Flood Risk Due to Hurricane Flooding

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In this study, we evaluated the expected economic losses caused by hurricane inundation. We used surge response functions, which are physics-based dimensionless scaling laws that give surge elevation as a function of the hurricane's parameters (i.e. central pressure, radius, forward speed, approach angle and landfall location) at specified locations along the coast. These locations were close enough to avoid significant changes in surge elevations between consecutive points, and distant enough to minimize calculations. The probability of occurrence of a surge elevation value at a given location was estimated using a joint probability distribution of the hurricane parameters. The surge elevation, at the shoreline, was assumed to project horizontally inland within a polygon of influence. Individual parcel damage was calculated based on flood water depth and damage vs. depth curves available for different building types from the HAZUS computer application developed by the Federal Emergency Management Agency (FEMA). Parcel data, including property value and building type, were obtained from the county appraisal district offices. The expected economic losses were calculated as the sum of the products of the estimated parcel damages and their probability of occurrence for the different storms considered. Anticipated changes for future climate scenarios were considered by accounting for projected hurricane intensification, as indicated by sea surface temperature rise, and sea level rise, which modify the probability distribution of hurricane central pressure and change the baseline of the damage calculation, respectively. Maps of expected economic losses have been developed for Corpus Christi in Texas, Gulfport in Mississippi and Panama City in Florida. Specifically, for Port Aransas, in the Corpus Christi area, it was found that the expected economic losses were in the range of 1% to 4% of the property value for current climate conditions, of 1% to 8% for the 2030's and of 1% to 14% for the 2080's.