



Modeling and Mapping Major Hurricane Storm Surges on the American Gulf Coast

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The 2004 and 2005 Atlantic hurricane seasons have reawakened awareness of the extreme hazards associated with these powerful weather events. The great majority of the northern and eastern coasts of the Gulf of Mexico have been severely impacted by a total of eight hurricanes. Three of these, including Ivan (2004), Katrina (2005) and Rita (2005) were at or above the Saffir-Simpson Hurricane Scale Category Three level when they made landfall.

In this paper we present the results of storm surge measurements that we have made in the impacted coastal areas and compare them with the results of a numerical model. To collect the data our project teams blanketed the impacted areas as soon after the storm as prudence allowed. Maximum surge elevations were determined from water marks, debris deposits or other indicators, including eye-witness accounts. Once these were identified and marked, a follow-up team of surveyors accurately determined the elevations and locations. In the process of identifying the high water marks the crews made on-the-spot assessments of the origin of the maximum water levels. That is, they determined whether the indicator was in a sufficiently sheltered location to represent the true surge level versus being exposed to both waves and surge. The role of wave set-up and run-up were also considered so that the coastal high water marks were classified as surge, wave height or run-up types.

One use of the measured data is to aid in the prognostic modeling of the storm event. This work is conducted weeks after the storm. Modeling input concerning meteorological conditions and forerunning water levels are adjusted to provide the best agreement with the measured data. This results in forming a better understanding of the condi-

tions during each storm and provides insight into how predictions about future storms can be improved.

In this paper we illustrate these processes with data from several of the 2004 and 2005 storms. Points of agreement and differences between the modeling measurements are illustrated where they are significant. The overall characteristics of the different specific realizations of coastal storm surges are demonstrated with special attention to the role of location-specific factors on the severity of local flooding.