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Unveiling Blue Carbon Hotspots: The Amplified Role of Seagrass Meadows in Organic Carbon-Rich Reef Sediments

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Seagrass meadows are increasingly recognized as a natural climate solution due to their significant potential for alkalinity-driven carbon dioxide (CO_2) removal—an often-overlooked aspect of ocean carbon sequestration. This study systematically examines carbonate chemistry, sediment carbon content, mineral composition, and benthic alkalinity fluxes at two tropical seagrass meadow sites: one situated on organic carbon (OC)-rich reef sediments and the other on OC-poor terrestrial sediments. Results reveal that benthic alkalinity fluxes in OC-rich reef sediments are nearly two orders of magnitude higher than in OC-poor sediments (72.8 ± 64.4 vs. 0.53 ± 0.99 mmol m^{-2} d^{-1}). This substantial alkalinity production can elevate seawater alkalinity levels, lower CO_2 partial pressure, and contribute to the formation of blue carbon hotspots. Therefore, we propose that seagrass meadows on high-OC reef sediments serve as alkalinity hotspots, amplifying their role in climate change mitigation and enhancing the impact of seagrass restoration efforts.