



EGUsphere, referee comment RC2
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Comment on egusphere-2022-689

Qiufang Zhang (Referee)

Referee comment on "Soil depth as a driver of microbial and carbon dynamics in a planted forest (*Pinus radiata*) pumice soil" by Alexa K. Byers et al., EGU sphere,
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This study explored the changes in SOC dynamics and soil microbes in the Puluki Experimental Forest (New Zealand) down to a soil depth of 1 m. ITS and 16S rRNA sequencing and quantitative real-time PCR were used to measure changes in soil microbial diversity, composition, and abundance. Stable ($\delta^{13}\text{C}$) and radioactive (^{14}C) C analyses were performed to assess depth-driven changes in SOC stability and age. It has to be said that it is very important to use these methods to explore the dynamic changes of deep SOC, but it is not the most innovative. The sentences are smooth and comfortable to read. To my surprise, the total C stocks of deep soil accounted for only 35%, which was not more than 50% as previously reported. The Introduction is like science fiction, lacking clear questions and hypotheses. Moreover, few links were made between changes in soil microbes and soil carbon stocks in the Discussion. Other suggestions are as follows:

Title: Microbial communities are not suitable to be described as big and old.

L16: Why must it be an incremental change?

L22: Does soil carbon refer to carbon storage or carbon concentration or stability or others?

L23-L25: This study is only a sample study, why do you say "These research findings highlight the importance of quantifying subsoil C stocks for accurate systems-level global and local C budgets and modeling"? Moreover, this study does not address climate change.

L28-31: These three sentences all emphasize the importance of forest soil carbon, which can be simplified and combined with the next paragraph.

L41-42: What is the meaning of "having a physical and chemical nature"?

L44-46: Although these are all factors affecting the stability of SOC, they are not addressed in this study, and the preamble should introduce more advances in microbes, isotopes, etc.

L46: delete ", thereby,"

L51: delete "fundamental"

L64: How to understand the meaning of the word "fundamental"?

L65: How to understand "at a highly refined spatial scale"?

L87: delete the second "(".

L100: To avoid DNA degradation, soil samples are usually stored at -20 or -80 °C before DNA determination. How long will this study complete DNA determination after sampling?

L103: What are the "Mehlich 3 extractable elements"? How are fractions equal to 2 mm treated?

L150: How to calculate soil carbon storage, it is recommended to list a formula.

L153: What are the "Bray P sequential 1"? What does slope corrected mean?

L209: It is recommended to merge 3.1 and 3.2.

L213: Is the result reliable if the variation of SOC stocks in the coarse soil fraction is so large? Some similar results can be described together to avoid redundancy. For example, the results of most indicators decrease with the soil layer. Where is the Table?

L220: delete "this trend was variable. In particular,".

L225: It is suggested to delete some results in 3.4 and 3.5. Not all results need to be described, but they should be targeted.

L251-257: Generally, $|R| < 0.3$ is considered a weak correlation, where R is generally lower than 0.3. I doubt the reliability of the results.

L264: Microbial classification names need to be italicized.

L333: neatly to? Or nearly to.

L350: What does "quantity" mean here?

L365: How to calculate the microbial density?

L367-368: The abundance of bacteria significantly declined with soil depth. Is it contradictory to say that the relatively large community abundance?

L408: How to understand that the abundances of Myxomycetes, Thelephorales, and Tremells were related to soil C quantity and age?

The red line in Figure 1 is not obvious, so it is recommended to consider other colors.