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## The distributions of Glomalin-related soil protein in the coastal wetlands of the Liaohe Delta, Northeast China: Implications for mineral weathering and carbon sequestration

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The role of Arbuscular mycorrhizal fungi (AMF) in conditioning soils is achieved by its metabolite glomalin. However, glomalin has not been biochemically defined, it has often been quantified in terms of Glomalin-related soil protein (GRSP). Therefore, as a proxy for AMF, GRSP has been widely used to explore the role of AMFs in various ecosystems around the world. However, information on AMF-carbon-weathering interactions is limited. To evaluate the relationship among the AMF, carbon content, nutrients and chemical index of alteration (CIA), GRSP in 133 surface sediment samples and the major components, nutrient content and the grain size of 304 surface sediment samples were analyzed in the wetlands of the Liaohe Delta (LHD), including the upper delta plain wetlands (UDPW) and its adjacent shallow sea wetlands (SSW). The GRSP concentrations averaged over 133 samples were  $2.30 \pm 0.17 \text{ mg g}^{-1}$ , in a range between 0.11 and  $11.31 \text{ mg g}^{-1}$ , and significantly affected by the land use pattern. The ratios of organic carbon in GRSP (GRSP-C) to soil organic carbon (SOC) ranged between 0.71 and 25.34%, with an average of  $10.34 \pm 0.52\%$ , confirmed that GRSP was an important part of the sediment carbon pool in the LHD. In addition, it is worth noting that the carbon dynamics in these wetlands were closely related to human activities. The CIA values varied from 18.97 to 68.75, and were significantly higher in the UDPW than in the SSW ( $p < 0.05$ ). In order to explore the effect of AMF on weathering process, triangle maps were constructed to analyze the weathering characteristics of sediment samples with different GRSP concentrations. The results indicated that biologically AMF-mediated weathering in this area leads to the formation of clay minerals. Moreover, The CIA was significantly correlated with GRSP concentrations ( $r = 0.43$ ,  $p < 0.01$ ), and both the CIA and GRSP were significantly correlated with nutrient concentrations (SOC, TN, P, and Fe) ( $p < 0.01$ ). These results indicate that AMF excursions in wetland ecosystems enhance carbon sequestration and mineral weathering, and in turn they alter retention of at least some nutrients.