

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.

Anonymous Referee #1

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General comments: The manuscript by Dreesen et al. presents data from an experiment manipulating drought, heat and both factors in combination. Two events are initiated at different time intervals and compared with treatments only experiencing the second event to assess the effects of recovery period. A number of experimental studies mostly focussing on drought events have been conducted in recent years, and the authors themselves already previously published experimental work on combined effects of drought and heat. Less is known about different time intervals for recovery/resistance of plant assemblages. Therefore, the results showing differential effects of different types of extreme climate events, but indicating a potential of herbaceous vegetation to recover after different time spans between extreme events, extend the

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increasing knowledge on plant response to current and expected global changes. In general, the manuscript is well written and analyses/results are clearly related to hypotheses. However, I have two major points which should be addressed in a revision. First, the authors emphasize in the introduction that the response to extreme climate events may be species-specific. 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. 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. 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.

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

Results: P9159,L4-11: An additional figure showing the total number of leaves over time would be helpful. The experiment was conducted by planting a mixture of

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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. 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.

Discussion: 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.

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

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