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Interactive comment on “CO₂ and nutrient-driven changes across multiple levels of organization in *Zostera noltii* ecosystems” by B. Martínez-Crego et al.

Anonymous Referee #2

Received and published: 10 October 2014

Dear authors, the final review report was submitted by e-mail, and I've copied it below.

Best regards,

Steven Bouillon.

Review of manuscript bgd-11-5239-2014 CO₂ and nutrient-driven changes across multiple levels of organization in *Zostera noltii* ecosystems

This manuscript documents the responses of the seagrass, *Zostera noltii*, to a factorial manipulation of both CO₂ and nutrient availability. In light of both local and global environmental change, this work addresses an important issue facing many coastal

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seagrass beds. Using a series of experimental mesocosms, this study examines the influence of these environmental stressors across multiple levels of organization (at organismal, community, and ecosystem scales). While an interesting topic, there are a number of issues with this manuscript that need to be addressed before I can recommend this work for publication in Biogeosciences. See the detailed comments below.

Specific comments:

Lines 8-10, p5241: Please provide citations to support these statements.

Lines 27-28, p5241: Please provide citations to support these statements.

Line 1, p5254: Any reason why all effects on epiphytes and sediments were attenuated under both CO₂ and nutrient enrichment.

Line 11, p5254: However, this finding is in contradiction to much empirical research for seagrasses. Please address. (Jiang et al. 2010, Campbell & Fourqurean 2013)

Line 12, p.5254: So the seagrasses from the low-nutrient meadows were not nutrient limited? What evidence do you have to suggest a trade-off between phenolic production and growth? I currently don't see data to support this conclusion.

Line 16, p.5254: Did CO₂ enrichment actually enhance LAI? Is this supported by your statistical analyses.

Line 20, p.5254: Were your plants really not under any degree of light limitation? Didn't the excessive epiphyte loading reduce light levels?

Line 23, p.5254: Yet note that in a subsequent study Campbell 2013 Mar Biol document increases in carbohydrate content with elevated CO₂, along with Jiang et al 2010, Palacios 2007, and Zimmerman et al 1997. Clearly both nutrient regime and CO₂ levels can have an effect on carbohydrate levels and should be acknowledged. (Zimmerman et al. 1997, Jiang et al. 2010, Campbell & Fourqurean 2013)

Line 2, p.5255: Cite (Campbell & Fourqurean 2014)

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Line 5, p. 5256 : But don't you document declines in shoot recruitment and LAI ?

Line 17 p. 5256: Any chance that this excess organic matter was simply exported out of the mesocosms due to the experimental set up?

Line 22 p.5256: Any explanation for this statement? The first sentence of this paragraph needs clarification / explanation.

Line 4- 17 p.5257: This paragraph reads more like the results section. Please revise.

Line 19 p.5258: But if I understand correctly, combined CO₂ and nutrients had no effect on carbon sink capacity. Why might this be the case?

Campbell JE, Fourqurean JW (2013) Effects of in situ CO₂ enrichment on the structural and chemical characteristics of the seagrass *Thalassia testudinum*. *Marine Biology* 160:1465-1475

Campbell JE, Fourqurean JW (2014) Ocean acidification outweighs nutrient effects in structuring seagrass epiphyte communities. *J Ecol* 102:730-737

Jiang ZJ, Huang XP, Zhang JP (2010) Effects of CO₂ enrichment on photosynthesis, growth, and biochemical composition of seagrass *Thalassia hemprichii* (Ehrenb.) Aschers. *Journal of Integrative Plant Biology* 52:904-913

Zimmerman RC, Kohrs DG, Steller DL, Alberte RS (1997) Impacts of CO₂ enrichment on productivity and light requirements of eelgrass. *Plant Physiology* 115:599-607

Interactive comment on Biogeosciences Discuss., 11, 5239, 2014.

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