PROJECTING BARRIER ISLAND STORM EROSION

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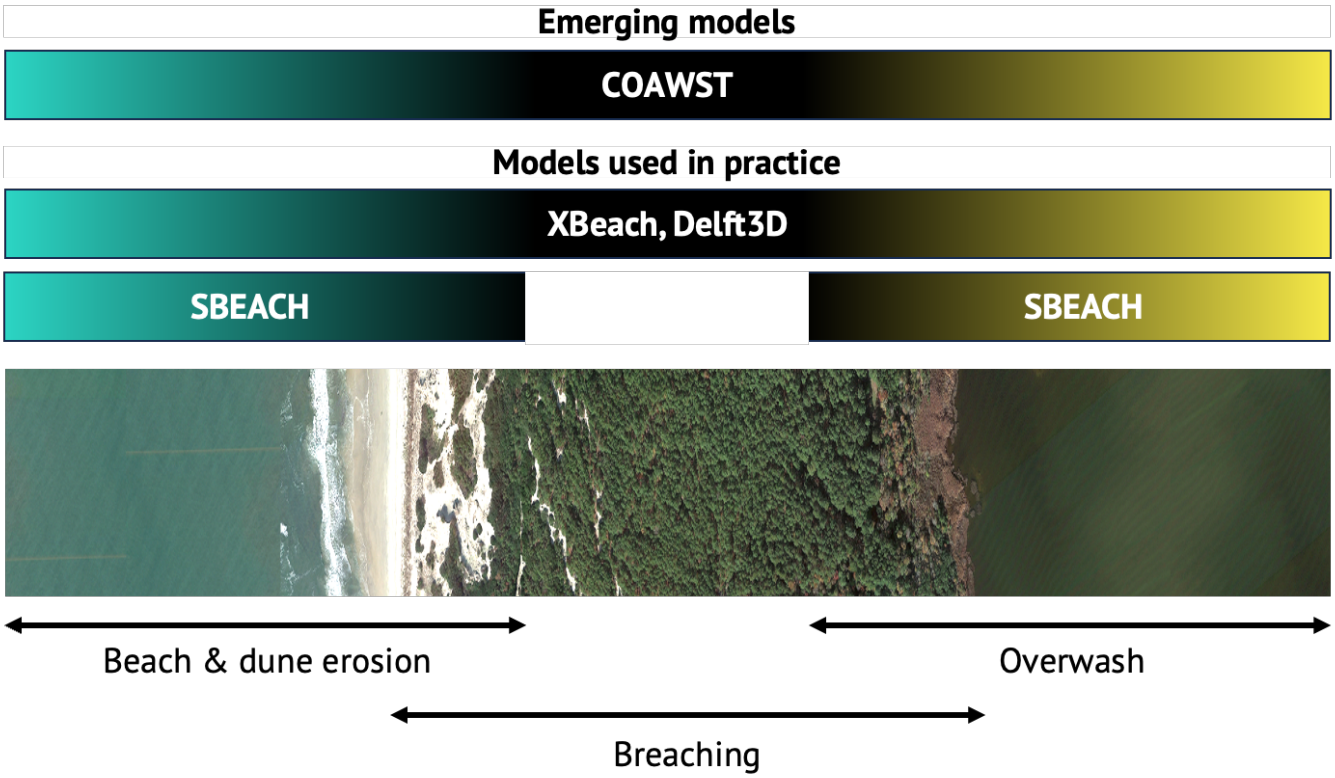
BARRIER ISLANDS

Barrier islands are narrow strips of land parallel to the coast that serve as a protective buffer between the ocean and the mainland. They play a crucial role in reducing flooding from storm surges and mitigating mainland erosion. They also provide habitats for diverse species and opportunities for recreational activities and tourism. Barrier islands are dynamic landforms that naturally respond to storms and sea level rise. During storms, these islands often experience erosion, but natural processes help restore and rebuild them afterward. Rising sea levels increase barrier inundation during storms, which intensifies erosion. Increasing rates of sea level rise and more frequent storms also accelerate landward migration of barrier islands, which can result in land loss and habitat degradation. Interventions like beach nourishment, dune restoration, and marsh creation aim to mitigate island erosion and protect these valuable landforms in the face of storms and sea level rise.

COMPUTER MODELS FOR SIMULATING STORM EROSION

Computer models have been developed to simulate sediment and island movement in barrier island systems during storms. These computer models range in complexity, from models that predict erosion based on storm surge height, to multifaceted models that combine complex flow models with erosion models. All of these models consider one or more of the following processes: beach and dune erosion, breaching (channel formation through the island), and overwash (sediment movement over the island). Popular models for simulating storm events include SBeach, XBeach, and Delft3D. These models, and emerging models such as COAWST, can also be used to analyze the impact of multiple storms and the periods of sediment accretion in between these storms.



Geographic domains and barrier island processes included in selected computer models. Horizontal bars span the computer model's geographic areas and processes (blue=beach & dune erosion, black=breaching, yellow=overwash).

COMPUTER MODEL LIMITATIONS

Over the past fifty years, the capacity to model barrier island change during storms has advanced significantly. Yet, there are still limitations to current modeling capabilities. Scarcity of observed data during storms hinders validation, and uncertainties arise from incomplete knowledge and nature's randomness. Further, factors like vegetation and the built environment are challenging to model accurately. Nevertheless, scientific understanding and computing power continue to drive improvements in predicting how barrier islands change during storms.

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