MARTIJN BREGMAN, MS
RESEARCH SCIENTIST:
NUMERICAL HYDRAULICS

ORGANIZATION ROLE

Research Scientist: Numerical Hydraulics

PROJECT ROLE / FOCUS AREAS

Numerical modeling

Coastal, deltaic, and riverine systems

Sediment management

Flood risk and impacts

EDUCATION

MS, Civil Engineering (Hydraulic Engineering track), Delft University of Technology, 2018

BS, Civil Engineering, Delft University of Technology, 2014

TRAINING

XBeach Course (Deltares, 2024)
SFINCS Course (Deltares, 2023)
A/E/C Project Management Bootcamp (PSMJ, 2022)
Delft3D FM - Coastal Morphodynamic Modeling Course (Deltares, 2019)

Martijn Bregman has over seven years of experience in numerical modeling of hydrodynamics, sediment transport, and morphology in coastal, deltaic, and riverine systems. He has contributed to a wide range of studies evaluating coastal protection and restoration projects, ecosystem impacts, and resilience initiatives. His research spans landscape evolution, sediment management, vegetation-hydrodynamic interactions, broader environmental dynamics, and flood risk assessment. Bregman has developed and automated cross-disciplinary, probabilistic modeling frameworks that run large ensembles of simulations in high-performance computing environments. He is a subject matter expert in the Delft3D 4 (structured grid), Delft3D FM (unstructured grid), and SFINCS modeling suites. He is also proficient in additional modeling tools such as HEC-RAS.

PROFESSIONAL EXPERIENCE

2021–Present: Research Scientist, The Water Institute

2018–2020: Research Associate, The Water Institute

2017–2018: Graduate Research Intern, Deltares (The Netherlands)

2017: Graduate Intern, Rijkswaterstaat (The Netherlands)

SELECTED PROJECTS

Louisiana Sediment Management Plan (Barataria Bay). *Coastal Protection and Restoration Authority. (2021–2023).* Conducted a numerical modeling study under the Borrow Area Management and Monitoring (BAMM) program to assess the impact of in-bay sediment mining in Barataria Bay, Louisiana. Developed a Delft3D FM model to simulate hydrodynamics, sediment transport, and morphology. Analyzed model results to investigate the effect of borrow pits on tidal prism, sediment capture efficiency, and the influence of pit orientation on local and regional sediment dynamics.

Louisiana Sediment Management Plan (Lowermost Mississippi River). *Coastal Protection and Restoration Authority. (2021–2023).* Numerical modeling study assessing infilling rates and downstream impacts of borrow pits in lateral bars of the Lowermost Mississippi River. Improved and extended two Delft3D 4 hydro-morphodynamic models to better understand infilling processes. The study also explored borrow pits' effects on regional river management, including diversion operations and navigation channel dredging.

A Citywide Probabilistic Compound Flood Model & Real-Time Forecasting System. *City of Jacksonville, Florida (2024-Present).* The Water Institute and partners support development of Jacksonville's first resilience strategy. Led the development, testing, and analysis of a SFINCS model for Jacksonville to improve understanding of compound flooding, perform a series of sensitivity tests, and inform and support the development of a more detailed 2D HEC-RAS model.

Bayou Greenbelt Feasibility: Hydraulic and Salinity Modeling to Evaluate the Bayou Greenbelt Greenway. *National Park Service. (2023-2024).* Led the development of a three-dimensional Delft3D model to evaluate salinity impacts due to Bayou Greenbelt, a proposed connection of waterways in Lake Charles, Louisiana. Supported and co-developed a 2D HEC-RAS model to assess changes in rainfall-induced flooding.

2023 Coastal Master Plan—Integrated Compartment Model, Hydro Modeling (Louisiana). *Coastal Protection and Restoration Authority. (2019–2023).* The Integrated Compartment Model (ICM) is used to predict future landscape changes and evaluate projects that are part of the Coastal Masterplan. I supported model setup and QA/QC, analyzed and documented model results, and assessed project impacts.

Mid-Breton Sediment Diversion—Environmental Impact Statement (EIS) support and evaluation of diversion operation. *Coastal Protection and Restoration Authority. (2019–2023).* Large numerical modeling project (~1 million CPU hours) to assess the Mid-Breton Sediment Diversion's impacts in southeast Louisiana on geomorphology, salinity, flooding, and water quality in the receiving area as well as the Mississippi River. Improved the model and implemented an automated production system for simulations in a high-performance computing environment, minimizing human intervention. Led analyses on hydraulic conveyance in the Mid-Breton receiving area and assessed the impacts of the diversion on navigation and dredging in the Mississippi River.

Partnership for Our Working Coast. *(2020–2022).* A public-private partnership between The Water Institute, energy industry partners (Chevron, Shell, and Danos), and the Greater Lafourche Port Commission (GLPC) aimed to maximize coastal restoration benefits from sediment generated by a large-scale dredging project to deepen the Port's entrance channel. Led the development, setup, coupling, and automation of the Delft3D FM hydrodynamic and morphology models, which formed the core of the framework for assessing various marsh creation projects.

Hurricane Sedimentation on Salt Marshes: Extent, Provenance, and Processes. *National Science Foundation (NSF) (2022–Present).* Collaborative study with external partners (Boston University, Virginia Institute of Marine Science) to understand delivery of mineral to salt marshes. Led development of a Delft3D FM model to simulate hydrodynamics (currents and waves), sediment transport, and morphology in the area around Sapelo Island in Georgia under regular and hurricane conditions.

SELECTED PUBLICATIONS

1. Baustian, M.M., Jung, H., Liu, B., Moss, L.C., Foster-Martinez, M., Esposito, C.R., Georgiou, I.Y., Bregman, M., Di Leonardo, D.R., McMann, B., Hemmerling, S.A. and Miner, M.D. (2024), Current and future potential net greenhouse gas sinks of existing, converted, and restored marsh and mangrove forest habitats. Restoration Ecology, 32: e14259.
2. Georgiou, I. Y., Messina, F., Sakib, M. M., Zou, S., Foster-Martinez, M., Bregman, M., Hein, C. J., Fenster, M. S., Shawler, J. L., McPherran, K., & Trembanis, A. C. (2023). Hydrodynamics and sediment-transport pathways along a mixed-energy spit-inlet system: A modeling study at Chincoteague Inlet (Virginia, USA). Journal of Marine Science and Engineering, 11(5), 1075.
3. Hemmerling, S. A., DeMyers, C., Parfait, J., Piñero, E., Baustian, M. M., Bregman, M., Di Leonardo, D., Esposito, C., Georgiou, I. Y., Grismore, A., Jung, H., McMann, B., & Miner, M. D. (2023). A community-informed transdisciplinary approach to coastal restoration planning: maximizing the social and ecological co-benefits of wetland creation in Port Fourchon, Louisiana, USA. Frontiers in Environmental Science, 11.