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Interactive comment on "^{14}C in cropland soil of a long-term field trial – in-field variability and implications for estimating carbon turnover" *by* J. Leifeld and J. Mayer

Anonymous Referee #1

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General Comments

This paper addresses an important issue with regards to modelling soil carbon dynamics. The inclusion of some measure of experimental uncertainty in such models is vital in informing the level of confidence one should have in their output. The approach taken by the authors to determine how the experimental error compares to the measurement error and how it is affected by experimental parameters such as soil treatment and sample depth appears to be straightforward and effective. Whilst the experimental approach seems sound, I have a number of large concerns with the manuscript itself. In many places, the written English is such that the sentences are overly convoluted

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and their meaning is often unclear (e.g. lines 22 to 26, 61 to 63) My major concern, however is not with the quality of the data itself, or the interpretation, but that it appears that there has been a transcription error in many of the values given for the coefficients of variation in Table 2. These are the main parameters from which many of the conclusions are drawn and if this transcription error occurred before the data were interpreted and analysed, this could have a significant effect on the discussion and conclusions. I would strongly recommend that the authors rectify the issues with the data and the clarity of the writing before resubmitting.

Specific Comments

- The sentence on lines 41-43 needs referencing. It may also be prudent to very briefly explain how stable isotopes have been used to investigate C storage changes over time and how fast new C replaces old C.

- The authors talk about in-field variability, but in this context, this term may be misleading. This field contains 60 different experimental plots. A large amount of variability across the field is very likely. I would argue that the individual experimental plots within the field are experimental replicates, and the variability the authors are discussing is an experimental error rather than a measure of soil heterogeneity, or in-field variation. If the issue were variation in a field due to soil heterogeneity, the authors should discuss the issue of representative sampling in the introduction section. If a sample is truly representative of a field, the within-field variability becomes irrelevant. This would be an important area of discussion, because if a representative sample is taken then it could be argued that the only error term of importance is the measurement error. The current experiment employed replicated treatment plots (n=5). This replicate error is another matter; it gives a measure of confidence in the experiment itself, i.e. repeatability, the influences of surrounding plots etc.

- Table 2 contains a worrying error whereby the wrong CV values are given for the majority of the samples in this study. The CV values reported by the authors and the

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values I calculated from the data presented are given in Attachment 1. It is unclear how this error will affect the interpretation of the data in this paper, but the authors urgently need to address this issue.

- In lines 126, it is not fair to say that there was no change with depth. The authors must at least say that there was no significant change, i.e. there was no change at a p=0.05 level of significance. The data shows that statistically, with a p value of 0.16, there is a significant difference at an 84% confidence level. This is not high enough to say that there is a significant change, but it is certainly not fair to say that there was no change. Similarly, line 132.

Technical corrections

There are many linguistic and grammatical errors throughout the manuscript and I would suggest professional editing might be required.

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Interactive Comment

CV values from the Table 2 of the manuscript:

	0-20 cm	30-60 cm	60-90 cm
Null	1.77	2.38	1.46
FYM+PK	2.95	0.93	3.71
N2P2K2Mg	1.87	6.27	6.93

CV values calculated from the data given in Table 2 of the manuscript

	0-20 cm	30-60 cm	60-90 cm
Null	1.77	**2.95**	**1.87**
FYM+PK	**2.39**	0.93	**6.27**
N2P2K2Mg	**1.45**	**3.71**	6.93

Fig. 1. Attachment 1