Interactive comment on "Limited protection of macro-aggregate occluded organic carbon in Siberian steppe soils" *by* Norbert Bischoff et al.

Anonymous Referee #1

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I have revised ms "Limited protection of macro-aggregate occluded organic matter in Siberian steppe soils". I have already provided these comments as a first revision, before the ms was published online, but found out that not all comments were properly reflected in the ms. Present work is a long-term laboratory incubation (400 d) of soils from two chronosequences (forest steppe and typical steppe). For each chronosequence soil plots with natural vegetation cover and agricultural management were chosen and samples were collected from the top horizon at the Kulunda steppe area (Russian Federation). From each soil, intact macroaggregates were separated by dry sieving, and the portion of them was crushed. The undisturbed soil samples, intact macroaggregates, and crushed macroaggregates were incubated with measurement of CO2 emission rates, and microbial biomass in the end of the study. Results showed that crushing had only weak effect on the amount of mineralized C from macroaggregates,

and authors made a conclusion: 'macroaggregate occluded soil OM is not stabilized against decomposition in the Siberian steppe soils under study". Authors did a lot of work for maintaining such experiment, however, ms has several shortcomings, namely: i) the novelty of the study should be provided more clearly because making a study similar to other 10 studies, but with different objects, is not the novelty, ii) figures need to be redrawn because it is not clear what exactly they show (mean, median?), iii) result and discussion parts need to be rewritten with presentation only significant results. Please, see detailed comments below. For this stage, I advise major revision for the ms and suggest to strongly improve it.

General comments Please, make the sequential line numbering in all ms next time, and not in each page from line 1.

Instead of "aliquot" please use "subsample".

How did you fit the model to the experimental data for the CO2 emission: for the each replication separately or for all replications together? If you have fitted the exponential model to all replication together, how did you then compare MRT of C pools between the plots (in this case you have only mean and st. error)?

How was the moisture controlled in during the experiment?

How can you be sure that aggregates were not formed again from crushed ones during incubation?

For the whole ms - be consistent with the terms - if you wrote arable, crop and pasture - use only them and not grasslands, croplands and so on. Use only one term - SOC or SOM. If you did not investigate N, use SOC only.

For MRT - it was longer/faster.

For the whole ms - write only about significant results, go through all ms and delete all sentences where "non-significant trends" and results are written. If you write only about significant results, please delete "(p<0.05)" everywhere in the text.

For the whole ms - do not repeat the numbers which are on the tables and on the figures, write about trends and make conclusions.

Discussion section - change the structure of the sentences - put the references in the end. Try to avoid sentences like: " The authors of the mentioned study suggested'...'.

Actually, the MRT is the most interesting part of the results, so you need to put more effort to discuss these results.

Specific comments P3 L 15-24 Actually this is already well known. Accordingly, Al-Kaisi et al. (2014) showed that macro-aggregates were faster disintegrated upon disturbance than micro-aggregates - This statement was already shown by Six et al., 2000.

P5 L5-10 - Put information about the MAP and MAT into the table 1 and delete from the text.

P5 L12-13, L24-25 The soil types are written in table 1, delete them from the text.

P5 L7 Add abbreviation for TS here.

P6 L6 Actually HCl fumigation is not the best method to remove carbonates from the soil, especially if you have high $CaCO_3$ content. Is it possible to check the initial $CaCO_3$ content and total C, to ensure that you have removed all $CaCO_3$?

P6 L18 It is not clear, did you incubate real field replications or analytical?

P6 L28 What was the reason to add SiO_2? You wrote to increase the volume, but maybe it was to prevent the formation of aggregates?

P9 L3-12 Completely delete. This information is presented in table 1, and you do not need to repeat it in the result section. Please write about trends.

P10 L16-21 Delete completely. This information is presented in table 2, you do not need to write these numbers again, write about trends and make the conclusions.

P13 L20 Fig 2 is a portion of remaining C and not mineralization rate.

C3

Figures and tables Table 2 - It is not clear - is this whole soil, intact aggregates or crushed aggregates? You need to show all MRT if you have measured them.

Please look at the data for all of these categories, maybe these are differences?

Please add results of statistical tests for the MRT of fast OM pool between the plots.

Fig. 2 - Please present the mean and st errors for each sampling point for CO_2, and not all experimental points.

Fig. 3 and 4 and 6 - I did not get, why you have tested the differences between the plots for all 3 fractions combined. Please provide differences for each fraction separately. Make a normal graph with mean and st. errors, what was the reason to make box plots and show the outliers?

Fig 4 Legend - This is not size, this is a portion of the fast mineralizable pool. Please, correct.

Fig 5 - Figure legend - this should be the "Mineralization rate of..." because your units are "% of total mineralized OC d-1", or there is a mistake in units. Make normal graphs - means (marked as dots), st. error to them and fitted exponential decay line. What does "Mean=1.4%" (and other similar information) mean? Mean mineralization rate? But it varies during a year.

Fig. 6 You can calculate % of MBC from the total SOC, and then you can compare plots between 2 chronosequences.

C4