

Gao (FEM)

The analysis is fatally flawed, but a correct analysis could be interesting. Unfortunately, I think they should go back to "data collection" (from the literature, so this is quite possible) in addition to doing an entirely new analysis.

Question 1: The subject addressed in this article is worthy of investigation
4) Agree

Question 2: The information presented is new
Ha ha. No, because they have inadvertently reported the importance of O horizon depth.

Question 3: The conclusions are supported by the data
1) Strongly disagree

Question 4: The manuscript is appropriate for the journal
The topic is appropriate. The current manuscript is an embarrassment.

Question 5: Organization of the manuscript is appropriate
IMRD, no question there.

Question 6: Figures, tables and supplementary data are appropriate
Supplementary data is crucial and absent (list of sources of data)
Figures are all based on the wrong variable.

To the Authors

This paper is poised to address an important question about the distribution of fine root biomass with depth in forest soils, namely, whether the depth of the O horizon matters. The analyses presented don't answer this question very well, but a different selection of variables might do it nicely. The new question that should be asked with the data in this paper is whether the density of roots (root biomass per unit volume or depth of soil) depends on whether roots are in an organic horizon.

The problem with the current analysis is that it focuses on the amount of roots in the organic versus the mineral soil. This analysis yields a lot of pattern, but it is completely uninteresting if it has nothing to do with whether the roots are in the organic or mineral substrate—and everything to do with how much organic vs. mineral soil there is.

To understand my point, imagine that, in every site, roots are exactly equally distributed per unit depth or volume of soil, and consider your main results. I'll translate the "highlights" you provided.

1. O horizon thickness varied markedly among forest biomes, with the maximum in tropical forests.
2. O horizon thicknesses are substantial across forest biomes.
3. Global variations of O horizon thickness differed with stand age.
4. The ratio of mean annual temperature to mean annual precipitation negatively contributed to thickness of the O horizon.

Okay, I lied. Those results are not completely uninteresting. Someone could write a paper about those questions (and probably has). But it would be dumb to do that analysis with your data, because there are way more data about horizon depth than about root density.

So, please design a test that tells us something interesting! For example, does the amount of root biomass per unit soil depth (or per unit soil volume, same thing) differ depending on the organic versus mineral distinction?

It's a little more complicated than that, because we know that root density declines with depth. So to ask the right question depends on accounting for distance from the surface as well as organic versus mineral substrate. I'm sure you can handle it.

I am not sure how meta-analyses such as these normally indicate the sources of data used. I am sure that you should indicate which of the papers in your "references" provided data for analysis. The copy editors are not going to allow you to list papers that are not cited in your text. I bet it's usually an appendix or a supplementary data file.

I am also sure that you should exclude your "unpublished data from one site." Hopefully this doesn't change your conclusions. Alternatively, you could publish the data set so that the information about it is publicly available, and then cite the data publication. If the work is not peer-reviewed, it can't be treated in the same way as the other works you found, and if it's not available, it makes your results irreproducible. This is why it's important to know what papers contributed to your analysis.

At the risk of compromising my anonymity (hi, Jiacun, this is Ruth), I will ask why these papers were not found in your search. It suggests that your search methods could have been improved. Just writing to people you know who work with roots would have provided these.

Park, B.B., R.D. Yanai, T.J. Fahey, T.G. Siccama, S.W. Bailey, J.B. Shanley, and N.L. Cleavitt. 2008. Fine root dynamics and forest production across a calcium gradient in northern hardwood and conifer ecosystems. *Ecosystems* 11(2): 325–341

Yanai, R.D., B.B. Park, and S.P. Hamburg. 2006. The vertical and horizontal distribution of roots in northern hardwood stands of varying age. *Can. J. For. Res.* 36: 450–459

I think I could find more if I looked. Actually, I would start by providing the list you have to the ForSoils listserv of the SSSA (you should join this if you aren't already on it) and ask for additions. If horizon depth is important to an improved analysis, you will benefit from having

more data to work with, as you will need to exclude studies that did not provide this information—maybe after contacting the authors to see if they have it.

The author contributions were not meaningful to me. I've published in journals that restricted the description of contributions to a defined vocabulary, and now I see why. What is "investigation"? What is "software"?

I will provide specific line-referenced comments, but some of these will not be relevant to a revised paper that addresses a slightly different question.

50 - 54, 63 your study addresses biomass, not fluxes such as root turnover and productivity. Frame your questions so they point us to the one you can answer.

59 I recognize "Oi, Oe, Oa" from the US soil taxonomy. Other readers will understand "L, F, and H." Consult the papers you have been using! You have a global survey of forest floor nomenclature, so you are well positioned to be sure you are communicating to a global audience.

61 There is no way that nitrogen increases from the surface to the sub soil. Did you mean the opposite? Total P is probably greater per unit volume at depth. Available P is not.

64 - 67 telling us the biomass in the O horizon doesn't seem relevant to your point unless you tell us the amount in the mineral soil.

72 "patterns of variation" is a little too vague. I guess this is how you got into trouble with your objectives.

90 and the statements preceding this: It's not clear whether these studies excluded the O horizon (I doubt it), so your conclusion doesn't follow from the evidence you provide.

119 I hope you included information from the controls in studies that add treatments you excluded. This is not clear.

155 you mean alpha.

143 it might be reassuring to show a sensitivity analysis

159 I want to know how many studies included O horizon thickness! Without this information, I'm not sure you can tell us very much that is useful.

Think carefully about how many digits you are reporting. There's no point in reporting the mean with a lot more precision than the estimate of the dispersion. So for example it looks silly to have 3954.6 ± 628.4 g/m². What you really know is that it is about 4000 ± 600 . In this case I might report 3955 ± 628 , because we don't know if a trailing zero means that you aren't

reporting that digit or if it really comes to zero. But the 0.1 pace is silly and it makes the numbers harder to read.

In general, please avoid introducing new symbols and acronyms. Rt and R20 are not easy to guess. Most readers will not read every word of your paper from top to bottom, and you want your message to be accessible to them if they pick up your paper and glance first at the results section. I hope you will change your analysis to focus on density, in which case your sentences could say "Root density in the O horizon" and more people would get your meaning than if you make up something like Dro and Drm and expect us to remember them.

211 Correct, please do not report the correlation of roots in the O with total roots. You could test for a correlation between roots in the O and roots not in the O. But, as I said already, I don't think this is a good approach without accounting for the depth of the O and the depth of the mineral soil sampled.

Most of the Discussion section (and all of the current figures) will be revised if you conduct an analysis that is not confounding horizon depths with the amount of roots found there.

In summary, we all know that root density declines with depth. The question you should be asking is whether knowing the depth of the O horizon adds any predictive power to the distribution of roots with depth. You have assembled a useful data set and you can do better than telling us that O horizon depths are substantial, and they contain roots.

By the way, there are many systems in which O horizons are not substantial. Where certain common types of earthworms are present, litter is quickly incorporated into the mineral soil. This affects root distributions (did Fahey work on this at the Arnot Forest?) What does your question about O horizons mean, in the context of different types of humus distribution in soils? Is the classification of mor, mull, and moder useful to your analysis?

Good luck with the project. The current product is very nicely presented but seems fatally flawed (fortunately the flaws will be easy to remedy).