

## ***Interactive comment on “Functional classification of bioturbating macrofauna in marine sediments using time-resolved imaging of particle displacement and multivariate analysis” by Stina Lindqvist et al.***

**Anonymous Referee #2**

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Lindqvist et al. present a study that attempts to use high frequency measurements of particle displacement in thin aquaria across a number of species to define functional groups. Often these functional group approaches use a set of a priori assumptions to define groups, then those groupings have often disappointed many when the actual measurements of some ecosystem function or sedimentary process is correlated to those groups. There are some areas of the paper that need revision prior to publication, and those general suggestions are listed below, which in my opinion, would vastly strengthen the manuscript.

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One of the general strengths of the manuscript is the approach of measuring the effects of infauna on processes first, then using that data to define groups. The authors however miss some of the justification and prior work in this area, that I believe would help support their overall approach, the approach can be highlighted more clearly here by citing Gerino et al. (2003) and another similar perspective from Waldbusser and Marinelli (2009) with regards to functional groupings based on measured effects on processes versus observations of behavior. Along these same lines, I believe the paper could be more impactful if the authors relied on a broader range of literature that has tried to tackle the functional group issue in soft sediment systems (see papers by Pearson, Jumars, Hutchings, and Pearson dating back to the 1970's and up to the 2000's). Let's not forget the work previously done on this general area, and it would be useful for the authors to perhaps couch their functional grouping in the context of prior work as well. Ultimately will we ever have a common functional grouping scheme? Or is it all context dependent? I would also suggest the overall literature cited could be broadened a bit.

While I appreciate the statistical approach used, as it seems like an important way to let the data do the talking, I have some apprehension about how the PCA was applied, then interpreted, and possibly how well it can be extrapolated to other studies. I don't feel strongly enough to say it is incorrect, but a bit more information on correlated variables within the entire analysis would be helpful. It seems a bit strange to have variables that seem like they would be conveying the same thing, such as the different depths and a maximum penetration depth. It would strengthen the paper if the authors could provide a little more justification for the variable selection criteria, then also, how the variables that seem to come out of the PCA may fit into a broader understanding of the different impacts of infauna on particle displacement.

The authors recognize that most of the activity occurs within 48 hours of placing the luminophores on the sediment surface. What I cannot determine is whether that activity is included in the broader analysis, or if it is excluded as it represents a bulk sedi-

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ment deposition event, which can vastly change behavior (see work by D'Andrea and Wheatcroft and also by Lohrer et al.). So, I would recommend that the authors more fully address this issue, as it seems it could be an important effector of their data, and thus possibly the outcomes of the analysis.

Finally, the figures could be perhaps conveyed in a bit more effective way? I also am unclear about the image of the system presented here. Is that a photograph that has had some filter applied to it? Why not just present the actual image? Some journals will not allow images that have been altered. If it is a line drawing, wow, the author could also be a graphic artist!

Overall, this is a nice study that should be ultimately published, the authors however need to do some more work to round out the paper a bit more, address some loose ends (as noted), and delve a bit deeper into the already published work.

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