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Silicon-32 as a potential tool for soil accretion dating and carbon sequestration of coastal wetlands and assessing their risk of sea level rise

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Title: Silicon-32 as a potential tool for soil accretion dating and carbon sequestration of coastal wetlands and assessing their risk of sea level rise

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Abstract: The basic pathway to carbon neutrality includes “emission reduction” and “sink enhancement”. Coastal wetlands (mangroves, seagrass beds, salt marshes) as important “blue carbon” pools in the world, have functions for regulating global climate, promoting the degradation of pollutants, carbon sequestration, but how to improve the efficiency of blue carbon sequestration and maintain the stability of blue carbon pool and assess whether they adapt to future sea level rise (SLR) is a hotspot under global climate warming. Cosmogenic silicon-32 (a half-life of approximately 150 years) has a potential tool for dating soil vertical accretion in coastal wetland to fill the dating gap (100-1000 years) that lies between those chronologies based on the shorter-lived isotopes of ²²⁸Thex and ²¹⁰Pb, and those based on the longer-lived ¹⁴C. It will play a key role improving the efficiency of blue carbon sequestration and maintaining the stability of blue carbon pool of coastal wetlands and assessing their risk of sea level rise under globe climate warming. Because carbon storage and sequestration in coastal wetland sediments (soils) need undergoing need undergoing centennial timescales. At present, the ²¹⁰Pb (T_{1/2}=22.3a) dating technique is often used estimate carbon burial and sources and to assess carbon storage and sequestration in coastal wetland sediments within the decadal timescale (<100a). However, coastal wetland carbon in sediments within the centennial timescale (<1000a) are few studied today. Therefore, it is of great importance to carry out the accretion rate of coastal wetlands based on natural ²¹⁰Pb and cosmogenic ³²Si (T_{1/2}≈150a) dating techniques. By analyzing organic carbon and nitrogen, biogenic silica, and their chemical and isotopic fingerprints in soil cores, it is possible not only to understand their spatial and temporal distributions, but also to assess the sources of organic matter/carbon through numerical modeling and to explore the stability of the sedimentary carbon pools in coastal wetlands over a 1000a time scale. This is important for assessing the stability of carbon pools, the sustainability and potential of carbon sinks, and predicting the impact of future global changes on the vulnerability of coastal wetlands.

Keywords: Coastal wetland; ³²Si dating method; Soil accretion rate; carbon sequestration; Sea level rise

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