

Interactive  
Comment

## ***Interactive comment on “Effects of climate warming and declining species richness in grassland model ecosystems: acclimation of CO<sub>2</sub> fluxes” by S. Vicca et al.***

**S. Vicca et al.**

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### GENERAL COMMENTS

1. No distinction between heterotrophic and autotrophic respiration was made.

We agree with the referee that separation of heterotrophic and autotrophic respiration would have been a great asset. Unfortunately, we did not have the funds nor the manpower to perform isotopic experiments required for such separation. Nonetheless, even without this separation, we feel that our observations (similar acclimation of total ecosystem respiration and photosynthesis) are both novel and of high relevance for the research community.

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2. Some key observations were not made.

See below (specific comment #1)

3. Some procedures were inadequately described.

See below (specific comments #2-6)

## SPECIFIC COMMENTS

1. No distinction between heterotrophic and autotrophic respiration was made.

We fully agree with the referee that the acclimation processes probably differ between autotrophic and heterotrophic respiration. Unfortunately, it was not possible to distinguish between these two processes for the reasons highlighted above.

2. What was the soil carbon content?

Information about the texture and soil carbon content of the soil in the communities was added to the revised manuscript (Table 1). Furthermore, we added a sentence containing some information about the soil type in the revised manuscript (p.5, line 9-10)

3. Spacing between the pots.

Pots were packed closely together, with a space of 1 cm between neighboring pots. Furthermore, because our experiment was performed more or less one month after harvesting, we can confirm that plants never spread out of the pots during our measurement periods. This information was added to the revised manuscript (p.5, line 11-12 and p. 6, line 11-12).

4. Installation of the cuvette over the plants.

The cuvette was placed on permanent soil collars, and was shaped such that it fitted the collars perfectly. Air tightness was ensured by a gas tight seal. This information was added to the revised manuscript (p.5, line 18-22). Temperatures inside the cuvette

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were not measured, but because measurements were accomplished in less than two minutes, we assume that temperatures inside the chambers remained more or less the same. Moreover, measurements were performed during wintertime, which makes it even more plausible that temperature changes inside the cuvette were negligible.

#### 5. Measurements of ecosystem respiration in the dark.

Measurements of ecosystem respiration were always made immediately after darkening the cuvette. This information was added to the revised manuscript (p.5, line 27).

#### 6. What did we do with the leaves which extended beyond the edge of the pots?

There were no leaves spreading out of the pots. (cfr. #3)

#### 7. How well did the Q10 function fit to the data?

We did not show how well the Q10 function fitted the data, because it was fitted to 48 plant communities and including this information would dilute the message too much. If the editor requests this information, for each individual community, we will include it in the revised manuscript. If not, we will merely mention that the regressions were always significant, and that the uncertainty surrounding the TER7 was on average 15 %. (p.7, line 22). We further agree with the referee that the Q10 function is not suited when large increases in temperature occur. However, this was irrelevant in our study, because the function was only applied to interpolate between measurements close to 7 °C and not to extrapolate.

#### 8. How well did the function $y = a * bx$ fit to the data? Which data were used exactly?

We do not really understand this question, because the fit of this function was shown in Table 3 (= Table 5 in the revised manuscript) and Figure 2 is exactly the figure that the referee requested.

#### 9. The referee did not understand how Equation 3 was used.

Using this equation, we were able to correct for the effect of plant cover on carbon

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dioxide fluxes. The residuals, computed after making one single regression for both unheated and heated communities, provide information about the distribution of the data. The residuals for both TER7 and GPP100 appeared to be lower in the heated communities than in the unheated communities, indicating that, at a certain plant cover, both TER7 and GPP100 were lower in the heated than in the unheated communities. Because the referee clearly did not fully understand what we were trying to convey, we have clarified the need for this normalization in this paragraph (p.8, line 6-19).

10. The referee did not understand what we meant with ‘at corresponding plant cover’.

Our aim was to make clear that we calculated TER7(pc2) and GPP100(pc2) for each plant community, at the plant cover that we measured for this community. For example: if in plot 1, we measured a plant cover of 60%, we calculated the y value of the fitted regression at 60%. We made this clearer in the revised manuscript (p.8, line 13).

11. Adjustment for plant cover.

The referee does not agree completely with our adjustment for plant cover. Especially with regard to heterotrophic respiration, he is having some doubts. Nonetheless, we think it is justified to make these adjustments, because we did find a highly significant, positive correlation between TER7 and plant cover. Heterotrophic respiration is often primed by root exudates, and it is not unlikely that exudation scales well with plant cover. This might explain the significant positive correlation. Furthermore, these corrections are essential to verify whether acclimation occurred, because plant cover varied greatly among plant communities. We opted not to include this clarification in the revised manuscript, because it is very speculative and would bring us too far from the objectives.

12. Outliers.

Three outliers were deleted from all analyses because the plant communities were severely disturbed. In the pair wise comparison of unheated and heated communities

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with equal species composition, we were obliged to delete some other communities as well, because, after two years of treatment, different species dominated in these unheated and heated communities. These plant communities could thus not be compared. As a result, comparisons of communities with equal species composition were performed for 36 communities, 18 unheated and 18 heated communities. This information was added to the materials and methods section (p.9, line 11-18).

### 13. Postponed senescence.

The referee does not fully agree with our hypothesized explanation of postponed senescence in the heated chambers. We agree with him and have now included the alternative explanation brought forward by the referee in the revised manuscript (p.11, line 17-21).

### 14. Plant cover.

Cfr. #3

### 15. Table of TER7, GPP100 and their ratios.

As requested, we added this table to the revised manuscript (Table 4).

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Interactive comment on Biogeosciences Discuss., 3, 1473, 2006.

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