Abstract

Project Title: Quantification of Inundation in South Florida Caused by Sea Level Rise, and its Social and Economic Impacts

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Sea level rise has caused inundation, erosion, and saltwater intrusion, and exacerbated storm surge flooding along coastal zones. The 2007 IPCC report projects a global sea level rise of 0.18-0.59 m by 2100 and recent studies show that sea level rise could reach 1.4 m at the end of this century. Such a large sea level rise would threaten millions of people, the economy, and unique ecosystems such as Everglades National Park in South Florida. Quantitative information on inundation and intensified storm surge flooding caused by sea level rise is needed for local communities to make sound policy to cope with the impacts. However, accurate quantification cannot be derived due to the lack of high-resolution digital elevation models (DEM) for low lying areas. The vertical resolution of existing DEMs provided by USGS is about 1.5 m (5 feet) for South Florida, which can correspond to a horizontal extent of tens of kilometers. Fortunately, the Florida Division of Emergency Management (Division) is completing state-wide, airborne light detection and ranging (LiDAR) mapping of coastal areas vulnerable to storm surge flooding, which provides valuable data set for quantifying the impacts of sea level rise.

The first objective of this project is to create high-resolution DEMs for South Florida using LiDAR measurements and to develop methods in geographic information systems (GIS) to estimate land areas inundated by potential sea level rise, and to quantify the impact of sea level rise on the real property, population, and critical infrastructure. The second objective is to examine the effect of topography and acceleration in sea level rise on inundation, to identify patterns of inundation caused by sea level rise, to seek a tipping point in the inundation process beyond which the flooding of land, property, and population becomes calamitous. The third objective is to examine the non-linear interaction of storm surge and sea level rise through numerical modeling, to compute the surge flooding under various sea level rise scenarios. The fourth objective is to collaborate with the NOAA Coastal Services Center to incorporate the results into the Digital Coast and to work with local communities including Palm Beach, Broward, Miami-Dade, and Monroe Counties, U.S. Fish and Wildlife Service, and The Nature Conservancy to incorporate the inundation information into their management plans.

The proposed project is related to the focus of the SARP program *Understanding the needs and gaps for climate information faced by decision-makers in distinct climate-impacted communities, and improving decision support capacity under a changing climate*. The products from the proposed project will provide local communities and the public with information on inundation extent and dynamics in low-lying areas, and associated social and economic impacts on South Florida caused by global sea level rise. The maps of inundation and increased storm surge flooding will allow local communities and the public to better understand the severity and range of the impacts of sea level rise on society and economy, and hence to make better decisions.

As more LiDAR data are collected for coastal states through the Federal Emergency Management Administration (FEMA) Map Modernization program, the proposed methods have the potential of being applied to the entire nation, aiding our society to make sound policy for coping with the impacts of sea level rise.