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Interactive comment on “Effects of vegetation restoration on the aggregate stability and distribution of aggregate-associated organic carbon in a typical karst gorge region” by F. K. Tang et al.

F. K. Tang et al.

tangfk_hi@126.com

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We are appreciative very much for two reviewer’s comments on our manuscript. Those comments are very valuable and helpful for improving the quality of our paper. Based on reviewer’s comments and request, we have made extensive modification on the original manuscript. Detailed responses to reviewer’s comments are addressed below:

Response to Referee #1: Comments: The first sentence of the introduction should be more general. It is the organic carbon who act as a cement and create the aggregate

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is in the other way round. Here some citations to update your research introduction. You need to update the formula. See here similar results that will power your paper. You need to open a discussion about the influence of vegetation on the soil and the aggregates.

Answer: We have checked the manuscript and revised it according to the comments. As suggested, we have updated several literature references. We tried our best to improve the manuscript and made some changes in the manuscript. Also, thank you for your valuable and thoughtful comments in discussion part. As suggested that vegetations have positive influences on soil aggregates, and vegetation control erosion at different scales but that the aggregate scale is definitive to control the erosion processes. We have added some citations and modifies as supplementary demonstrates to discuss the influence of vegetation on soil organic carbon and aggregate stability in the revised manuscript. We have checked the contents and formats of our manuscript, as well as all the checklist information (author names, references, tables, figures, et al.). As requested, we did not do any changes on substantial contents and authors' information.

Response to Referee #2:

(1) The aim of the study was to test the effect of land use on the aggregate stability in a karst area from China. This subject is import and falls within the general scope of the journal, but the paper has a several problems. There are several limitations in the manuscript related to the organization of the narrative and the experimental design.

Answer: Thank you for your recognition of our manuscript. Our paper was focused on the effects of vegetation restoration on soil aggregate distribution, aggregate stability and distribution of SOC associated in water-stable aggregate. We accept the limitations and lack clarity you proposed about the descriptions of organization and experimental design of our manuscript. We have substantially revised this manuscript and added entirely new analyses and descriptions that we hope will address these doubts.

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(2) The introduction must be improved, including specific information on the effect of land use on SOM and aggregate stability which is already found in others countries.

Answer: We fully agree with your comments. We have added some key information as request. Also, background and purpose of our study was supplemented modified. Details of the modifications are as follows: The formation and stability of the water-stable aggregates in soil are dependent on soil organic carbon (SOC), simultaneously vegetation communities affect soil organic carbon content via the addition of outer soil organic matter and in turn contribute to the formation of soil aggregates (Gabarrón-Galeote, 2013; Mekonnen, 2015). Impact of land use changes on aggregate stability and distribution of aggregate-associated SOC have always been research hotspots.(Unger et al.,1997; Dimoyiannis et al., 2012; Stanchi et al., 2015). Jastrow (1996) researched the formation and stabilization of macroaggregates and process of C aggradation under different disturbances. Burri (2009) concluded that revegetation measures increased soil aggregate stability by substantially accelerating vegetation development and by promoting soil formation process.

(3) In the same way, the methods must also improve.

Answer: Our paper focused on soil organic carbon and aggregate stability, and the corresponding research methods were improved as suggested. And the statement of methods were added in the material and methods section.

(4) The experimental design is confusion and must be described correctly.

Answer: We agree the reviewer's good advice. Yes, the initial experimental design is too confusion to understand. We have modified and described the experimental design to make it succinct and clear in understanding. The experimental design ideas are as follows: Four typical stages of vegetation restoration were selected to study the effect of vegetation restoration on the aggregate stability and distribution of SOC associated in water-stable aggregate. Each restoration stage has three replicated plots with a 20m×20m horizontal projection area. Undisturbed soils were collected and

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mixed together in each plot by quincunxes method at depths of 0-20cm, 20-40cm and 40-60cm respectively. Then the aggregates were separated by dry-wet sieving method, and soil organic carbon was determined by oxidation with potassium dichromate and external heating. Indices to evaluate aggregate stability include water-stable aggregates $>0.25\text{mm}$ ($\text{WSA}_{>0.25\text{mm}}$), aggregate stability index (ASI), percentage of aggregates destruction (PAD), mean weight diameter (MWD) and geometrical mean diameter (GMD) and fractal dimensions (D). The normal distribution test was carried out before data analysis.

(5) Information about land use must be included. Soil characteristic for each vegetation site are critical for this paper (as SOM contents, texture, pH, CaCO_3 content etc).

Answer: Thank you for pointing this out. Detail information about land use as well as soil characteristics is necessary. Four vegetation types were selected based on the topography unit features (similar topography, slope position and slope) as well as the vegetation and land use conditions, in accordance with the principle of typical and representative. It should be noted that all the four vegetation types were farmland before vegetation restoration. We have analyzed basic soil characteristics during the experiments which including SOM contents, soil nutrients, pH, enzyme activity, CaCO_3 content etc, and these results have been revealed in other articles of our group. For this paper, we have modified land use information in Tab.1 and added some related soil characteristic information in revised manuscript.

(6) What about the replicates.

Answer: Three research plots respectively with a $20\text{m} \times 20\text{m}$ horizontal projection area were established for each vegetation type. After removing litters from soil surface, undisturbed soil were sampled at depths of 0-20cm, 20-40cm and 40-60cm by quincunxes method using a shovel in each research plot. The soil samples of each soil layer from the five points were mixed together as the plot's samples, and a total of thirty-six mixed soil samples were collected for the purposes of the study.

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(7) There is not information about the fractal technique you mentioned. Improve the reference of the wet-sieving method you used.

Answer: Fractal technique method was proposed by Tyler and Wheatcraft,(1989). Since fractal theory can objectively characterize soil aggregate structure content and particle size distribution (PSD), it has been widely applied to the study of soil structure fractal since the 1980s and provides an effective tool for the quantitative study of soil structure and function. In our study, fractal dimension of aggregates was the key factor to evaluate the changes in aggregate stability after revegetation. References of fractal technique and wet-sieving method were improved in the revised manuscript. (8) Apparently, you carried out a field investigation and an indoor experiment. This is not clear.

Answer: We are sorry for did not clearly explain research methods. The field investigation mainly include selection and investigation of sample plots (topography, altitude, slope, vegetation, etc), and soil sample collection. The indoor experiment were mainly determination of aggregate composition and SOC contents. We have modified the presentation of research methods in the manuscript (in both abstract and material & methods).

(9) The details about data calculation and analysis are excessive.

Answer: The methods we took for evaluating the effects of vegetation restoration on aggregate stability and distribution of aggregate-associated SOC were recognized and standard, and all the methods can be easily obtained and repeated. As suggested, we have simplified the details about data calculation and analysis and provided the sources of the methods we took.

(10) The results describe the parameter measured without a coherent argument. If the author explained clearly the question, the hypothesis and the experimental design is easier to write clearly the results.

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Answer: Thank you for your comments. Different vegetation through affect soil organic matter, thereby affecting soil structure and aggregate stability. The influence of vegetation restoration on aggregates stability and the distribution of aggregate-associated SOC were the main contents of this research. The coherent argument was revised. The structure and order of results were revised to make the paper more clearly.

(11) The structure should include the two types of studies (field and laboratory).

Answer: Thank you for your suggestions. Our paper focused on the effects of vegetation restoration on soil characteristics (aggregate stability and distribution of aggregate-associated SOC). The field work was mainly vegetation investigation and soil sample collection, and mainly demonstrated in Table 1. We have modified the description of field and laboratory works in revised manuscript.

(12) Aggregate SOM contents should be considered before than aggregate stability.

Answer: Soil organic carbon content was easily effected in the process of vegetation recovery, thereby affecting soil structure and aggregate stability. We fully agree to your suggestions and have adjusted the order of aggregate-associated SOC and aggregate stability in both results and discussion part.

(13) Finally, the discussion is not clear, in some aspects it is speculative, with repetitive ideas.

Answer: We admit that the discussion was not clear enough and existed repeat and uncertainty in some aspects, especially in the discussing the influences of vegetation restoration on soil aggregates and distribution of aggregate-associated SOC. In the revised manuscript, we have removed the speculative & repetitive ideas and added some full demonstration. In addition, there was a section to discuss fractal characteristics (4.4.2) in original manuscript, which was repeated to 4.4.1 in some aspects. We have merged the two parts into one part in revised manuscript.

We hope that these revisions are satisfactory and that the revised version will meet

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reviewer's request. Wish you all the best!

Sincerely yours, Fukai Tang, Ming Cui, Qi Lu, et al

Please also note the supplement to this comment:

<http://www.solid-earth-discuss.net/7/C1355/2015/sed-7-C1355-2015-supplement.zip>

Interactive comment on Solid Earth Discuss., 7, 2213, 2015.

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