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Seagrass as a Sedimentary Reverse Phosphate Pump

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Carbon dioxide (CO_2) is the dominant greenhouse gas in the atmosphere, and as such it has a profound effect on the Earth's climate. An effective way of mitigating global changes is by carbon sequestration which is based on the capture of CO_2 and its burial in the sediment in the form of organic carbon. Coastal ecosystems such as seagrasses, mangroves and salt marshes sequestrate carbon more effectively than terrestrial ecosystems. Seagrass meadows play a particularly important role as they store over 15% of accumulated global carbon storage in the ocean's sediments. Seagrasses are aquatic flowering plants mostly found in shallow coastal water. Several factors are known to limit seagrass photosynthesis and growth. Nutrient scarcity regraded as the secondary growth limiting factor (second to light penetration). Nutrients can be supplied to seagrasses through the water column and porewater. Thus, seagrasses are widely distributed in oligotrophic tropical waters despite the low nutrient levels in the water column due to their ability to mobilize iron and phosphorus in the rhizosphere via multiple biogeochemical interactions. Seagrasses therefore hold an important advantage over planktonic photoautotrophs in oligotrophic regions due to their chemical interactions with the sediments while algae are limited by the availability of nutrients in the water column. The aim of this study is the examine the recycling of phosphate through the decomposition of different seagrass parts. In a series of incubation experiments, the changes in the geochemistry of the water were examined following the disappearance of seagrass (*Halophila stipulacea*). The results showed that the decomposition rate of the rhizome was the highest among all parts. However, the highest phosphate release rate was measured in the leaves. Since the leaves mostly decompose at the water column, the released phosphate is made available to planktonic photoautotrophs and further enhances more carbon fixation. Overall, we suggest that in oligotrophic environments seagrass act as a reverse phosphate pump by accessing nutrients in the sediment and later translocating phosphate to the aboveground parts and releasing in the water column, thus fertilizing planktonic photoautotrophs and enchanting further carbon sequestration.