model in Section ??:

Page 526, third paragraph: What observations of overwash (and the role it actually plays) exist in nature?

Response: Good point. We now point the reader to the examples in Figure 1.

Changes: We have added text to Section 4.1.

Technical corrections: Page 521, line 11: I would remove the parenthesis around the sentence. It seems out of place.

Done

Page 526, second paragraph, last sentence: Remove parenthesis at the start of the sentence.

Response: This parenthesis was technically accurate in terms of closing a phrase. However, we follow the advice from the previous comment that this parenthetical structure is perhaps unnecessary.

Changes: Parentheses removed.