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Understanding and predicting decadal behaviour of sandy barriers

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Developing geological/morphodynamic models of geomorphic systems involves the identification of common attributes from numerous examples or case studies and the distillation away of local variability. Barrier and barrier island systems share many common features, but there is a wide range of variability that strongly influences how they behave at historical timescales. Much morphodynamic modelling is centred on the relationship between dynamic driving forces on the one hand, and geomorphic response on the other. Some models take into account the feedback that exists between these. Less often considered are factors related to sediment volume and supply, underlying geology and the geological setting, and self-organization. Consideration of 'unusual' barrier island systems, where one or more of these factors is particularly important, highlights their role in barrier behaviour. Barrier islands on bedrock in Scotland demonstrate a primary control on evolution of antecedent topography. The low volume of sand in barrier islands in Chesapeake Bay is primarily responsible for very rapid migration rates. Episodic fluvial sediment supply to some South African barriers controls their historical scale behaviour. The high volume of sand in southern Brazil Barriers is a major constraint on their morphological evolution. These and other examples highlight the importance of factors that are often regarded as 'noise' in morphodynamic modelling.
The nature of 'local variability' in barriers and barrier islands is diverse, but its important, and even dominant role in their evolution, urges caution in the application of generic modellling approaches in predicting future shoreline behavior.