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Geoscientific Model Development Discussions

Interactive comment on "Simulating barrier island response to sea-level rise with the barrier island and inlet environment (BRIE) model v1.0" *by* Jaap H. Nienhuis and Jorge Lorenzo-Trueba

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This manuscript describes a numerical model of long-term barrier island evolution that includes the dynamical effects of inlets.

First, I commend the authors on a clear and cogent submission. As presented, the work serves the two functions it needs to address: the technical detail required by model users who may find themselves deep in the numerical machinery; and the explanatory summary required by readers looking for a sense of what the model does, and how.

My remarks have mostly to do with framing. At P1/L24–26, the authors state, ". . .there

exists a critical gap on understanding how barriers respond to change generally, and [to] sea-level rise specifically." This premise extends into the first two sections (Introduction and Background – and it appears in the Abstract). I flag it here because I don't think the statement is accurate – and the Background subsections essentially demonstrate its inaccuracy. (In the interest of full disclosure, I've been called out before for making a similar claim. The person was right to make the point – and it's equally valuable here.)

If current coastal science understands anything about barrier dynamics, it seems to me it's how they "respond to change generally" and to "sea-level rise specifically." I'm not sure what the authors mean by "respond to change generally" – but regardless, the "critical gap," as defined, isn't really what this model is ultimately concerned with.

All that is to say: a more precise statement of the "critical gap" early in the Introduction would go a long way toward streamlining the manuscript. The authors need look no further than their Background section, which is precise. The authors move rapidly and confidently through major developments in the discipline – and in doing so, they make their case for how their BRIE model represents an advance.

To me, the critical gap that BRIE addresses is how barriers, as they transgress landward with sea-level rise, ALSO adjust to alongshore sediment flux, inlet dynamics (initiation, migration, capture, erasure), and back-barrier sedimentation – and, in turn, how those adjustments affect barrier response to sea-level rise. (There are other gaps that this model does not address, such as the role of ecological feedbacks in barrier dunes and tidal wetlands, which must also inform evolution dynamics in fundamental ways. I do not mean to suggest that BRIE must model everything.) So, if the authors were to open the article with a clear paragraph along those lines (and propagate that framing through the rest of the first two sections), they would both nod to past contributions and chalk out the space in which they are working.

In a similar vein, on P3L11–12, referring to overwash, the authors state that "long-

term landward sediment flux is generally poorly constrained, and its relationship to modern overwash fluxes largely unexplored." Again, I would suggest that "unexplored" is perhaps a stronger statement than the authors mean to make? The relationship to modern overwash fluxes might remain unclear, but that doesn't make them unexplored. A comb through the document with fresh eyes will I hope reveal to the authors other such moments – they are subtle, but fixing them will avoid overstatement.

And a couple of very minor notes:

Save "LTA14" for mentions of that model, specifically? When referring to insights from that paper, I would cite the paper with its full in-text citation.

ASMITA needs some kind of introduction: "Coming from a different angle, the model known as ASMITA. . ." – but even then, I'm left wondering what the acronym stands for. A description does come in the sentence that follows, but it's a small step too late.

Again, hats off to the authors – I look forward to seeing this article in its final form.

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