Hydrol. Earth Syst. Sci. Discuss., 11, C172–C177, 2014
www.hydrol-earth-syst-sci-discuss.net/11/C172/2014/

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Effects of extreme drought on agriculture soil and sustainability of different drought soil" *by* S. M. Geng et al.

S. M. Geng et al.

simin0818@126.com

Received and published: 25 February 2014

Dear Editor and Reviewers,

Thanks very much for your useful comments and suggestions on our manuscript. We have discussed and modified the manuscript accordingly, and detailed corrections are listed below.

Anonymous Referee #1

1. The subject mater of the paper would be more suited to a soil science journal than HESS. There are no hydrological implications of the research discussed by the authors and therefore I doubt that the research fits within the scope of the journal.

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

√Answer: Drought is one of the extreme processes of hydrological cycling, which is hydrological implication of our research. In the study, we studied the response of microbial to rewetting after different drought (moderate drought, severe drought and extreme drought), in different hydrology conditions.

2. A flaw in the experimental design is that the system is planted under maize and that the three different droughts tested were successive such that the results are likely to be significantly impacted by first the increasing density of roots as the maize plants grow and then the subsequent senescence of the root system due to drought stress and/or anthesis. This effect is even suggested by the authors in the Discussion but not implicated in the interpretation. Soil microbial biomass is strongly impacted by the amount and age of roots. Therefore the hump-shaped relation between soil microbial biomass and soil moisture content could just be dominated by a root effect, rather than soil moisture. In addition, the recovery experiments to asses the effect of rewetting would have been impacted by the amount of remaining roots in the soil. As the shortest drought had wetting occurring when the plants were at their youngest (and likely had most roots) then the greater recovery post wetting would be expected for this treatment on the basis of root biomass alone. These effects could have been accounted for somewhat by the use of appropriate controls, though none were used. For example, a bare soil treatment as well as a constant water content treatment could have been used.

√Answer: All the soil samples were collected about 10cm far away from the rhizosphere of the maize, so there was almost no fresh roots in the soil samples (there was only roots which came from crops that was planted in the last years).Therefore changes of microbial biomass carbon were not largely influenced by roots density and senescence of the root system.

We made a mistake in discussion. We had deleted “In this research when water content reduced to 20.5%, it was just the time that vegetative growth of aboveground plant was vigorous. At the same time root productivity and belowground root biomass in-

HESSD
11, C172–C177, 2014

creased, resulting in an increase of soil organic carbon. However, microbial biomass carbon had not increased as much as soil organic carbon, so proportion of microbial biomass carbon in soil organic carbon decreased.". This conclusion was right in soil that was in the rhizosphere, where density of root was large. But in the fields where we collected samples, this conclusion might be wrong, because of lack of fresh roots. The roots of our summer maize grow vertically downward at first and they grow laterally when the roots growing to a certain depth. We collected our samples at the depth of 10∼20cm, where were little roots. However, the suggestion is reasonable and useful. We might account for effects of root density and growth stage on the relationship between microbial biomass carbon and water content, by comparative experiments (for example, a bare soil treatment as well as a constant water content treatment), in the rhizosphere.

3. Another significant flaw is the apparent lack of replication. For each of the three treatments there appears to be only one treatment, which opens the potential for an impact by spatial variation within the field to significantly impact conclusions. Finally, the methodology hints at "pooling" of results during the first drying, but apparently not during the second drying following rewetting. Therefore, with one treatment and three different sites the recovery is potentially impacted by significant site differences.

√Answer: We had three replications throughout the experiment. We just drew the mean of the three replications. This time, we added error bar (standard deviations of three replicates) in the figs 1, 3 and 4.

In order to reduce site differences, we mixed samples together to form pool samples. But there was only one section under the same water condition during the second drying following rewetting, resulting that we took no pooled samples. However, we had three replicates under the same condition that the problems of site differences were solved.

4. Minor comments The English could have been improved substantially prior to sub-

HESSD
11, C172–C177, 2014

mission and would be required to be corrected for resubmission.

√Answer: We have revised the whole manuscript carefully and tried to avoid any grammar or syntax error.

5. It is not clear what the reported % soil moisture refers to, volumetric or gravimetric.

√Answer: All the reported % soil moisture refers to gravimetric which means “mass water content”.

6. No information on site layout was provided. It is not exactly clear how samples were “pooled”, how many from each site etc. From what is described the pooling of samples between different treatments occurred during drying therefore there looks as if there was effectively no replication throughout the experiment.

√Answer: We collected 100g soil sample randomly in each test section and mixed them together in a plastic pot to form a pooled sample.

7. It is not clear what Origin 8 is.

√Answer: Origin 8 is a drawing and data analysis software which can build nonlinear fitting models between two variables.

8. It is not clear how much water was reapplied to each site.

√Answer: Each test section was a rectangular with one meters wideïijŇtwo meters long, and 0.032m^3 water was reapplied to each site in an hour with sprinkling can (16mm/ hour).

9. The Discussion relies on data not presented. In addition, it is a little speculative about conditions in the soil and causes of the changes.

√Answer: The discussion relies on fig.4, including section A, B and C. In addition, we have studied the relationship between microbial biomass and soil physical, chemical properties, which indicated that content of microbial biomass carbon was signifi-

HESSD
11, C172–C177, 2014

cantly related with soil content, and causes of changes have been included in another manuscript, which is under review in the other journals.

10. There is no indication of the variability of measured soil properties in Table 1.

√Answer: We measured the background values of soil properties at the beginning of our experiment through three replicates. We have added standard deviations in Table 1.

11. Table2 and 3 are repetitious of text and either could have been omitted or the text reduced significantly. Table 4 perhaps too much for one result and it could instead be inserted into the text.

√Answer: We have omitted table 3 and 4 and they were inserted into the text.

12. Figure 3 and 1 could have been combined. In relation to Figure 3 no data is presented to illustrate temporal changes in total soil organic carbon content with time/ water content.

√Answer: It is clearly that Fig.1 is "dynamics and fitting curve of microbial biomass carbon along with mass water content of soil", while Fig.2 is "dynamics of proportion of microbial biomass carbon in soil organic carbon along with mass water content". Content of microbial biomass carbon and proportion of microbial biomass carbon in soil organic carbon are both sensitivity indicators for soil ecosystem degradation, which are more sensitive than soil organic carbon. So we did not draw the dynamics of total organic carbon with water content.

13. Figure 5 repeats the presentation of a significant proportion of the data presented in Figure 4.

√Answer: We have removed Fig.5.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/11/C172/2014/hessd-11-C172-2014-

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

supplement.pdf

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 1, 2014.