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Reply on RC1

Roisin O'Riordan et al.

Author comment on "The effects of sealing on urban soil carbon and nutrients" by Roisin O'Riordan et al., SOIL Discuss., https://doi.org/10.5194/soil-2021-18-AC1, 2021

General comments

We thank you for taking the time to read and review our manuscript, it is gratefully appreciated, and we hope to make improvements to the paper as a result. We address your comments individually below.

Thank you for your comments on the classification of SU and SA soils. We agree the threshold of 40% mass proportion of material >200 µm is arbitrary to define anthropogenic soils. We note that many soil classifications may use arbitrary thresholds to define characteristics, and so whilst we acknowledge this, we found it the best description for the soils we sampled. The mass proportion of artefacts, while a useful index, would be difficult to measure in these soils as artefacts were often fragmented and collected in the >200 µm fraction. Smaller fragments of brick, charcoal and cement were also found in the <200 µm fraction, and indicated that the artefacts had been broken up and distributed throughout the soil. Thus, distinguishing between anthropogenic particles and 'natural' particles that may otherwise have been there would make this approach impractical and subjective. We acknowledge the limitations of our method but chose it as the most consistent repeatable approach for our samples and to enable the investigation into whether anthropogenic additions had any effect on the results.

We will clarify this in the text as follows:

"Wet sieving was undertaken on subsamples of the sealed soils to distinguish between SU and SA soils. We used the proportion of materials in the > 200 µm fraction to determine the level of anthropogenic additions and serve as a proxy for the proportion of artefacts. Soils with visible artefacts generally exhibited more than 40 % of subsample mass in the >200 µm fraction; thus, subsamples with more than 40 % mass in the >200 µm fraction were classed as SA soils, and those with less than 40 % in the >200 µm fraction were classed as SU soils. While we acknowledge the limitations to this approach, the fragmentation of artefacts into smaller fractions made it impractical and inaccurate to use a measure the mass of artefacts alone. Using material >200 µm served to describe our samples well and enabled a consistent comparison between anthropogenic and undisturbed soils for the purposes of this study."

Response to Specific comments:

Line 14-15, ambiguous, please revise.

- We agree this was ambiguous and will update the text to: Line 14: "Anthropogenic additions led to carbon stocks equivalent to or larger than those in greenspaces; this was likely a result of charcoal additions, leading to carbon stores with long residence times."

Line 72, soil nutrient dynamic is a broad concept, which includes nitrogen nitrification, phosphorus sorption, etc. This work did not investigate specific soil nutrients dynamics. Please revise.

- We agree and will update the text to: Line 71: "nutrient contents and stocks".

Line 171 and in other places, p = 0.006? Please add ''='.

- Thank you for pointing this out. We will update this and the other occurrences of this in the text.

Line 342-343, urbanization will result in phosphorus enriched in soil (e.g. Water, 2019, 11: 2504). This may influence phosphorus content and stock of unban sealed soils depending on when the soil was anthropogenically covered. If the urban soil, which is already phosphorus enriched, is converted to urban sealed soil, the resulted urban sealed soil may have higher phosphorus content.

- Thank you for bringing this study to our attention. We agree that if soils had recently been sealed they may have higher P contents; however, some may be lost due to the topsoil removal that occurs prior to sealing. We will add this reference into the text as follows: Line 340: "In addition, P may be higher in some studies where sealing has occurred more recently, as urban greenspace soils can have high P contents (Qin et al., 2019), however, length of time sealed was not included in this study."

Table 1, the statistical analysis result is not easy to be understood. Actually, these data was also presented in figures. Please incorporate the statistical results in the figures and delete Table 1.

- Thank you for this observation. We will do as you suggest and incorporate the statistical results into the figures and move table 1 to the supplementary material.

We thank the reviewer once again for their comments and suggestions. We hope that the changes discussed here will lead to a clearer and improved manuscript.