

Advanced Wave Modeling of Inlets

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Coastal inlets (natural and engineered) are typically dynamic and complex systems specific to each inlet and are difficult to understand. Advances in computer technologies and model development have further enabled desktop capabilities to simulate coastal inlet dynamics. Early wave models were only capable of modeling a monochromatic wave under simplified geometries. Later, models included wave refraction and diffraction, spectral wave input and complex geometries, which furthered the evaluation of shoreline and inlet impacts due to borrow area or channel dredging. Current advances in the wave models include abilities to model wave reflections, structure interactions, wave breaking, non-linear wave interactions, and input of complex swell and sea-state wave conditions. The current generation of wave models allow for a holistic approach to analyzing these complex inlet systems in order to provide integrated solutions to inlet related issues.

This paper will present recent project examples where advanced wave models were used in the design and assessment of inlets that experience problems resulting from wave-current issues, wave-structure interaction and stabilization of adjacent shorelines. This paper will present examples on Florida and Caribbean projects. The South Lake Worth Inlet study in Florida utilized a boussinesq wave model to engineer solutions to boater safety and while reducing downdrift shoreline impacts resulting from the wave-current wave interactions and wave breaking on the bypassing sandbar. The wave model was used to develop, engineer and evaluate feasible solutions to improve boater safety while minimizing downdrift impacts. Other recent examples will be presented where advanced wave models were used to evaluate inlet/entrance improvements where down drift beaches were built and/or stabilized.

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