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Interactive comment on "Do successive climate extremes weaken the resistance of plant communities? An experimental study using plant assemblages" *by* F. E. Dreesen et al.

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We would like to thank the referee for the review of our manuscript and for her/his constructive and helpful feedback. We hereby provide the answers to the referee's comments.

Comment: The experiment was conducted with three species planted as mixtures of 10 individuals. Species-specific data should be available for all measured variables, but no information is given how different species were treated in statistical analyses (for leaf and plant survival) or data were analysed at the community level (aboveground plant biomass). It would be interesting to know whether and how species differed in

their responses to the experimental treatments.

Answer: We agree with the referee and will include species-specific data and additional statistical analyses in the revised manuscript.

Comment: Second, the authors conducted scenarios with different intervals between the first and second heat/drought event. Therefore, it should be more carefully discussed whether the developmental stages of plants (plants experienced first extreme climate event at different age after planting) and not only different time for recovery affect the outcome of the study

Answer: In the original manuscript we highlight in the discussion that the sensitivity of the plants in terms of leaf and plant mortality varied greatly between the preceding climate extremes that were induced at different moments, and that this difference in sensitivity probably depends for the greater part on the phenological stage of the plants (such as the amount of leaf area at that time, or investment in reproductive organs) (P9163, lines 16-23). We will discuss this part more in detail in the revised manuscript.

Comment: In addition, it would be useful to mention in the abstract limitations of the experimental approach regarding the short duration (one growing season) and the selection of particular species/vegetation type as mentioned in the discussion.

Answer: We will indicate in the abstract that herbaceous species were used, and that the successive events were applied in one growing season.

Specific comments: Methods: Comment:P9154,L20-21: Give an explanation for the lower number of replicates exposed to the second climatic event only.

Answer: We chose to use a lower number of replicate assemblages exposed to the second climatic event because of practical reasons and space limitation in the experimental set-up. Using a higher number of replicates exposed to the second climatic event only would have decreased the number of control replicates and the number of replicates exposed to the scenarios with the successive events. This explanation will

be added to the manuscript.

Comment: P9154,L22 - P9155,L4: The experimental set-up is difficult to understand from the description because it is not possible to identify, whether there exist independent replicates of each treatment scenario in different boxes ("experimental blocks"). It would be helpful to provide a schematic figure showing the experimental design (distribution of replicates in the boxes).

Answer: A schematic figure of the experimental set-up will be included in the revised manuscript.

Comment: P9158,L5-6: Figures shows time-dependent changes in leaf survival. Statistical analyses was performed with ANOVA. Explain which data were included in statistical analyses (during or after the manipulation of drought and heat)

Answer: Leaf and plant survival were analyzed for each sampling date separately, using ANOVA with treatment as fixed factors.

Results: Comment: P9159,L4-11: An additional figure showing the total number of leaves over time would be helpful.

Answer: Given the amount of figures already included in the original manuscript and the figures that will be added in a revision (e.g. species-specific data, tissue nitrogen concentration), we think that an additional figure showing the total number of leaves is not essential for the understanding of the manuscript. Such a figure, however, could still be added in the revised manuscript, if the referee or editor insists.

Comment: The experiment was conducted by planting a mixture of three species. Information/analyses, whether/how species differed in their responses to drought/heat should be provided. P9159,L25 – P9160,L6: Did the experimental species differ in their survival rates in different treatments? P9160,L26 –P9161,L3: Analyses was only conducted for Plantago lanceolata. Therefore, it is important to get species-specific information on leaf and plant survival for the interpretation of differences in leaf colour.

P9161,L5-8: Biomass was sorted to species. For the aboveground biomass it would be interesting to know whether species differed in their response to different scenarios of drought/heat.

Answer: These comments are related to the first major point of the referee, namely that species-specific data should be included in a revision. Reponses of the different species to the different scenarios will be included in the revised manuscript.

Comment: P9160,L17-20: It is likely that plant N pool increase with higher biomass production. Additional information on differences in tissue nitrogen concentrations should be presented

Answer: We will present data on tissue nitrogen concentrations in our revised manuscript.

Discussion: Comment: Indeed, it is interesting to see that similar experiments yielded different results. One possible explanation are species-specific responses (interactions with other species). Therefore, it would be particularly useful to analyse data separately per species in addition to the presented results at the community level. In the final paragraph, the authors discuss the role of functional diversity and/or particular species for resistance/recovery. Even if the present experiment did not manipulate plant diversity it should be possible to set results of the present study into the context – species-specific information is available and obviously one species (Plantago lanceolata) became dominant among the three experimental species.

Answer: Species-specific data will be included and the final paragraph will be adapted (also referee #2 had a comment on the last paragraph and suggests deleting it).

Minor points: Comment: Fig. 3: Symbols and error bars should be slightly displaced for different treatments to improve readability

Answer: Figure 3 will be adapted in the revised manuscript.

Sincerely,

Interactive comment on Biogeosciences Discuss., 10, 9149, 2013.