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Carbon sequestration in seagrass habitats: Studying the effects of environmental heterogeneity on this key ecosystem service

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There is currently a need for initiatives of Climate Change mitigation through active Green House sequestration, particularly of CO₂. Seagrasses are one of only three marine habitats that provide this ecosystem service, storing carbon in living tissue through photosynthesis and buried in their sediments for up to thousands of years. However, seagrass meadows are also highly threatened and are continuing to decline worldwide, threatening the capacity of this ecosystem to serve as a carbon sink. Seagrass management and conservation initiatives need adequate understanding of the spatial and temporal variability of carbon storage in these ecosystems, which is currently limited. The effect of varying environmental and biological conditions on spatial and temporal variability of carbon storage was studied in subtropical and tropical seagrass meadows. In the Coral Sea, seagrass biomass and sediment cores were collected at multiple locations across a water quality gradient in Moreton Bay, Australia. High resolution seagrass biomass mapping was developed through remote sensing and mapping techniques. Sediment carbon content and seagrass structural complexity were determined for each location. Environmental variables were determined from field data (water quality) and modelled data (wave height). Spatial variability in carbon content among sites was linked to variations in seagrass canopy complexity, water turbidity, depth and wave energy. Seasonal variability was limited and overshadowed by spatial variability. Variation at longer time frames was analyzed by dating sediment cores up to 2m sediment depth. Carbon content, vertical accretion and carbon accumulation rates varied within Moreton Bay and were higher following European settlement. Findings from the Coral Sea are now being compared to new studies in the Caribbean and Eastern Tropical Pacific. The findings on spatial and temporal variability of the ecosystem service of carbon sequestration in seagrass meadows provide useful information for the development and implementation of blue carbon conservation and management initiatives.

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