Biogeosciences Discussions

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# Comment on bg-2021-75

Simon Mudd (Referee)

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Referee comment on "Reviews and syntheses: Composition and characteristics of burrowing animals along a climate and ecological gradient, Chile" by Kirstin Übernickel et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2021-75-RC2, 2021

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This manuscript has a few different components. Firstly, it reports detailed field measurements from four sites (each having two plots) where burrow densities were systematically sampled. This sampling involved counting burrows and recording their diameters and minimum lengths. The second component is a compilation of all the burrowing species in Chile. And a third component is a compilation of global studies that measured excavation rates.

For the first component, I felt the methods section (which in this paper is called "Data Compilation") is incomplete: some of the methods are presented later in the paper (for example how the volumes were calculated) and there is some text about how burrow angles are used that contradicts an earlier statement about what data was collected (see my commented pdf for the details).

The compilation of Chilean burrowing species was interesting, although some discussion of the sampling bias in this dataset would be useful. It isn't clear to me if the data on species diversity is real or just a function of proximity to major universities.

Then there is a data compilation on excavation rates. This is very interesting: which animals are most efficient at moving sediment? But it is a big challenge to actually quantify how much sediment is being moved by fauna. In this manuscript the volumes for the burrows appear to be calculated using the minimum length of the burrow multiplied by the cross sectional area of the burrow (although this could be clearer in the methods). It isn't clear how this is converted into a flux. Is it assumed the burrows are newly dug each year? Presumably the other papers listed in the compilation have some mixture of methods to estimate both volumes and fluxes. This isn't listed in the paper. But I think it should be so that readers know if some of the methods are more likely to be underestimates and which ones have more carefully calculated fluxes. I am most familiar with the Gabet 2000 paper, mainly because the author of that paper and I were graduate students together at the time and the author spent many, many hours complaining about

how difficult it was to excavate complete gopher burrows. That paper also got volumes from terminal sediment piles. So I have high confidence in that data. Are other fluxes as reliable? I would like to have that information. It seems the method of flux estimation from each study could be added to the compilation table as a new column.

Finally, I think that a stronger connection between the survey of burrowing species and the excavation rates could be made. The species densities are difficult to quantify (and for most species this data is unavailable) but it would be interesting to discuss which species might be dominant in moving sediment from bioturbation in the different regions of Chile. I suppose I do not have a specific revision request here but more of a feeling that the survey of burrowing species feels somewhat disconnected from the site-specific work where there was an emphasis was quantifying fluxes. The site work meshes quite well with the global survey of excavation rates, whereas the species survey seems bolted on. I leave it up to the authors to decide how best to do this.

Please also see my comments in the pdf.

Please also note the supplement to this comment:
https://bg.copernicus.org/preprints/bg-2021-75/bg-2021-75-RC2-supplement.pdf