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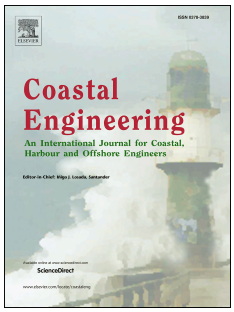

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Identification of storm events and contiguous coastal sections for deterministic modeling of extreme coastal flood events in response to climate change

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Abstract

Deterministic dynamical modeling of future climate conditions and associated hazards, such as flooding, can be computationally-expensive if century-long time-series of waves, sea level variations, and overland flow patterns are simulated. To alleviate some of the computational costs, local impacts of individual coastal storms can be explored by first identifying particular events or scenarios of interest and dynamically modeling those events in detail. In this study, an efficient approach to selecting storm events for subsequent deterministic detailed modeling of coastal flooding is presented. The approach identifies locally relevant scenarios derived from regional datasets spanning long time-periods and covering large geographic areas. This is done by identifying storm events from global climate models using a robust, yet computationally simple approach for calculating total water level proxies at the shore, assuming a linear superposition of the important processes contributing to the overall total water level. Clusering of the total water level time-series is used to define coherent coastal cells where similar return period water level extrema occur in response to region-wide storms. Results show that the more severe but rare coastal flood events (e.g., the 100-year (yr) event) typically occur from the same storm across the region, but that a number of different storms are responsible for the less severe but more frequent local extreme water levels (e.g., the 1-yr event). This new 'storm selection' approach is applied to the Southern California Bight, a region of varying shoreline orientations that is subject to wave refraction across complex bathymetry, and shadowing, focusing,