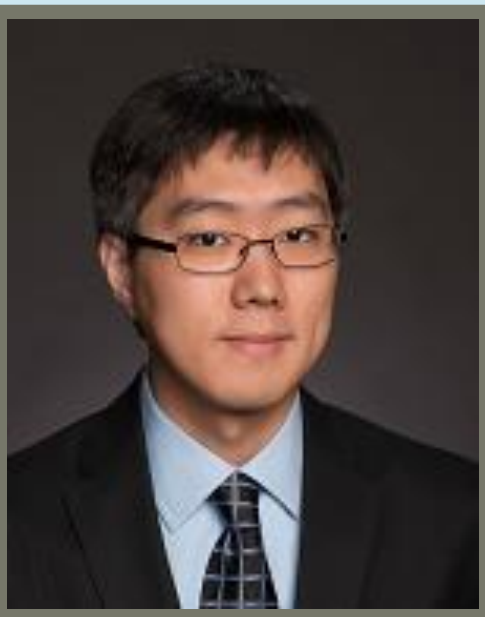
Yushi Wang, Ph.D.

THE WATER INSTITUTE OF THE GULF



Company Role
Research Scientist: Water Resources

Project Role / Focus Areas
- Environmental Hydraulics
- Computational Fluid Dynamics
- Multiphase Modeling
- Thermal Discharge Modeling
- Hydro Power Flows

Education
- Ph.D. – Civil and Environmental Engineering, University of Iowa, 2013
- M.S. – Civil and Environmental Engineering, University of Iowa, 2009
- B.S. – Environmental Sciences, Florida A&M University, 2007

Registration / Certification
- N/A

Professional Membership
- International Association for Hydro-Environment Engineering and Research

Experience Profile
Yushi Wang is a Research Scientist with The Water Institute of the Gulf's Natural Systems Modeling and Monitoring group. He has more than eight years of experience conducting hydraulic and water resources studies using numerical models. His areas of expertise include numerical simulation of hydrodynamic, water quality modeling, hydraulic design and environmental impact assessment.

Prior to joining the Institute, Dr. Wang worked as a Computational Fluid Dynamics (CFD) Specialist for the Stantec Consulting Ltd., where he focused on developing numerical models to resolve a broad range of industrial and environmental flow-related problems. During his graduate studies, Dr. Wang has been involved in several research projects to assist in the design of hydraulic structures to minimize environmental impacts and optimize operational effectiveness using CFD models.

Dr. Wang received his Ph.D. in civil and environmental engineering from the University of Iowa.

Professional Experience
The Water Institute of the Gulf 2015-Present
- *Research Scientist*

Stantec Consulting Ltd. 2013-2015
- *Computational Fluid Dynamics (CFD) Specialist*

University of Iowa: IIHR-Hydroscience & Engineering
- *Research Assistant* 2007-2013

Florida A&M University: The Environmental Science Institute
- *Research Assistant* *2005-2007*

Selected Projects
Finding the Right Flow, Lake Maurepas Basin, Louisiana (2016-2017). Using the Integrated Compartment Model developed by the Institute and partners for use in the 2017 Coastal Master Plan, Institute researchers used the model in a new way to determine how changes – either more water or less water – to the flow of the river would impact the estuary at Lake Maurepas.

This modeling looked at not only current conditions at the mouth of the Amite River in Lake Maurepas, but also provided a glimpse into 50-year future scenarios incorporating potential changes such as sea level rise, subsidence, the operation of future river diversions as well as construction of restoration and protection projects included in Louisiana's 2017 Coastal Master Plan.

Through funding from the Charles Lamar Family Foundation, this project provided an integrated look at how the future of the Amite River could be impacted over time.

Selected Projects (cont.)

Development and Application of a Hydrological Model in the Anahuac National Wildlife Refuge, Anahuac National Wildlife Refuge, Texas (2016-2017).

Using the Integrated Compartment Model, the Institute set out to test three different potential freshwater additions to certain marsh tracks on the wildlife refuge. This Integrated Compartment Model can account for a number of different components from plant impacts to daily water surface elevations and allows each part to communicate in order to form a more complete picture. In this case, the objective of the study was to determine how certain marsh areas would react over time depending on several scenarios that varied in water volume, where this additional water was added, and how long additional water was added. The modeling also looked at differing impacts if all of the water was added to the Jackson Ditch Tract or if it was split between this tract and the East Bay Bayou Tract.

In the second phase of the project, funded by the National Wildlife Federation, additional information was gathered to refine the model and added a vegetation modeling component based on current field surveys.

The modeling results indicated that delivering more freshwater to both the Jackson Ditch and the East Bay Bayou tracts over a shorter period of time resulted in larger reductions in salinity than a single flow to just the Jackson Ditch portion of the refuge, at least while the freshwater is flowing. In all the scenarios, the modeling indicated that adding freshwater to the system resulted in salinity reductions across the entire area, although to varying degrees.

In the second phase of the project, modeling results indicated that how long the fresh water flowed into the refuge was the most important factor in minimizing drought impacts on wetland vegetation. This allows managers to better plan how much additional fresh water needs to be secured and when that fresh water can be best utilized.

Calcasieu Ship Salinity Control Project, Calcasieu Ship Channel, Louisiana (2014-present). The Institute collected data on salinity and other water quality parameters, and did screening-level modeling to evaluate a wide array of salinity control alternatives developed by the Louisiana Coastal Protection and Restoration Authority. After narrowing down the alternative solutions, the Institute's role was expanded to perform detailed modeling as part of the engineering, design, and permitting phase of the project. Specifically, the Institute developed and applied a suite of models (MIKE Flood, Delft3D, and the Integrated Compartment Model) to help evaluate the remaining salinity control alternatives.

In the design and engineering phase, the Institute undertook an additional phase of data collection and modeling to get a better picture of the pathways of sediment movement through the system, and to develop a sediment budget in order to get a better understanding of how the proposed project might impact dredging operations in the channel. Another aspect of the data collection and modeling will be used to evaluate water drainage and channel navigability throughout a large storm event.

Data collection in support of the design and engineering phase modeling includes lower ship channel bathymetry, Calcasieu Lake sediment cores (to investigate geotechnical properties and sedimentation rates), as well as boat-based and fixed station hydrological measurements (salinity, temperature, and water level), cross-sectional channel flow, and turbidity for estimation of suspended sediment transport.

Selected Publications

1. Yuill, B., **Wang, Y.**, Meselhe, E., Allison, M. 2020. Sand settling through bedform-generated turbulence in rivers. Earth Surf. Process. Landforms, 45, 3231–3249. https://doi.org/10.1002/esp.4962
2. Reed, D., **Wang, Y.**, Meselhe, E., White, E. 2019. Modeling wetland transitions and loss in coastal Louisiana under scenarios of future relative sea-level rise. Geomorphology 352. https://doi.org/10.1016/j.geomorph.2019.106991
3. **Wang, Y.**, Politano, M., and Weber, L. 2018. Spillway jet regime and total dissolved gas prediction with a multiphase flow model. Journal of Hydraulic Research, 57(1): 26-38. https://doi.org/10.1080/00221686.2018.1428231
4. **Wang, Y**., Politano, M., Laughery, R., & Weber, L. 2015. Model development in OpenFOAM to predict spillway jet regimes. Journal of Applied Water Engineering and Research, 3(2):80-94. DOI: 10.1080/23249676.2015.1025442
5. **Wang, Y**., Politano, M., and Laughery, R. 2013. Towards Full Predictions of Temperature Dynamics in McNary Dam Forebay Using OpenFOAM. Water Science and Engineering, 6(3): 317-330.

Selected Conference Proceedings and Presentations

1. Meselhe, E., White, E., Reed, D., Grace, A., **Wang, Y.,** Green, M., Freeman, A., Habib, E., Lindquist, D., Pahl, J., Yuill, B. 2016. Introduction to the 2017 Coastal Master Plan Future Scenarios. In Proceedings of the State of the Coast Conference 2016. New Orleans, Louisiana, USA.
2. Freeman, A., Grace, A., Green, M., Lindquist, D., Meselhe, E., Reed, D., **Wang, Y.,** White, E. 2015. Coastal Ecosystem Integrated Compartment Model (ICM): Modeling Framework. In Proceedings of the AGU 2015. San Francisco, California, USA.
3. Politano, M., **Wang, Y**., Laughery, R., and Weber, L. 2015. A Numerical Model for Spillway Jet Regimes and Total Dissolved Gas. In Proceedings of the HydroVision International Conference 2015. Portland, Oregon, USA. (Best Technical Paper)