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# *Interactive comment on* "Exploring coral reef responses to millennial scale climatic forcings: insights from a 1-D numerical tool pyReef-Core v1.0" *by* Tristan Salles et al.

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Exploring coral reef responses to millennial scale climate forcings: insights from a 1-D numerical tool pyReef-Core v1.0 Salles et al

This is a well written paper that details a new 1D stratigraphic forward model specialising in simulating coral reef assemblages over (geologically) short timescales. pyReef-Core contains algorithms that simulate coral reef growth due to changes in water depth, turbidity, flow velocity, wave energy and the assemblage. Assemblages are simulated using a simple L-V type equation set.



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Discussion paper

pyReef-Core is a unique model in that it is a) open source (rare for SFMs!) and is the first model I know of that attempts to to simulate reef assemblages from an ecological point of view in conjunction with the general controls on reef dynamics. This paper should be published with only minor corrections.

I could access the code (but have not tested it) and I commend the authors for their use of GitHub and Zenodo to archive code.

+++General comments+++

The paper is well written and easy to understand. My only criticism is that the paper contains perhaps too much detail on the controls on carbonate growth which have been well established in the literature for decades (sec 3.1 to 3.3). However, these sections then seem to come to the conclusion we don't know that much, but they are going to be in the model anyway. Perhaps shorter, more succinct summaries with a clear reason for inclusion in the model would clarify this? Another suggestion would be to move the discussion part of these intro sections to the discussion part of the manuscript? I'll leave this to the authors to decide here.

+++Specific comments+++

Pg 1, ln 1: Unclear opening sentence to abstract. Do you mean laterally perpendicular to shore, alongshore or both (in which case, perhaps "spatially" is a better term)? The lateral change and progradation/accretion/retrogression is responsible for the change in core depth: i.e. they are the same thing are they not?

pg 1, ln 5: poorly constrained on centennial to geological timescales, no?

pg 1, ln 6: it doesn't do the inverse though?

pg 2, ln 33: Add Hill et al 2012 as a heuristic tool Hill, Jon, Rachel Wood, Andrew Curtis, and Daniel M. Tetzlaff. 2012. "Preservation of Forcing Signals in Shallow Water Carbonate Sediments." Sedimentary Geology 275-276 (1): 79–92.

pg 3, ln 14: typo \textsc you forgot the \

pg 4: I like this figure - excellent summary

pg 5, ln 6. Does this need a new paragraph?

pg 6, ln 10. So how can you encapsulate this in an algorithm if there's no data? Perhaps some of this needs moving into the discussion? See above general comment.

pg 6, ln 10. Remove sentence: "This objective....". I don't think it adds anything.

pg 7, ln 9-10: As general comment on moving to discussion.

pg 9, ln 15: good explanation of this parameter

pg 11, sec 4.7. 50% is rather arbitrary! Can you give any insight on how the resultant core varies if this is altered to say 25% or 75%? How did you arrive at 50%!?

pg 22, ln 30+: I'm not sure this is relevant here. You don't tackle the inverse problem in this paper and whilst I don't disagree with this at all (as you know!), the linkage to inverse in the abstract and this is tenuous. Perhaps leave removing the inverse and removing the reference to pyReef-Bayes is sufficient here; i.e. you still get to stake out the fact that the inverse problem is what we are trying to solve (as a community), but it's the implication you are doing that in this paper which I don't think sits well.

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