

Macroalgal metabolism and carbon budgets affect atmospheric CO₂ uptake in a temperate *Sargassum* bed

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Macroalgal beds are considered to be one of the vegetated coastal ecosystems (i.e., blue carbon ecosystems) that act as atmospheric CO₂ sinks. Macroalgal metabolisms and carbon budgets affect CO₂ sequestration by macroalgal beds, but its relationships are still poorly understood. In this study, we investigated air–water CO₂ exchange and budgets of dissolved inorganic carbon, total alkalinity, and dissolved organic carbon (DOC) in a temperate *Sargassum* bed during the productive winter. We estimated the metabolism of macroalgae and carbon budgets by using a field-bag method, a degradation experiment, and mass balance modelling over a diurnal cycle. Our results showed that macroalgal metabolism and carbon budgets affected atmospheric CO₂ uptake in and around the *Sargassum* bed. The macroalgal metabolism formed water with low CO₂ and high DOC that was then exported offshore. This export process potentially promotes CO₂ uptake in and around macroalgal beds.

Keywords: macroalgal bed, CO₂ sink, metabolism, blue carbon, carbon dynamics