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Interactive comment on "A meta-analysis of soil biodiversity impacts on the carbon cycle" *by* M.-A. de Graaff et al.

Anonymous Referee #2

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I have read this paper with great interest. As its authors point out, works on effects of soil biodiversity on soil functioning are scarce and often yield conflicting results. In this sense, I really appreciate the effort made in this meta-analysis to collect and put in order the available knowledge to produce a comprehensive and quantitative evaluation of potential effects of soil biodiversity loss on some soil processes and environmental services.

The paper is correctly written and, in general terms, allows a fluid reading. The two general hypotheses formulated in the introduction (a: soil biodiversity positively influences soil C pools and process rates, and b: biodiversity manipulations across multiple organismal groups more strongly affect soil C processes than manipulations within organismal groups) are correctly tested based on correct data selection and treatment.

There are, however, some exceptions to the general clarity of the presentation:

(1) First of all, I'm afraid that the term "organismal groups" is confusing. I presume that it refers to diverse organisms belonging to different taxonomic levels but sharing some kind of common traits. If this were the case, I'd like to know which kind of traits (morphological, physiological, trophic.... traits?) we are talking about.

(2) Another terminological difficulty arises from the use of species richness (here called "number of species") as a synonym of "biodiversity". Although, as the authors state in pg 913 (lines 10-15), this is becoming a common practice in works on plant science, it can easily lead to confusion.

(3) Pg 911, lines 26-28, "functional redundancy .... is manipulated". Please, clarify this sentence.

(4) Pg 912, lines 25-27. This paragraph should be moved to Methods

(5) Page 918, lines 21-24. The groups mentioned in the text do not match the groups that appear in figure 4.

(6) Pg 920, line 20. What do you mean with "more complex food webs consisting on multiple organismal groups"? May I suggest "several trophic levels of the soil food web"?

(7) Pg 944 and 945, figs 4 and 5. I find the axes very confusing: How should I interpret a -100% change in diversity? Zero diversity?; What does a negative value mean for a natural logarithm?

I would also like to mention some methodological issues:

(8) Pg 913, lines 18-20: C pools were measured as total soil C, but also as dissolved organic carbon and as microbial biomass. I agree that microbial biomass is a sub-pool of the total soil C pool, but I'm not that sure about DOC that could be considered a flux and a vector for C loss from soil.

(9) As mentioned in several points of the text (and is also shown in figs 4 and 5), the number of studies on macro and mesofauna is very low (1 and 3 works on soil fauna in teh meta-analysis). Is this enough to build up regressions and to sustain your discussion on effects of biodiversity manipulation at these levels of the soil trophic web?

(9) Also for conclusions and just as a suggestion: when working on soil biodiversity, could we talk about "key functional traits" more than about key species?

Please, also review the whole text for some minor errors such as: "process" instead of "processes" - pg 92 line19-; separate words in pg 919, line 1, etc.

Finally, I want to congratulate the authors for the election of the references. You probably want to include two very interesting papers based on field experiments and covering a wide geographical scale that have been published from 2013 to now: de Vries et al. 2013 (PNAS 110, 14296-14301) worked on diverse soil food web structures caused by differences in soil use, and Handa et al. 2014 (Nature 509, 218-221) manipulated biodiversity in litter.

Interactive comment on SOIL Discuss., 1, 907, 2014.