

Interactive comment on “Altered response to nitrogen supply of mixed grassland communities in a future climate: a controlled environment microcosm study” by J. Van den Berge et al.

Anonymous Referee #2

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Climate change studies addressing a single factor (CO₂, temperature, precipitation) are fairly common, but fewer studies have addressed the interactive effects of these factors. In this microcosm study, CO₂ and temperature were manipulated in a mixed grassland community containing two grasses, two dicots, and two N₂-fixing dicots; soil N supply was also varied. Biomass responses of shoots and roots, plant N concentration, and soil extractable N were measured as a function of soil N supply. Surprisingly, plants were generally unresponsive in the future climate (620 ppm CO₂ and +3C warming) relative to the current climate (375 ppm CO₂ and ambient temperature).

My main concern with this study was that independent climate factors (CO₂ and warm-

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ing) could not be assessed due to the experimental design. Although I can appreciate the difficulty in having many replicates of a given treatment, the design of having a current climate treatment (ambient CO₂ and temperature) and a future climate treatment (elevated CO₂ and warming) is confounding and problematic. For example, are climate treatment effects due to CO₂, temperature or the interactive effects? Is the lack of treatment response due to lack of response to CO₂ and temperature, or due to opposite (and therefore, cancelling) effects of these two variables? With this design it is impossible to develop a detailed mechanistic understanding of the system and therefore, confidently assign treatment responses to different environmental drivers.

My other main concern was that too few parameters were measured, thereby leading to significant amounts of speculation in data interpretation. Although different processes were invoked as explanations for the results, they were not measured. For example, immobilization in SOM, leaching, gaseous emissions by microbial processes, N₂-fixation and mineralization of SOM are all indicated as potential factors controlling N balance in the grassland community and yet none of these factors was measured. Development of this conceptual model prior to initiation of the experiment, and hence collection of the appropriate data set, would have greatly improved this manuscript.

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