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Interactive comment on "Physiological response of a golden tide alga (*Sargassum muticum*) to the interaction of ocean acidification and phosphorus enrichment" *by* Zhiguang Xu et al.

Anonymous Referee #2

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This is an interesting paper describing the combined effects of elevated CO2 (and hence ocean acidification) and elevated P levels on growth and physiology of Sargassum muticum. The work is well designed and executed and the data presented and discussed thoroughly, although English expression is a little strange in places.

I do though draw the authors attention to a couple of points:

Line 239: It is stated that projected ocean acidification increased pCO2 by 138.29% (LP) and 134.08% (HP) but surely it is the changes in pCO2 that cause OA?

Line 348-9: Here it is stated that "The evidence above indicates that the CO2 in seawater should be carbon limited for marine macroalgae". This is based on the high k0.5

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CO_2 for Rubisco and the diffusive resistance to CO_2 on seawater - that the k0.5 CO_2 values for intact thalli are very much lower than those for Rubisco is prima facie evidence that an active CCM is present. More could be made of this and the fact that it appears CCM activity is not down regulated by the high CO_2 conditions. The explanation on lines 359-61 that this is "mainly because of increased CO_2 availability for Rubisco and depressed photorespiration at the elevated ratio of CO_2 to O_2" would not apply to P vs DIC curves.

The authors suggest in several places (e.g. lines 388-91) that the HC conditions may have down-regulated CCMs in S. muticum, but there is no evidence for this in their data (Fig 3, Table 2).

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