UNIVERSITY of HOUSTON

CULLEN COLLEGE of ENGINEERING

Department of Civil & Environmental Engineering

CIVE 6111 Graduate Seminar Series

Qin Jim Chen
CSRS Distinguished Professor in Coastal Engineering
Dept. of Civil and Environmental Engineering
Louisiana State University

ATTENUATION OF HURRICANE-GENERATED WAVES IN FLOODED WETLANDS: FIELD OBSERVATIONS AND NUMERICAL MODELING

Friday, February 13, 2015
3:00 pm – 4:00 pm
Room: 102D (Engineering Building 1)

Abstract: It is well known that vegetation in wetlands can effectively reduce the flow speed, modify turbulence structure, attenuate wave energy, and affect sediment dynamics. Restoring coastal wetlands and reducing flood risks require improved understanding and better predictive capability for wave and surge attenuation over inundated coastal landscapes with vegetation. Recent field studies on wave attenuation by salt marshes under tropical cyclone conditions have shed light on the vegetation effects on wave spectra and wave height distributions. Most of the existing storm surge and wave models utilize the conventional quadratic law for bed shear stresses. An empirical, constant bottom friction coefficient has been used to represent the increase in the flow resistance due to vegetation, which may not be applicable to storm surges and hurricane-generated waves over marsh grass.

During a hurricane event, salt marshes remain emergent at the beginning and ending of the water surge while become completely submerged at the peak of the surge. For flows over flooded wetlands, the bottom drag coefficient strongly depends on the vegetation properties (vegetation spacing, stem diameter, plant height and flexural rigidity, etc.) as well as the flow depth and speed associated with the storm surge. Hurricane Isaac (2012) made landfall in southeastern Louisiana. Although it was only a Category 1 hurricane, the large size of the storm, the slow forward speed, and the shallow water depth of the Mississippi River delta and its estuaries result in a surge height equivalent to a Category 3 hurricane making landfall on an open coast. Large waves were observed in the Gulf of Mexico.

This seminar will present recent advances in field observations and numerical modeling of wave attenuation by wetland vegetation. Two field data collection campaigns during Tropical Storm Lee (2011) and Hurricane Issac (2012) will be described and the data will be presented. Numerical modeling results ranging from vegetation-resolved large eddy simulations under idealized conditions to incorporating vegetation-induced drag forces into conservation laws of momentum and energy for engineering applications will be shown. Effects of vegetation flexibility on wave attenuation will be discussed.

About the speaker:

Dr. Qin Jim Chen is CSRS Distinguished Professor in Coastal Engineering and Professor of Civil and Environmental Engineering at Louisiana State University (LSU). Before joining LSU in 2006, Dr. Chen had been on the civil engineering and marine science faculty in Alabama for five years. He conducted postdoctoral research at the University of Delaware's Center for Applied Coastal Research, and doctoral research at Old Dominion University and Danish Hydraulic Institute. Dr. Chen specializes in the development and application of numerical models for coastal hydrodynamics and deltaic processes. His research also includes field observations, and applications of remote sensing and high performance computing technologies. He has served as a focus area head in the Center for Computation and Technology and the coordinator of Water Resources and Coastal Engineering at LSU.