

Interactive comment on “Different approaches to model the nearshore circulation in the south shore of Oahu, Hawaii” by Joao Marcos Azevedo Correia de Souza and Brian Powell

Anonymous Referee #1

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General remarks:

This paper examines output from regional waves and circulation models of the south shore of O’ahu, Hawaii, for two typical scenarios. SWAN and ROMS are used to model the flow and wave fields, respectively, and their outputs are described in isolation, and when the models are coupled in a variety of ways, i.e. one- and two-way coupling. This way the differences due to wave-current interactions are described. The focus is on the difference in near shore processes in the region. The paper also discusses the operational suitability and feasibility of the different approaches.

I think the paper could be better structured to help the reader understand the content. One way to do this could be to have a model validation section, before the results,

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detailing the validation of the models, i.e. the separate SWAN and ROMS models. It would also help if Sections 3.1 and 3.2 could be split up further. I was struck by the absence of validation of the ROMS model. I understand that the currents model cannot be validated to the extent that the waves model is in the paper, due to the scarcity of data. But, is there not even any water elevation records within the fine scale domain that could be presented, to show that the phase of the tide etc. is correct?

It would be useful to have some presentation of the baseline spatial variability of the wave parameters, such as H_s and T_p and wave direction, i.e. i.e. in the format of Fig. 4. This would allow the reader to gain some idea of the typical conditions, before being presented with the differences between the models (Fig. 4). Following on from this the differences in significant wave height (H_s) of around 0.5 m presented for Keehi Lagoon seem quite large for a “stagnant region”. If this is the difference between two models, then what would H_s predictions be for each individual model?

I found the use of the phrase “experiment” in relation to modelled scenarios a bit strange. You could consider using “scenario” instead, but I understand this is probably a question of style and personal preference.

In Section 2.1 some more details of the tidal boundary forcing should be provided. For example, does the tidal forcing simply compose of waters elevations along the boundary, or are tidal velocities through the water column also used? Do the outer models (which this model is nested in) also provide tidal boundary forcing, i.e. are the models tidal, or has the tide been removed from the output of these models? Given that the forcing from the outer models is provided every 3 hours, I assume that they have no tide in them, but this should be clarified in the text.

Specific comments:

Page 4, line 17: It sounds like you are using a curvilinear grid. If this is the case please indicate this in the text.

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Page 4, line 21: Regarding the percentage of the grid being deeper than 50 m, and it being deepest at the southern boundary. How deep is the model at the southern boundary?

Page 4, line 23: This text makes it sound like the ROMS model is forced with surface gravity waves. I understand the SWAN model, which is described later, to be the waves model for all the simulations. This needs to be explained here, as it is confusing to the reader.

Page 5, line 1: I don't understand how tidal forcing can be imposed as a "separate spectral forcing". This should be further explained, as I don't think this kind of forcing is that common. Do you mean harmonic forcing, i.e. tidal harmonic constituents are used to force the tide?

Page 6, line 30: please explain why this assumption about the wave field is necessary

Page 7, line 13: This sentence doesn't really make sense. You mention the difference between the wave parameters, but these differences haven't been presented yet, and you do not explain how these differences don't impact the model solution, or what this means. It is also not clear what the times in brackets are indicating.

Page 7, line 18 – page 8, line 2: This is a description of the validation of the waves model. You could consider having a separate subsection detailing the validation in order to help structure the paper a little more (see earlier comment about paper structure). It appears to me that these model results are from a SWAN only run, is that correct? This should be made clear. One way to do this would be to introduce another 'group of simulations', i.e. (4) WAVEONLY or similar.

Page 7, line 31 – page 8, line 2: Regarding the model representing the typical multi-modal wave conditions. I don't understand how this can be deduced from the results presented so far can, i.e. a comparison of wave parameters with measurements (Figs 2 and 3). I understand multi model seas to be hard to represent with parameters such

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a s peak period, and that an analysis of the wave spectrum is necessary. Could this be done? Or could more of an explanation about how you came to your conclusion be provided? It would also be useful for the multi-model nature of experiment 1 to be mentioned earlier, in section 2.4.

Page 8, line 3: You should supply results / evidence to support this statement, i.e. introduce Fig 4 here and say how this shows this. Fig 4 shows how Hs is larger, but there's not presentation of wave periods.

Page 8, line 23: You mention that ~20% higher Hs if considering the whole domain. Is this because of the contribution at Keeki Lagoon?

Page 8, line 29: You mention the return flow area in the middle of the beach. It is hard to discern the beach in the figure. I can see an area of no change in Hs, and this must be this section of the beach. It would be useful to have the extent of the beach indicated somehow; maybe in Fig 1 if that's easier.

Page 8, lines 31- 34: Can you provide some more details as to how the correlation analysis was performed.

Page 9, lines 18 – 21. Please explain how the along-shore and cross-shore components were calculated.

Page 13, lines 31 -34: The reduction in computation cost of WAVEFORCE, compared to WAVECOUPLE is discussed. Surely the waves model alone has some computational cost and it would be interesting to mention this, as this would also have to be run in an operational modelling scenario.

Page 13, line 27: can you consider specifying the percentage increase in Hs and Tp in brackets.

Minor Points and typos:

Fig1c should have a label and units for the colour scale (depth).

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Page 6, line 28: "thickness" -> "depth"

Page 6, line 30: "what was found ..." -> "which was found ..."

Page 7, line 4: "These simulations ..." -> "Each of these simulations ..."

Page 8, line 7: The current, u , should be defined in the text

Page 8, line 18: What the difference is H_s is should be stated, i.e. is it H_s (WAVEFORCE) – H_s (WAVECOUPLE) or the other way around?

Page 8, line 25: "/reff4B"

Page 9, line 5: "prevalence of small waves (...), this emphasizes ..." -> "prevalence of small waves (...) emphasizes ..."

Page 10, line 13: "associated to the ..." -> "associated with the ..."

Page 10, line 15: "observed differences in the total currents between the WAVEFORCE AND WAVECOUPLE models"

Fig 8: The first line of the caption doesn't quite make sense.

Page 11, line 32: Fif. /reff11

Page 12, line 10: "as evident" -> "as is evident"

Page 12, line 14: "seams" -> "seems"

Page 12, line 33: "aim on providing" -> "aim to provide"

Page 13, line 25: "with general stronger" -> "generally with stronger"

Page 14, line 2: "view" -> "viewed"

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