Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2019-155-RC2, 2019

Geoscientific Model Development Discussions

Interactive comment on "SEAMUS (v1.0): a $\triangle^{14}$C-enabled, single-specimen sediment accumulation simulator" *by* Bryan C. Lougheed

Anonymous Referee #2

Received and published: 8 October 2019

This manuscript presents a a simple but useful model to simulate the impact of accumulation and bioturbation on sediment core signals.

The software appears to present a useful step forward for the community, and the manuscript explores a number of interesting implications/artefacts that idealised simulations with the model throw up. A focus is given to the interpretation of single foram geochemical analysis, which is timely. The provision of a script to analyse the implications of picking different numbers of forams from a sample is valuable.

By treating each added foram as a single element in an array, SEAMUS can follow a simple logical set of steps to simulate the bioturbation, and as such I have no concerns about the scripts themselves. The description of how the program operates, following on from the logical set of steps around which the script is built, is again clear and

logical.

I have no major concerns with this work, but rather a few minor suggestions, which may help make it valuable to a wider audience.

The first suggestion I would not expect to be acted upon here, but I think is useful to make in this forum. The community who undertake sediment-based paleoclimate analysis are perhaps increasingly, but still scantly familiar with programming. While Matlab is relatively accessible as programming languages go, there is a substantial cost associated with obtaining the software, which may prohibit an individual for making use of a tool like SEAMUS if they do not do other work in Matlab. While Octave provides an open source alternative to Matlab, and I support the other reviewer's suggestion of making the relatively minor changes required for the script to be able to run in Octave, use of a language like Python which is already available on most people's computers, and which could be built as a stand along program, would surely be very beneficial.

I suggest including a brief paragraph of the different sources of uncertainty in paleoclimate reconstructions (which I appreciate is a large topic), and identifying bioturbation within this. The reason for suggesting this is that the way that uncertainties are discussed in the latter part of the manuscript does not directly attribute these to bioturbation alone, and a user who treated this model as a black box (as is unfortunately sometimes the case), may miss this point and believe they are generating more fully assessing the uncertainty in their analysis.

Is there scope for turning the virtual picking simulator the other way round, i.e. use this approach to tell the user how many individuals they should be picking ahead of time? I appreciate that this can be achieved by playing around with the model, but it would be a simple addition to the code, which I would again anticipate would increase the audience for this work.

I wonder if it would be useful to bring some of the conclusions regarding the artefacts which can be generated by bioturbation into the abstract. While these are logical and

some discussed elsewhere, I found them thought provoking and very clear when presented in the context of the idealised model simulations, and I suspect that highlighting them may help convince people that they should be making use of a tool like SEAMUS.

Finally, two minor points about figure 2. Firstly, part A requires a color bar to be able to interpret it fully. Secondly, I found the caption to be considerably less readable than the rest of the manuscript. While it was possible to understand the figure from the main text and a bit of thinking, I found the figure caption actually confused rather than helped me.

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