

***Interactive comment on* “The role of the reef-dune system in coastal protection Morelos (Mexico)” by Gemma L. Franklin et al.**

Anonymous Referee #2

Received and published: 6 October 2017

The paper presents numerical modeling and analysis of wave runup on a reef-dune fronted coastline. The material presented is interesting and scientifically relevant. However, the description of methods and analysis of the data are lacking. Variables need to be defined more clearly and the notation (including italics) needs to be consistent throughout the text and figures; wave setup and 2% exceedance runup are two examples of inconsistent notation. The model validation with laboratory data is cursory and doesn't add much to the paper as it is written. The two model validation figures (Figures 2 and 3) do not state what runs are shown and whether it is a monochromatic or irregular wave case. This is extremely important as infragravity waves likely dominate the runup spectra in the field case. I would use the laboratory results and model comparison to highlight some of the important wave and wave setup dynamics, before

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going into the field modeling results. Of particular interest would be using the flume/model results to explain the trends in Figure 8 and 10, which show less difference between reef degradation scenarios under large wave conditions.

Not including storm surge is very problematic to the legitimacy of the hind-cast modeling. I think the authors should either include storm surge or reorganize the paper as more of a theoretical investigation rather than an applied hind-cast analysis. Major revisions are recommended before publication.

See detailed notes below: 1. Figure 1: Label color bar.

2. Figure 2: Need to state the wave forcing and still water level. Also, the measured wave setup is negative offshore due to having a fixed volume of water in the flume (Figure 2b). The initial water levels in the model should be adjusted to this offshore water level and rerun with the correct offshore water level.

I would include a low wave and a large wave example to highlight the dynamics seen in Figure 8 and 10.

3. Figure 4: Need to state the wave forcing and still water level. Are Z and Z_m the same? Include definition of Z and R_{high} in the caption.

4. Figure 6: Is this data repeated in Figure 8? Remove this figure if it is.

5. Figure 8: This figure is extremely interesting. I would reorganize the paper to focus on explaining the trends seen here.

6. Page 2 Line 10: This paragraph needs revision. "The degradation of coral reefs affects the incident wave climate." Are you referring to the offshore wave climate? If so how does coral reef degradation affect offshore conditions?

7. Page 3 Line 5-15: Most of this site description isn't needed.

8. Page 4 Line 30: I would not include monochromatic waves in the model analysis and statistics as infragravity waves will be important for runup in the field.

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9. Page 5 Line 5: I don't understand this discussion of bottom friction coefficients. Coefficients used in flume studies are discussed as if they are applicable to field cases? Are you using these values for your hind-cast analysis?

10. Page 5 Line 10: I would either remove the r^2 statistics or expand on how these values were calculated and which runs were used with table of runs, etc. I would probably remove and just focus on detailed analysis of two representative wave cases.

11. Page 5 Line 20: Did the flume have active reflection compensation? Were outgoing waves removed from the time series used to force the model? Generally need more details.

12. Page 6 Line 25: In Figure 2 and elsewhere η is used for wave setup. Here η is a function of time. Change wave setup to overbar η or $\langle \eta \rangle$. Sometimes 2% runup exceedance is written as R sometime $R_{u2\%}$ sometime $R_{u_2\%}$ sometime italics sometimes not. Make this consistent

13. Page 8 Line 20: I would go more into explaining the R_{high} response at larger wave heights. You mention resonance, but you don't provide evidence or state if this is the cause of the R_{high} response.

14. Page 10 Line 1: The Buckley et al. 2015 reference should be Buckley et al. 2016

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2017-304>, 2017.

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