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Discussions

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Interactive comment on "Land-use perturbations in ley grassland decouple the degradation of ancient soil organic matter from the storage of newly derived carbon inputs" *by* Marco Panettieri et al.

Anonymous Referee #2

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1) Introduction – the organization and flow of the introduction needs to be improved. There are short paragraphs that aren't integrated, the objectives are stated before the literature is reviewed in detail. The Introduction section needs major revisions and should have improved logic flow and organization. For example: Line 47: The link of the hypotheses to the literature should be better emphasized. The current structure of the introduction doesn't make it clear how these hypotheses were derived based on research gaps in the literature.

Line 55: This is a short paragraph which should be better integrated with the rest of

the introduction.

Lines 66-67: NMR does not provide such information – clarify.

Line 73: Another hypothesis is stated later in the intro.

2) Methods – all methods seem appropriate. However, it is not justified why only LF was used. This only represents a small portion of the total soil C and analyzing this alone can be misleading. Why were the other fractions not included in some of the analyses in this study? This is a potentially significant limitation becuase mineral associated organic matter (MAOM) provides insight into mechanisms of stabilization and carbon storage.

Lines 92-93 – this information would be more useful if placed in the stable isotope section.

3) Results and Discussion – the organization of this section is very poor. Many short statements with no explanation. Very little data synthesis. The authors need to improve this section for organization and clarity. They must also correct the overinterpretation of the NMR data and be weary about the detection limits of 13C NMR.

This section is also very hard to follow because of the many abbreviations and acronyms used. The authors should revise this entire section carefully and should separate the results and discussion so that the discussion can focus more on what the individual data sets mean when considered holistically. The current format is too fragmented and difficult to follow.

Lines 294-299 and 355 – this isn't correct, a terminal methyl group is not an indication of microbial compounds. Many plant-derived compounds have terminal methyl groups. The authors are misinterpreting the NMR Data here. The NMR data are not resolved enough to provide discreet chemical structures.

Line 345 – it is well documented that the LF is rich in O-alkyl so it is unclear what the point is here.

Line 367 – this is unclear – would changes in vegetation inputs reflect changes in SOM because there is less cutin being added to the soil?

4) Conclusions - because of the poor organization of the R & D section, it is hard to appreciate the conclusions and how the authors made these conclusions based on the data interpretation.

Line 409 – all of the methods have been previously published so there is no novelty in the approach but in the insight.

Tables/Figures Table 3 – there are too many significant figures for the integrated NMR Data. What is the level of reproducibility and detectability? Typically no decimal places are used with such data due to the lack of sensitivity of 13C NMR.

Figure 6 – this figure is very busy and it is unclear what this is showing.