

## ***Interactive comment on “Interactions between organisms and parent materials of a constructed Technosol shape its hydrostructural properties” by M. Deeb et al.***

**M. Deeb et al.**

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Dear Dr G. Wessolek,

We sincerely appreciate your interest in our study. We followed most of your recommendations and suggestions you've made to improve the paper. We detailed these changes below. Firstly, the title you proposed (“Organisms restore hydrostructural properties of a constructed Technosol”) may give a more concise message. However, we prefer not to change it because the actual title mentions clearly the notion of interaction between organisms and parent materials, and avoid talking about “restoration”, which is not really adapted to constructed Technosols.

C764

Secondly, in the text:

page 1310

Abstract: The first two sentences will be changed as suggested. We finally started with: “There are no information on how organisms influence hydrostructural properties of constructed Technosols and how such influence will be affected by the parent material composition factor. In a laboratory experiment. . . “

Line 17: “micropores, but not...” (“but” will be added).

Line 18: “biomass resulting in positive effects...” (we will change as suggested)

Line 19: “...materials affected positively the hydro-structural” (“thus” will be deleted)

Page 1311

line 12: “...Technosols because these materials could be used as an alternative to topsoil material...” (will be changed as suggested)

line 20: “materials. Thus, the evolution of Technosols is different compared to the pedogenesis of ...” (will be changed as suggested)

line 27: “This importance should be more considered in the Soil Science community.” (modification accepted in this page)

Page 1312

line 20: you mean: Technosols are often influenced by compaction? Yes, that is the meaning of this sentence. A reference (Jangorzo et al., 2013) which confirms this information will be added.

Line 22: “water regulation services and to supply vegetation requirements.” (Modification accepted)

Line 23: “Therefore, we are also interested in...” will be change to “Therefore, we were interested in”, as you suggested

C765

Page 1313

line 5: "...have a significant influence on soil aggregation..." instead of "Influence" (will be changed)

line 8: "which guarantee the exchange of gases in the vadose zone." (will be changed)

line 9: "aggregates by wetting-drying cycles": we did not change the sentence because we consider that the idea would have been changed.

Page 1314

Materials and methods

line 4-5: "This material is typical for ..." (will be changed)

line 8: "...with the aim having a representative sample composition that is typical for...". We eventually made no change, the paper was corrected by a scientific native speaker (from UK)

line 10: "...Carbonate content (lime)..." (will be changed)

line 11: "... with the aim" (unchanged)

line 16: "EDH reached very low levels" (will be changed)

line 19: "...which is relatively high compared to natural soils..." (will be changed)

line 21: "...containing 21.41%..." (will be changed)

Page 1315

line 1: we deleted "...for ten minutes": we agree it is not a crucial information, but the idea here was to insist on the fact that all mixtures were mixed in the same conditions, including time duration.

line 5: "with a total capacity": will be changed to "maximum capacity"

C766

line 22: "at the end of the experiment" (will be changed)

line 24: according to the manual instructions of Eijkelkamp (referee) (will be changed)

Page 1316

line 13: "... (shrinkage phases) due to the four types..." ("that are" deleted)

line 15: odes (aggregates formed by clay particles) (will be changed to "aggregates formed by clay particles").

line 19: were called plasma (without also)...properties according to Boivin et al., 2004 and (will be changed)

Page 1317

line 23: introduce an equation for:  $V_{ma} = \dots$  (6)  $V_{mi} = \dots$  (7) The text will be modified according to the reviewer's comment. As a consequence, we will also change equation number (6) to (8) in the page 1318 line 3.

Page 1318

line 3: = equation becomes now  $n^\circ$  (8)

line 6: introduce an equation in line 10:  $\Theta(ma) = \dots = \dots$  (9) We introduced the two equations.

line 12: analyses, requiring non disturbed soil properties (suggestion) Vs which requires not disturbing soil physical characteristics (original). Unchanged, the meaning is completely different.

line 24: errors of the... (Unchanged, we are explaining "generically")

line 25: ...curves using the ... (Unchanged)

Page 1319

line 1: .... phase, both the .... (will be changed)

C767

line 24:....effect on both dry below ground and aboveground biomass... we made no change because we also referred to the total biomass “the presence of earthworms had a positive effect on dry belowground, aboveground, and total biomasses”

line 25: GWC percentage had almost no influence on total biomass (??) but increases plant production (message right?... was not clear to me). Thus, we wrote: GWC percentage had almost no influence from 0 to 30% but increases plant production at 40 and 50% (Fig. 2). So it is not only in total biomass but for both belowground and aboveground. To clarify this, we will add (Fig. 2a, b, c).

Page 1320

line 4: In average, earthworms.... (will be changed)

line 6: was significantly higher than all other mixtures... (will be changed)

line 14: .... parent materials on the hydrostructural... (Unchanged)

line 24: Earthworms showed a positive... (Unchanged)

line 26: ...positive for 10 up to 50% (“at” will be removed)

Page 1321

line 9: organism had a similar effect ...like GWC. Unchanged: the meaning is different.

line 24: Taking both together, the single... (rest is not clear to me). “The influence of factors taken independently was not very high: the total percentage of variance explained by the GWC percentage, regardless of the organisms, was 14% ( $P = 0.005$ ), while the total percentage of variance explained by the organisms, regardless of the GWC percentage, was 19% ( $P = 0.005$ ). Taken together, the single factors accounted thus for 33% of explained variance, whereas their interaction (organisms x GWC effect, estimated from the subtraction of single factors effects from total variance) was responsible for 39% of the variance ( $72\% - 33\%$ )”. We added “x” and “(72% - 33%)”

C768

Page 1323

line 4: for the micropore volumetric water content. (unchanged)

line 5:...affected micropores (done) and... delete line 6 to line 11: the reader don't need them, go on with: The presence... (will be deleted) Regarding interactions between factors, the influence of GWC on moisture ratio and volumetric available water content depended on the presence of plants for micropore, macropore and total volumetric available water content, on earthworms for macropore and total volumetric available water content and the interaction between plants and earthworms for total volumetric available water content (Table 2).

line 13: available water contents. (delete macro pore and micropore). (Unchanged, the meaning could be altered otherwise)

Page 1324

line 6: reduce Title: delete "in Technosols" the whole manuscript is about it! (will be changed)

line 12: ( $P > 0.001$ ). However, the difference in... (Unchanged)

line 15: and 16: I suggest creating a table showing these both equations, these are your results! Thank you for this suggestion. However, the authors consider the message is short enough like this. We want to focus on other results.

line 21: soils (will be changed)

line 22: has never been studied before. (will be changed)

Page 1325

line 2: Thus, the behavior of the mixtures... often observed in....The first part of the sentence was corrected, but we kept “but not always” because we believe it is important to mention that this is not always the case.

C769

line 4 and 5: Because .... was. General fact here, so the use of the preterit is not adequate.

line 7: delete "from a hydro-structural viewpoint" (we didn't suppress because we wanted to avoid generalising our results, as a previous reviewer highlighted)

line 9: just take: Influence of waste compost (we will delete only Technosol)

line 14: delete "more" .... recently (will be changed)

line 18: just take Influence of earthworms (we have to be specific about the earthworm species we are using... so unchanged)

line 23: ...in climates with droughts. (changed to "with occasional droughts", to insist on the fact that the weather is not permanently dry)

Page 1326

line 25: earthworms can be interpreted as a feedback influence of the plants. This synergistic effect between plants and earthworms was thus likely to be due to an increase of the plant influence in the presence of earthworms (Fig. 6). Unchanged

Page 1328

line 4: Thus, Pedogenesis, in this case Technosol pedogenesis appears. We modified the sentence as followed: "Pedogenesis, and more particularly in the case of Technosol, appears as an inter disciplinary field of study that needs to include ecology".

1) In Fig. 1 you use gravimetric water content, why not volumetric like in Fig. 7?

Fig. 1 refers to the theory of Braudeau, where the soil specific volume ( $\text{cm}^3.\text{g}^{-1}$ ) is expressed in function of the gravimetric water content ( $\text{g}.\text{g}^{-1}$ ). We then calculated volumetric water, as we explained in the equations 9 and 10, following the numeration of your correction, to compare water holding capacities ( $\text{cm}^3$  of water. $\text{cm}^{-3}$  of soil)

C770

2) you are not showing water retention curves, why?

Because SSC characterize both the soil structure and water retention in two different levels of soil organization.

3) what is the advantage of using hydro-structural parameters?

SSC is a signature of the soil organization. It depends on the composition and structure of the soil. The hydro-structural parameters defined quantitative analysis of soil structure (arrangement of soil particles and associated pores) by distinguishing two pore systems (elementary particle arrangement, defining primary pores and associated micropores; primary pore arrangement, defining macropores) and characterizing hydric properties for each of them. Every hydro-structural parameter has a physical meaning, for example the basic phase which corresponds to the shrinkage of micropores, is determined between  $W_N$  ( $\sim pF_{4,2}$ ) and  $W_M$  ( $\sim pF_3$ ).

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Interactive comment on SOIL Discuss., 2, 1309, 2015.

C771