

## ***Interactive comment on “How deep do we dig for surface soil? A comparison of patterns of microbial C : N : P stoichiometry between topsoil and subsoil along an aridity gradient” by Yuqing Liu et al.***

### **Anonymous Referee #3**

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The manuscript requires further clarification on methods, resolution of data and a more realistic presentation of the data analysis. The study design cannot answer the title of the paper, the ‘gradient’ variables are poorly described, and the methods are lacking with respect to the most important ‘variables’. To some extent, the required revisions are minor. However, the focus on ‘depth’ in the manuscript title suggests that the authors need a major revision with respect to their study hypothesis. Please see the specific comments for further direction on the required revisions.

Title: you cannot answer the question ‘How deep do we dig for surface soil’? Because

C1

you did not dig very deep / or a high dig with high incremental accuracy. Two 10 cm samples do not answer the question. L42 is influenced the correct term? What was the relationship? L46-48 delete last sentence. Unsupported. L87 why ‘might be’? L109 revise wording ‘climate change background’. This study does not truly address deeper soils. L132 it this truly an ‘ideal’ platform. The resolution of the resolution of the aridity index is less than ideal. L135 at two depth... why especially in the surface. This is common? L150 what is the proportion of snow? L158 define slightly? Agricultural? Heavy grazing? Infrequent grazing? L159 why the uneven sample numbers per grassland type? Was this weighted by area? L161 what stop at 20 cm? L161 where were the three plots sampled? Corners and centre? L164 sentence is incomplete. L168 what elemental contents? Carbon only? What are the other elements? If other elements, how were they measured? L170 how was organic matter and carbonates removed from the soil? Carbonates should not be removed before texture is estimated. They are part of the mineral soil texture. L172 what was the resolution of the AI database? Is this adequate to evaluate against site specific measurements? If the metric is important why not calculate at each site? L172 what about bulk density? How was it measured? Reported? Why not use loss-on-ignition? How was AGB biomass measured. This is not explained but is an important measure (as indicated by the abstract) L180 is that ration based on mass or volume? L193 what different phases? L201 why t-test? Maybe an ANOVA should be used to account for the different grassland types? Or was a t-test applied to each type? If the latter, was the p value corrected for multiple tests? L206 AGB is not defined. L206 provide more details on the source of AL and AGB. What is there resolution? Is there a gradient in the data? Demonstrate that they are gradients. How are they estimated / measured? Provide a description of the data in the results (if they are important variables). L214 what is the gradient? L216 does distinct mean ‘significantly different’ L216 why is bulk density mentioned here... and only here? How was it measured? Did it differ greatly between grassland types? Why was soil microbial biomass not weighted by bulk density? L218 the concentrations were larger but was the pool larger? Use the bulk density to evaluate the pool difference. L225-235

C2

these are very weak significant relationships. This should be acknowledged. Similarly, the relationships in Figure 2 and Figure 3 are not very convincing of a relationship (s). L225-235 you are regression carbon against a ratio that contains carbon. . . this is spurious? L237 clarify. . . subsoil is reported in L232, L233, and L235. L274 drought? Clarify. L285 many things change across latitude. Is microbial biomass influenced by latitude or the change in grassland type / climate / etc. Will microbial biomass also change across longitude? What is the range in the aridity gradient in the current study? L292 this is essentially stating that carbon is related to a ratio that includes carbon. This is not surprising. Is this a spurious (correlation) regression? L309 how were AGB and AI measured? Are they site specific or regional indicators? They only show a weak relationship with little predicative power. L334 did you quantify spatial heterogeneity? How? L337 you cannot answer this question. L341 are the pools distinct? L350 you tested limited depth, with coarse increments. L369 what about pools? L375 not shown, this statement is too strongly with respect to drought. There was a weak relationship using a coarse metric. L383 edaphic? Influence of soil on soil? L384 you need to demonstrate the gradient

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