Application of Geophysical Techniques to Study the Texas Coast: Internal Architecture of Beach-Dune Morphology along the Lower Texas Barrier Islands

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EXTENDED ABSTRACT

The Texas Coast contains one the longest chains of barrier islands, which are Holocene in age, in the United States. The barrier islands contain sand dunes, which protect the main land, bays, and lagoons from flooding and erosion. The islands have formed by fluctuation in sea level and sediment deposition through longshore drift. As a result, sand dunes are formed on the backshore area from the accumulation of sediments deposited by waves, trapped within coastal vegetation located within the foredunes Texas' lower coast contains the most preserved sand dunes that vary in size, but average 15 to 25 meters in height according to Texas Parks and Wildlife. Natural causes erode the barrier islands on the Texas coast at a rate of about 1.2 meters per year. Dunes on North Padre (Fig. 1), Mustang (Fig. 2), and Matagorda (Fig. 3) islands are studied due to the sand dunes being unaltered. These islands are prograding, aggrading, and retrograding. The structure and formation of the sand dune determine the impact that a storm will have landward. To study the evolution of the dunes a Terrestrial Laser Scanner (TLS) is used to quantify the movement of the sand dune over time. Ground Penetrating Radar (GPR) is used in 2D and 3D to visualize the lithology and stratigraphy of the subsurface within the sand dunes at frequencies ranging from 100 to 400 MHz. Core samples will be taken to further study the sediments and variation of grain size within the sand dune. Electromagnetic (EM) induction is used to aid the GPR data to gain better understanding of the conductivity of the area. The stratigraphy of sand dunes depends on wind speed, wind direction, and if an erosional event has occurred. This detailed study of sand dunes will help identify the effect of migration and erosional events on sand dune stratigraphy, gain a description of sediment grain size within a blowout sand dune, and how dunes are affected by the rising sea level that is affecting the Texas Gulf Coast.

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