The Role of Current Velocity in Dune Geometry and Sand Distribution in a Tidal Environment: An Example From the San Luis Pass Flood Tidal Delta

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ABSTRACT

Tidal environment dynamics are complex: different hydrodynamic and sedimentological processes interact at the same time and with different spatial distributions. We hypothesize that dune geometry in tidal environments is controlled by the interaction of different parameters such as grain size, water depth, and water velocity and direction. The interaction and effect of these parameters is difficult to analyze because factors, such as grain size and water velocity, can vary independently. Although different studies have tried to analyze modern and paleo-tidal deposits and establish dune geometrical relationships, a tidal sediment transport quantitative model that encompasses the different physical processes and areal changes is needed. This study aims to use seafloor sediment samples, water depths, water current data, and available databases to characterize and then model sediment transport and deposition in a modern tidal environment such as San Luis Pass inlet.

San Luis Pass is one of the few natural inlets on the Texas coast and separates the Galveston and Follets islands. This tidal inlet is located approximately 80 km south of Houston. It is generally shallow, with water depths varying from 0.5 to 4.0 m. The Texas coast is characterized by diurnal tides ranging from 45 to 60 cm, which are classified as microtidal.

Ultimately, the purpose of this study is to create a quantitative model of dune formation in tidal environments. This model could be correlated to other modern tidal environments and applied to ancient tidal deposits in the rock record, helping to characterize sand distribution and quality through the study of outcrops and down core samples.

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