DECOMPOSITION AND LABILITY OF SOIL ORGANIC MATTER AND CARBON STOCKS ACROSS A SEAGRASS LANDSCAPE

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The paradigm for understanding the accumulation of organic carbon (C_{org}) in coastal "blue carbon" habitats holds that burial of C_{org} slows decomposition and leads to stability of carbon stocks. Further, it is generally assumed that the presence of the plant communities contributes to the buried organic matter and the stability of the carbon stocks. This study tested these assumptions and examined the lability of soil C_{org} as a function of environmental and plant community drivers. Samples of surficial sediment and seagrass community characteristics were collected at 93 locations across the ca. 15,000 km^2 of seagrass beds in south Florida. Ramped pyrolysis was used to describe the relative lability of soil organic carbon across the landscape. Organic matter (OM) was lost at all temperatures from 180° C to 600° C, suggesting that even the relatively high combustion temperature of 550° C underestimates OM content by ≈ 10% on average. Additionally, deployments of model substrates (canvas strips) were used to examine decomposition rates of buried and surficial organic material at a subset of these sites. On average, finer, muddier soils contained slightly higher C_{org} stocks than coarser sediment sites, but the relationships between sediment grain size and seagrass community structure was weak. The lability of soil organic carbon varied with grain size; as much as 80% of the C_{org} was refractory in coarse-grained soils compared to less than 30% in muddy soils. In muddy soils, burial decreased cellulose decomposition rate by an average of 22 - 39 % compared to surficial breakdown, but in coarse-grained soils, burial enhanced cellulose decomposition rate by at least 55 %. Taken as a whole, this study suggests that burial does not enhance C_{org} storage in all blue carbon environments, and that soil C stores are only weakly correlated with seagrass biomass at the landscape scale.

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