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Mitigation of hurricane storm surge impacts: Modeling scenarios over wide continental shelves

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The improvement of present understanding of surge dynamics over wide and shallow shelves is vital for the improvement of our ability to forecast storm surge impacts to coastal regions, particularly the low-lying land areas that are most vulnerable to hurricane flooding (e.g. the Northern Gulf of Mexico, coastal Bangladesh, the Southeast China sea). Given the increase of global sea-surface temperature, both the total number and proportion of intense tropical cyclones have increased notably since 1970 (Emanuel, 2005; Nature). Therefore, more intense hurricanes may hit densely populated coastal regions, and this problem may be aggravated by the prospect of accelerated sea-level rise in the 21st century.

This presentation offers a review of recent work on hurricane-induced storm surge. The finite-volume coastal ocean model ("FVCOM", by Chen et al., 2003; J. Atmos. Ocean Tech.) was applied to the storm surge induced by Hurricanes Rita and Ike along the coasts of Louisiana and Texas in 2005 and 2008, respectively, to study coastal storm surge dynamics. The sensitivity analysis of Rego and Li (2009; Geophys. Res. Lett.) demonstrated how stronger, wider or faster tropical cyclones would affect coastal flooding. Li, Weeks and Rego (2009; Geophys. Res. Lett) looked into how hurricane flooding and receding dynamics differ, concluding that the overland flow in the latter stage is of considerable importance. Rego and Li (2010; J. Geophys. Res.) showed how extreme events may result of a combination of non-extreme factors, by studying the nonlinear interaction of tide and hurricane surge. The ability of models to reproduce these extreme events and to proactive plan for damage reduction is covered in Rego and Li's (2010; J. Marine Syst.) study of how barrier island systems protect coastal bays from offshore surge propagation. Here we combine these results for a wider perspective on how hurricane flooding could be mitigated under changing conditions.