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TITLE: Geomorphic and human influence on large-scale coastal change

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ABSTRACT:

An increasing need exists for regional-scale measurements of shoreline change to aid in management and planning decisions over a broad portion of the coast and to inform assessments of coastal vulnerabilities and hazards. A recent dataset of regional shoreline change, covering a large portion of the U.S. East coast (New England and Mid-Atlantic), provides rates of shoreline change over historical (~ 150 years) and recent (25?30 years) time periods making it ideal for a broad assessment of the regional variation of shoreline change, and the natural and human-induced influences on coastal behavior. The variable coastal landforms of the region provide an opportunity to investigate how specific geomorphic landforms relate to the spatial variability of shoreline change. In addition to natural influences on the rates of change, we examine the effects that development and human modifications to the coastline have on the measurements of regional shoreline change. Regional variation in the rates of shoreline change is a function of the dominant type and distribution of coastal landform as well as the relative amount of human development. Our results indicate that geomorphology has measurable influence on shoreline change rates. Anthropogenic impacts are found to be greater along the more densely developed and modified portion of the coast where jetties at engineered inlets impound large volumes of sediment resulting in extreme but discrete progradation updrift of jetties. This produces a shift in averaged values of rates that may mask the natural long-term record. Additionally, a strong correlation is found to exist between rates of shoreline change and relative level of human development. Using a geomorphic characterization of the types of coastal landform as a guide for expected relative rates of change, we found that the shoreline appears to be changing naturally only along sparsely developed coasts. Even modest amounts of development influence the rates of change and the human imprint override the geomorphic signal. The study demonstrates that human activities associated with creating and maintaining coastal infrastructure alter the natural behavior of the coast over hundreds of kilometers and time spans greater than a century. This suggests that future assessments of vulnerability, based largely on rates of change along developed coastlines, need to take the role of human alterations into account.

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