

Modeling Sea Level Rise and Surge with Geographic Information System Datasets

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Raster datasets of varying geometric and thematic properties often are used to simulate geospatial processes and events in global and regional environmental models. Usually it is necessary to project the raster datasets to a common coordinate framework for tabulation of statistical properties and visualizations. Projecting global raster datasets is subject to significant distortion, including pixel value gain and loss, and creates errors in the model. We have developed effective raster transformation and resampling in a publicly available software package, mapIMG. We illustrate the methods using global elevation, land cover, and population data with 1 km resolution in a simulation and animation of worldwide sea level rise and surge. The simulation provides locations of high population densities in low-lying coastal areas that are subject to risk from sea level rise and particularly from surges of sea water, such as from hurricanes and tsunamis. Our results include animations of Malaysia (90 m resolution data) and the United States (30 m resolution data), including major coastal urban areas such as New York, Washington, D.C., and Los Angeles. We also include a simulation for parts of the northern coast of Africa including Tunisia.