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Biogeosciences Discussions

Interactive comment on "Carbon and oxygen isotope analysis of leaf biomass reveals contrasting photosynthetic responses to elevated CO_2 near geologic vents in Yellowstone National Park" *by* S. Sharma and D. G. Williams

Anonymous Referee #2

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This manuscript presents analyses of stable carbon and oxygen isotope ratios of leaf dry matter for a pine species (Pinus contorta) and a perennial herb (Linaria dalmatica) growing in the vicinity of CO2 vents in Wyoming, USA. The plants were exposed to varying degrees of CO2 concentration enrichment above the background concentration. The degree of enrichment was determined by measuring the 14C/12C ratio in the leaf dry matter. The authors observed that 13C discrimination increased for both species with increasing CO2 concentration exposure. In contrast, the two species had differing responses to increasing CO2 exposure for d18O, with the pine species in-

creasing d18O in response to increasing CO2 enrichment and the herbaceous species decreasing d18O in response to increasing CO2 enrichment. The authors interpret these patterns as variable responses of photosynthetic capacity and stomatal conductance to elevated CO2 in the two species.

I found the manuscript generally well written and clearly presented. The data present an interesting addition to the large body of short-term experimental results for physiological responses of plants to elevated atmospheric CO2. The contrasting results for the two different species are not necessarily consistent with what one would predict based on generalized responses from short-term CO2 exposure studies, which makes the data interesting and important. However, I feel the authors should make one point that is not made in the current version of the manuscript. The isotopic data provide indirect measurements of gas exchange responses. Because they are indirect measurements, there is additional uncertainty associated with them that would not be associated with direct measurements. For example, the interpretation of the d18O responses relies on the assumption that d18O of leaf dry matter will decrease with increasing stomatal conductance. However, data sets have now been published that showed the opposite pattern, so the assumption should be treated with caution. I suggest that the authors conclude their discussion section with a call for direct measurements of leaf gas exchange in these plants to confirm the patterns suggested by the isotopic data.

Specific comments:

Page 3828, line 1: ‘increases’ should read ‘increase’

Page 3834, line 26: The word ‘decreased’ should be inserted after ‘pine’.

Figure 3: I can’t think of any reason why the y-axes should be reversed here. I suggest that the figure be revised with values on the y-axes increasing from origin upward.

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Interactive Comment

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