RAPID DEPLOYMENT AND POST-STORM RECONNAISSANCE OF HURRICANE LAURA

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INTRODUCTION

Hurricane Laura made landfall on the southwest Louisiana coast near Cameron, LA on August 26th. As Laura approached the Louisiana coast, the Coastal Emergency Risks Assessment predicted a storm surge of approximately 5.2 m (17 ft), which marked the strongest surge to impact southwest Louisiana since the catastrophic Hurricane Rita in 2005. As a result, a team led by LSU and NEU mobilized to deploy surge and wave sensors and collect drone imagery at Rockefeller Wildlife Refuge and Cameron, LA on August 25th before the arrival of tropical storm winds. Rockefeller Refuge was selected to measure the capacity of wetlands and breakwaters to attenuate hurricane surge and waves, and pressure sensors were strategically placed at locations of civil infrastructure at Cameron to capture hurricane-induced overland flow (see Fig. 1). After the surge water receded, LSU retrieved the sensors, collected RTK elevation transects and multispectral drone imagery, and surveyed infrastructure damage along the southwest corridor of Louisiana, following the Highway 82 from Abbeville to Cameron.

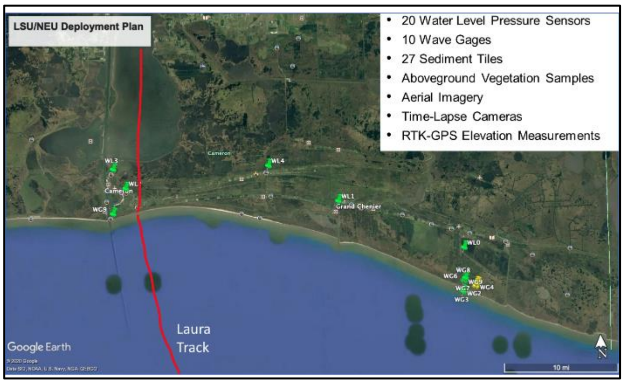

Fig. 1 Instrument deployment plan.

POST-STORM OBSERVATIONS

The field observations were focused on overland flow and flood mitigation infrastructure, including earthen embankments, breakwaters, and natural features (wetlands), under the extreme hurricane forcing. For example, the critical failure mode of the earthen embankments that formed Highway 82 was surge and wave overtopping, which led to scour and erosion (Fig. 2A). Measuring overland flow, extent of scour damage, and geotechnical properties of the embankment can lead to better models for predicting overtopping damage.

The Rockefeller Refuge site represents a unique field experiment documenting the capacity of wetlands with and without breakwaters to reduce storm surge and waves and shoreline erosion. Natural infrastructure, along with hybrid (combination of natural and human-made) infrastructure, are gaining recognition as sustainable and resilient flood mitigation strategies. However, coastal engineers lack documented field performance of wetlands during the extreme events and their long-term recovery, which in turn limits their application in coastal management plans. The initial findings from the elevation transects indicate that the shoreline with breakwaters migrated inland 20 m; without migrated 40m. The elevation for the sand beach decreased from an average pre-storm 1.3 m NAVD88 to 0.8 m NAVD88, i.e., a loss of 0.5 m of elevation due to Hurricane Laura.

The water level sensors placed into the subsurface wetland soils (depths of 30 cm and 60 cm belowground surface) showed that the surge was 3 to 4 m (10 - 13 ft). The soil response behaved in an undrained condition and excess pore-water pressures increased and decreased concomitantly with the surge.

(a)

(b)

Fig. 2 Images of (a) Highway 82 showing scouring of coastal embankment, and (b) Shoreline of Rockefeller Refuge after Hurricane Laura.

CONCLUSIONS

The successful pre-deployment and post-storm damage surveys after Hurricane Laura provided important lessons learned of natural and hard infrastructure performance. In particular, coastal highways are prone to overtopping and scour, which can affect the recovery of communities. There was limited evidence of wetland uprooting from the storm surge, but inundation of over 10 days stressed the vegetation. The recovery of vegetation is important to document. The presence of breakwaters reduces shoreline erosion, even for large hurricane events.