

Interactive comment on “Animal-sediment interactions: the effect of ingestion and excretion by worms on mineralogy” by S. J. Needham et al.

Anonymous Referee #1

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Because I do not do such measurements, I cannot appreciate the difficulties of XRD, and I apologize if I suggest unrealistic measurements and replication. The final draft of the paper, however, should avoid text that could fool the readers or worse, the authors. (This sentence refers to Feynman's famous quote about science being a way to avoid fooling yourself.)

The statistical purist would point out that the many fecal casts sampled are not experimental replicates but instead replicates of the measurement from one, unreplicated experimental treatment (cf. Hurlbert, S.H. 1984. Pseudoreplication and the design of ecological field experiments. *Ecol. Monogr.* 54: 187-212.). The final draft of this paper should state plainly that the experimental treatment was unreplicated.

I tried to ferret a time course for the effect from the manuscript but could not. I did not try too hard because a time course in an aquarium at one animal density would in any case be hard to relate to a time course in the field. The paper and this response to my initial review convince me that it happens quickly ("all results produced are identical").

Interactive
Comment

That conclusion is hard for me to reconcile with the notion that it would take "more than two years" to replicate the experiment. Rapid adjustment with little subsequent change is not clearly compatible with the implied mechanisms (that should continue to transform more clay?) and suggests a simple alternative that could be tested quickly. Arenicolids do show some selectivity for smaller grain sizes, and would in an aquarium quickly produce an equilibrium profile, with non-preferred material accumulating at and below the feeding depth. Some sampling by depth on the experimental side could be revealing. A related control in the Feynman spirit would be to physically extract fines from the control side and make sure that they do not show XRD results similar to casts on the experimental side.

I agree with the authors that one cause of the apparent transformation is difficult to isolate, and a single cause may be unlikely. I don't believe that the original paper made this case clearly enough. My reading suggested an inference that acid digestion was the most likely culprit. It is one of many possibilities (including various combinations and permutations of possibilities) that cannot be ruled out without further experiments.

Interactive comment on Biogeosciences Discussions, 1, 533, 2004.

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