Quantifying Autocompaction of the Pearl River Marsh, Louisiana

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Autocompaction of Holocene strata is understudied in the peat facies of Gulf Coast marshes like that of the Pearl River marsh (PRM). The PRM is oligohaline to brackish, microtidal, and dominated by Sagittaria lancifolia and Spartina patens in fresher areas and by Spartina patens and Juncus roemerianus with fringing Spartina alterniflora at higher salinities in the southern marsh. The PRM contains thick deposits, up to six meters, of peaty sediments that are susceptible to significant autocompaction along distributary banks and marsh interiors. Peat is the most compressible of typical Holocene deltaic soils and peaty sediments comprise large portions of the near-surface PRM. Peats mineralogical and organic matter varies regionally, and this heterogeneity does not allow for broad predictions to be made about regional compressibility. Furthermore, many other complex and related processes contribute to the subsidence and inundation of Louisiana's wetlands, including eustatic sea level rise, allocthonous sediment starvation, reduced vegetative growth, growth faulting, isostatic subsidence, and fluid withdrawal. An important factor contributing to regional subsidence patterns is the natural autocompaction of Holocene strata.

To more clearly define shallow-sediment compaction, physical sediment parameters (bulk density, initial porosity, water content, organic matter, and texture) will be both measured and calculated to determine which drive autocompaction on a site specific basis. High-resolution autocompaction rates of the near-surface, deltaic marsh platform of the PRM will be determined by down-core measurements of short (~1 meter) compaction free, wedge cores on a centimeter scale. Utilizing fallout radionuclides, including anthropogenic Cesium-137 and natural Lead-210, chronological control of near-surface sediments is possible. Near-surface sediment dating methods do not require a common marker horizon, like basal peat or deep buried cypress marsh datums, to be shared by all cores. An empirical formula will be developed to identify those locations where autocompaction rates are highest, lowest, and static. The methods employed here will provide an opportunity to conduct similar studies across larger, regional areas and enable a better understanding of autocompaction in the PRM and similar marshes throughout the northern Gulf of Mexico.