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 (T1/2=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 (T1/2≈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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**标题：宇生硅-32 用于示踪研究沿海湿地的土壤增生年代测定和碳封存，以及评估其海平面上升风险的潜能研究**

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摘要： 实现碳中和的基本途径包括 "减排 "和 "增汇"。滨海湿地（红树林、海草床、盐沼）作为全球重要的 "蓝碳 "池，具有调节全球气候、促进污染物降解、固碳等功能，但如何提高蓝碳固存效率、维持蓝碳池的稳定性并评估其是否适应未来海平面上升（SLR）是全球气候变暖下的一个热点。宇宙生成物硅-32（半衰期约为 150 年）是一种潜在的工具，可用于确定沿岸湿地土壤垂直增生的年代，以填补基于228Thex和 210Pb 等寿命较短同位素的年代学与基于寿命较长的 14C 的年代学之间的年代空白（100-1000 年）。它将在提高沿岸湿地蓝碳封存效率、保持蓝碳库稳定性以及评估全球气候变暖下海平面上升风险方面发挥关键作用。由于滨海湿地沉积物（土壤）中的碳储存和封存需要经历百年时间尺度。目前，210Pb (T1/2=22.3a) 测年技术通常用于估算碳埋藏量和碳源，以及评估沿海湿地沉积物中百年时间尺度内(<100a)碳储存和封存，然而对百年时间尺度（<1000a）内滨海湿地沉积物中碳的研究很少。因此，基于天然 210Pb 和宇宙成因 32Si(T1/2≈150a)测年技术来开展滨海湿地的增殖速率具有十分重要意义。通过分析土壤岩芯中的有机碳和氮、生物硅及其化学和同位素指纹，不经可以了解其时空分布，还可以通过数模型评估有机物/碳的来源，并探讨 1000a 时间尺度内沿岸湿地沉积碳库的稳定性。这对评估碳库的稳定性、碳汇的可持续性和潜力，以及预测未来全球变化对滨海湿地脆弱性的影响都非常重要。

**关键词: 滨海湿地**; 32Si 定年; 土壤加积速率；碳汇; 海平面上升