George McLeod, Department of Ocean, Earth, & Atmospheric Sciences, Old Dominion University

Keywords: GIS, sea level rise, monte carlo, uncertainty, LiDAR, inundation,

Abstract

Sea level rise is a major concern for coastal Virginia which ranks 10th in the world in value of assets exposed to increased flooding. Inundation models are foundational to the analysis of the impacts of sea level rise. Uncertainty in analysis results from the accuracy of elevation data. This potential error may cause the inundation zone to fluctuate landward or seaward. Assessment of the impacts of positional errors was accomplished by conducting Monte Carlo simulation on one watershed in Norfolk, VA. Levels of uncertainty of the source elevation model were determined. 100 permutations were created using a pseudo-random number generator and the bounds of potential error. Means and standard deviations were calculated for all permutations to verify each was within the realm of possible error. Inundation modeling was performed on each permutation and differences were recorded. The cumulative confidence of all simulations was calculated by tallying the number of runs that resulted in each cell being inundated. Grid cells were shaded proportionally to the number of simulations that produced flooding, more precisely delineating potential error and flood vulnerability. Monte Carlo analysis of inundation variability using error modeling suggests broad fidelity of inundation zones while highlighting areas of moderate uncertainty.