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Wave Evolution in Cohesive Sedimentary Environments: Open Problems

Wave-current interaction with cohesive sediment is a complex and not fully resolved problem. Contrary to the widely accepted hypothesis that mud-induced wave dissipation is important only for long waves, observations show significant damping of high frequency, short waves, which interact weakly with the bottom. The mechanism of short wave dissipation is not understood. Numerical simulations show that other dissipative processes such as refraction, or depth-limited breaking, do not account for the magnitude of the observed effects. Independent observations of strong sediment re-working during storms suggest that these effects are related to sediment resuspension processes.

New wave-current and turbidity measurements made using the WAVCIS (wavcis.csi.lsu.edu) ocean observing array offshore coastal Louisiana in the northern Gulf of Mexico suggest that sediment concentration distribution in the water column responds fast and varies considerably as a function of wave energy. Cohesive sediment is resuspended by waves, reaching an almost constant concentration throughout the water column in high energy states, and resettles to form thick bottom fluid mud layer (low energy states). This effect has been observed before (Allison et al. 2000), but at a much coarser time resolution. The formation of the high-turbidity bottom layer is associated with a marked decrease in both swell and sea energy, suggesting that it might play a role in observed short wave dissipation.