Satellite monitoring of suspended sediments patterns in Texas Estuaries: distinguishing between natural processes, dredging, and commercial fishing

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Suspended sediments are an integral part of estuarine systems; their flux within estuaries is a result of interplay between freshwater inflow, tidal currents, wind-wave resuspension, commercial fishing, and dredging operations. This study investigated the relative importance of the aforementioned drivers of suspended sediment long-term variability in the three largest estuaries in Texas (Galveston, Matagorda, and Corpus Christi Bays) using daily satellite-derived suspended sediment concentrations (SSC) from 2002 to 2014. Median and IQR composites of suspended sediments were generated for seasonal wind and inflow regimes in each estuary. Based on these patterns the Galveston Bay system seems to be dominated by riverine inflow with some influence from frontal passages but to a lesser extent than the two other bays of the study. Surprisingly, influence of oyster harvesting in Galveston Bay is the most salient pattern within this estuary. Matagorda Bay’s patterns indicate that the system is mostly controlled by wind-wave resuspension with patterns changing between frontal passages and southeasterlies dominated seasons. Corpus Christi Bay is similarly influenced by wind-wave resuspension with different patterns during the predominant northerlies and prevalent southeasterlies seasons. SSC are lower in Corpus Christi Bay compared to Matagorda Bay with the difference attributed to shallower average depths and longer fetch lengths in Matagorda Bay. The impact of dredging is also apparent in long-term patterns of Corpus Christi Bay as concentrations of suspended sediments over dredge spoil disposal sites are higher and more variable than surrounding areas, which is most likely due to their less consolidated sediments and shallower depths requiring less wave energy for sediment resuspension. This study highlights the advantage of how long-synoptic time series of SSC can be used to elucidate the major drivers of suspended sediments in estuaries.

Key Words: Sediment dynamics, Remote sensing, estuaries, oyster dredging, wind resuspension.

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Bio

Dr. Anthony Reisinger is a Post-doctoral Fellow in the Coastal & Marine Geospatial Laboratory at the Harte Research institute for Gulf of Mexico Studies. This research is the result of his doctoral studies where he received a NASA fellowship to use satellites to monitor sediments of Texas Bays and Estuaries.

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