COMPANY ROLE

Compound Flooding Research Specialist

EDUCATION

PhD Physical Oceanography, Virginia Institute of Marine Science, College of William and Mary, 2018

BS Marine Technology, Xiamen University, 2012

PROFESSIONAL MEMBERSHIP

American Geophysical Union (AGU)

ZHUO LIU, PHD

Compound Flooding Research Specialist

Zhuo Liu, Compound Flooding Research Specialist, has years of experience connecting research advancements to the development of products that can be used by communities for better climate adaptation and mitigation planning and preparation.

Prior to joining The Water Institute, Liu was data science manager and tech lead at One Concern, Inc. where he led the research, development, and implementation of a coupled physics modeling and machine learning compound flood prediction system that covered the entire country of Japan, supporting emergency managers in more than 100 cities.

Specializing in blending research into data science, and development into widely useable tools, Liu's work focuses on modeling and data analysis around compound flooding driven by storm surge, river flow, and rainfall. His experience includes researching, developing, and operationalizing end-to-end cloud-based compound flood (coastal and inland floods) forecasting pipelines and climate resilience data analytics workflows.

Liu received his bachelor's degree in marine technology from Xiamen University and his Ph.D. in physical oceanography from the Virginia Institute of Marine Science, College of William and Mary.

PROFESSIONAL EXPERIENCE

2023-Present: Compound Flooding Research Specialist, The Water Institute

2022-2023: Data Science Manager and Tech Lead, One Concern, Inc.

2021-2022: Staff Data Scientist, Tech Lead and Product Owner, One Concern, Inc.

2020: Senior Data Scientist, Tech Lead and Product Owner, One Concern, Inc.

2018-2020: Data Scientist, One Concern, Inc.

2018: Hydrodynamic Modeler Intern, Texas Water Development Board

2012-2018: Graduate Research Assistant, Virginia Institute of Marine Science, College of William and Mary

SELECTED PROJECTS

Louisiana Watershed Initiative (LWI). *The Water Institute. (2023-Present). Compound Flood Research Specialist.* Hydrological and hydraulic modeling on compound flood for tropical and non-tropical storms, joint probability methods and optimal sampling, uncertainty and bias quantifications.

Texas General Land Office (GLO) River Basin Flood Study. *The Water Institute. (2023-Present). Compound Flood Research Specialist.* Hydrological and hydraulic modeling of tropical and non-tropical storms, joint probability methods, uncertainty and bias quantification, and development of compound flood hazard maps.

An operational cloud-based compound flooding forecast system for the entire country of Japan. *One Concern, Inc. (2018-2023). Data Science Manager and Tech Lead.* An operational compound flood forecast system was developed and deployed to the entire country of Japan. The system consists of: (1) weather forecast data ingestors; (2) flood early warning alert calculation, (3) riverine streamflow prediction, (4) rainfall-runoff prediction, (5) coastal storm surge prediction, and (6) compound inundation prediction. A seamlessly coupled physics modeling and ML/DL data driven approach was applied. The system supported emergency managers in more than 100 cities during extreme flood events.

A 3-D Texas coastwide hydrodynamic model. *Texas Water Development Board. (2018). Hydrodynamic Modeler.* A first-ever 3-D coastal hydrodynamic model of entire Texas coastal regions was built to support long-term planning and short-term real-time forecasts.

Large-scale unstructured-grid storm surge and sub-grid high-resolution inundation models for coastal applications. *Virginia Institute of Marine Science. (2012-2018). Graduate Research Assistant.* A large-scale unstructured grid coastal storm surge model covering the entire U.S. East Coast was developed and validated during Hurricane Sandy (2012) and Hurricane Irene (2011). An iterative Newton-type non-linear solver was developed to accurately simulate street-scale coastal flooding.

SELECTED PUBLICATIONS

The full publication list can be found at Google Scholar: https://scholar.google.com/citations?user=nwHHLeEAAAAJ&hl=en

1. Wei Huang, Yinglong Joseph Zhang, **Zhuo Liu**, Hao-Cheng Yu, Yi Liu, Sam Lamont, Yu Zhang et al., 2023: "Simulation of compound flooding in Japan using a nationwide model." *Natural Hazards*: 1-21. Link
2. Wei Huang, Fei Ye, Y. Joseph Zhang, Kyeong Park, Jiabi Du, Saeed Moghimi, Edward Myers, Shachak Pe'eri, Jaime R. Calzada, H.C. Yu, Karinna Nunez, **Zhuo Liu**, 2021: "Compounding factors for extreme flooding around Galveston Bay during Hurricane Harvey". *Ocean Modeling*, 158. Link
3. Yinglong J. Zhang, Fei Ye, Haocheng Yu, Weiling Sun, Saeed Moghimi, Edward Myers, Karinna Nunez, Ruoyin Zhang, Harry Wang, Aron Roland, Jiabi Du, **Zhuo Liu**, 2020: "Simulating compound flooding events in a hurricane". *Ocean Dynamics*, 70, 621-640. Link
4. **Zhuo Liu**, Harry Wang, Y. Joseph Zhang, Linus Magnusson, J. Derek Loftis, David Forrest, 2019: "Cross-scale modeling of storm surge, tide, and inundation in Mid-Atlantic Bight and New York City during Hurricane Sandy, 2012". *Estuarine, Coastal and Shelf Science*, 233. Link
5. Fei Ye, Yinglong J. Zhang, Haocheng Yu, Weiling Sun, Saeed Moghimi, Edward Myers, Karinna Nunez, Ruoyin Zhang, Harry V. Wang, Aron Roland, Kevin Martins, Xavier Bertin, Jiabi Du, **Zhuo Liu**, 2019: "Simulating storm surge and compound flooding events with a creek-to-ocean model: Importance of baroclinic effects". *Ocean Modeling*, 145. Link
6. **Zhuo Liu**, Y. Joseph Zhang, Harry V. Wang, et al., 2018: Impact of small-scale structures on estuarine circulation. *Ocean Dynamic,* 68, 509. Link
7. **Zhuo Liu**, 2018: "Development of Large-Scale Unstructured Grid Storm Surge and Sub-Grid High-Resolution Inundation Models for Coastal Applications". *Dissertation, Theses, Masters Projects*. Link
8. Harry V. Wang, J. D. Loftis, **Zhuo Liu**, et al., 2014: The storm surge and sub-grid inundation modeling in New York City during Hurricane Sandy, *Journal of Marine Science and Engineering*, 2 (1), 226-246. Link