ZACH COBELL

Senior Computational Scientist

Zach is the lead developer of FloodID, a user-friendly flood forecasting system that provides information to decision makers in as far in advance as feasible with available meteorological forecast data. FloodID is being jointly developed by meteorologists, coastal hydrologists, and inland watershed hydrologists to forecast coastal and compound flooding for pre-, during, and post-storm conditions.

Since 2010, Zach has helped lead numerical modeling studies throughout the United States, including the storm surge and wave analysis for both the 2012, 2017, and 2023 Louisiana Coastal Master Plans. He has also worked extensively on optimization of numerical models in high performance computing environments and serves as the maintainer of the ADvanced CIRCulation Model (ADCIRC). ADCIRC is a system of computer programs for solving time depending, free surface circulation and transport problems in two and three dimensions. Typical ADCIRC applications have included prediction of storm surge and flooding and modeling tides and wind driven circulation.

COMPANY ROLE

Senior Computational Scientist

PROJECT ROLE / FOCUS AREAS

Computational fluid dynamics

Hurricane storm surge and waves

High performance computing applications

Numerical model development

EDUCATION

BS, Civil Engineering, Environmental Engineering, University of Notre Dame, 2010

PROFESSIONAL EXPERIENCE

2019-Present: Research Engineer, The Water Institute
2012-Present: Model Developer and Maintainer, ADCIRC Model Development Group
2010-2019: Surface Water Hydrologist, Arcadis U.S., Inc.

SELECTED PROJECTS

Louisiana 2012, 2017, and 2023 Coastal Master Plan: Storm Surge and Wave Analysis, Baton Rouge, Louisiana (2011, 2017, 2023). Louisiana Coastal Protection and Restoration Authority. Served as modeling lead for storm surge and wave simulations. Developed new statewide ADCIRC+SWAN model mesh maximizing efficiency and accuracy. Implemented proposed coastal protection and restoration features in the landscape. Conducted over 17,000 total hurricane simulations with varying sea level rise, landscape scenarios, and restoration and protection project implementations.

NYC Special Initiative for Rebuilding and Resiliency, New York, New York *(2012-2013).* New York City Economic Development Corporation. Led hydrodynamic modeling efforts to perform rapid hindcast of Hurricane Sandy. Developed high resolution model based upon the FEMA work recently completed. In a compressed schedule, use FEMA synthetic storms to evaluate proposed restoration and protection projects using multiple future sea level rise projections with varying hurricane strengths. Analyzed model results to help refine project characteristics. Received highest award from New York Chapter of the American Society of Landscape Architects which recognizes work done through a collaboration of landscape architects with allied professionals in a spirit of mutual expansion beyond traditional roles. Received Innovation Excellence Award from Hyperion Research which recognizes outstanding scientific, engineering and business computing achievements enabled by high performance computing.

Florida Protection Level of Service Hurricane Simulations, West Palm Beach, Florida (2017-2019). SFWMD. Used ADCIRC, SWAN, and D-Flow Flexible Mesh to simulate storm surge near gates and pumps managed by South Florida Water Management District (SFWMD) within narrow canals in South Florida adjacent to Biscayne Bay. Validated model using Hurricane Andrew and Wilma. Used synthetic hurricanes with varying degrees of sea level rise understand operational impacts. Trained SFWMD staff to deploy the model as required.

Galveston Bay Hydrodynamics and Salinity Modeling, Houston, Texas. *(2017-2018). GCCPRD.* Developed D-Flow Flexible Mesh model geometry of Galveston Bay, Texas and surrounding areas. Simulated three years of hydrodynamics and salinity using discharge, evaporation, precipitation, astronomic tides, and atmospheric forcing. Evaluated impacts to water levels due to the construction of various gate designs at Bolivar Roads. Provided guidance to structural engineers to optimize position of structural elements to minimize environmental impacts.

Living Breakwaters Hydrodynamics and Sediment Transport Analysis, Staten Island, New York *(2016-2018*). NY Office of Resilient Homes and Communities. Developed a Delft3D model using multibeam LIDAR and validate hydrodynamic and wave quantities to deployed ADCP gages at project site. Supported 30, 60, and 95% phases of design for a proposed group of breakwaters near Staten Island, New York using the Delft3D modeling suit. Simulated impacts to retention time, sediment transport, wave parameters, and currents.

Support for Flood Mapping at Newark International Airport, Newark, New Jersey. *(2014-2015).* PANYNJ. Led hydrodynamic modeling efforts to develop a Delft3D model of Newark Airport and surrounding areas. Validated model performance on PANYNJ property. Used modeling to support revision of FEMA Flood Insurance Rate Maps (FIRMs).

Simulations of Dynamic Levee Breaching During Hurricane Katrina, New Orleans, Louisiana *(2012-2013).* US-DOJ. Developed new modules for the ADCIRC+SWAN model to allow simulation of wave overtopping volumes and dynamic levee breaching for simulation of Hurricane Katrina. Demonstrated that the new modules accurately reproduced water level elevation and time of food arrival throughout the Central Wetlands and Lower 9th Ward. Supported DOJ expert witness through deposition and trial.

West Shore of Lake Pontchartrain Hurricane Protection Project, New Orleans, Louisiana (2011-2013). USACE-MVN. Updated ADCIRC+STWAVE model geometries for use in study area. Implemented protection features and efficiently simulate hurricanes using Department of Defense Resources. Projected vegetation and sea level rise conditions for 20 and 50 years into the future.

SELECTED PUBLICATION AND CONFERENCES

1. J.H. Atkinson, H.J. Roberts, S. Zou, P. Bacopoulos, S. Mederos, J. Weishampel, and **Z. Cobell.** Deriving Frictional Parameters and Performing Historical Validation for an ADCIRC Storm Surge Model of the Florida Gulf Coast. Florida Watershed Journal, 4-2:23, 27, 2011
2. J. C. Dietrich, J. J. Westerink, A. B. Kennedy, J. M. Smith, R. E. Jensen, M. Zijlema, L. H. Holthuijsen, C. Dawson, R. A. Luettich, M. D. Powell, V. J. Cardone, A. T. Cox, G. W. Stone, H. Pourtaheri, M. E. Hope, S. Tanaka, L. G. Westerink, H. J. Westerink, and **Z. Cobell.** Hurricane Gustav (2008) Waves and Storm Surge: Hindcast, Synoptic Analysis, and Validation in Southern Louisiana. Monthly Weather Review, 139(8):2488, 2522, August 2011
3. **Z. Cobell**, H. Zhao, H.J. Roberts, F.R. Clark, and S. Zou. Surge and Wave Modeling for the Louisiana 2012 Coastal Master Plan. Journal of Coastal Research: Special Issue 67 - Louisiana's 2012 Coastal Master Plan Technical Analysis, pages 88, 108, 2013
4. **Z. Cobell.** Advancements in Hurricane Storm Surge Modeling Utilizing the ADCIRC Model. State of the Coast 2014. New Orleans, Louisiana, March 2014
5. **Z. Cobell.** Impacts to Surge and Waves due to the 2017 Louisiana Coastal Master Plan. State of the Coast 2018. New Orleans, Louisiana, May 2018
6. **Z. Cobell**. Modeling Storm Surge Suppression Impacts in Galveston Bay. American Shore and Beach Preservation Association: National Coastal Conference. Galveston, Texas, November 2018