Martijn C. Bregman, MS
Research Scientist: Numerical Hydraulics
The Water Institute
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EDUCATION

Delft University of Technology	Delft, The Netherlands	Civil Engineering (Hydraulic Engineering Track)	MS, 2018
Delft University of Technology	Delft, The Netherlands	Civil Engineering	BS, 2014

RESEARCH INTERESTS

Coastal and riverine systems, sediment management, flood risk and impacts, numerical modeling

PROFESSIONAL EXPERIENCE

The Water Institute	Research Scientist	2021–Present
	Research Associate	2018–2021
Deltares (The Netherlands)	Graduate Intern	2017–2018
Rijkswaterstaat (The Netherlands)	Intern	2017
eThekwini Metropolitan Municipality (Greater Durban area, South Africa)	Graduate Research Project	2016

TECHNICAL PROFICIENCIES

- Numerical Modeling
  - Delft3D 4 (advanced knowledge)
  - Delft3D FM (advanced knowledge)
  - SFINCS (advanced knowledge)
  - HEC-RAS
  - HEC-HMS
  - PCSWMM
  - Flow3D
- GIS
  - ArcMap
  - ArcGIS Pro (advanced knowledge)
- Programming, Scripting & Computing
  - MATLAB (advanced knowledge)
  - Python (advanced knowledge)
  - Bash/Shell scripting
  - HPC computing

TRAINING COURSES

- XBeach Course (Deltares, 2024)
- SFINCS Course (Deltares, 2023)
- A/E/C Project Management Bootcamp (PSMJ, 2022)
- Flow-3D Hydro CFD Workshop (Flow Science, Inc., 2022)
- HEC-RAS and HEC-HMS Training (Water Institute, 2022)
- Delft3D FM Coastal Morphodynamic Modeling Course (Deltares, 2019)

NOTABLE PROJECTS

The Water Institute of the Gulf (Research Scientist [2021-present], Research Associate [2018-2021]).
Selected Projects and Clients:

- **Louisiana Coastal Protection and Restoration Authority (CPRA)**
  - **Louisiana FloodID Flood Forecast System** (2023): Program to develop a flood forecasting system for the State of Louisiana. Led the development of an SFINCS model to assess and compare its performance in compound flooding against the HEC-RAS model, which is intended to be part of the forecasting system.
  - **Mid-Breton Sediment Diversion - Environmental Impact Statement (EIS) support and evaluation of diversion operation** (2019-present): Large numerical modeling project (~1 million CPU hours) to assess impacts of the planned Mid-Breton Sediment Diversion in southeast Louisiana on geomorphology, salinity, flooding, and water quality in the receiving area as well as the Mississippi River. Made improvements to the model and implemented an automated production system to perform the simulations in a high-performance computing environment with minimized need for human action or intervention. Led several analyses, including an assessment of hydraulic conveyance in the Mid-Breton receiving area, and a study into diversion-related impacts on navigation and dredging in the Mississippi River.
  - **Louisiana Sediment Management Plan** (2021-2023):
    - Numerical modeling study as part of the Borrow Area Management and Monitoring (BAMM) program to assess the effect of in-bay sediment mining in Barataria Bay, Louisiana. Developed a Delft3D FM model that simulates hydrodynamics (currents and waves), sediment transport, and morphology. Analyzed and interpreted model results to investigate the impact of borrow pits on the tidal prism, the capability of borrow pits to capture sediment that would otherwise be lost from the system, and the influence of pit orientation on local and regional sediment dynamics. The findings are presented in a paper written for the 2023 Coastal Sediments Conference.
    - Numerical modeling study to assess 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 processes that govern borrow pit infilling. This study also investigated the impact of borrow pits on regional river management (e.g. diversion operation, dredging of the navigation channel).
  - **2023 Coastal Masterplan: Integrated Compartment Model - Hydro Modeling** (2019-2023): The Integrated Compartment Model (ICM) is used to predict future landscape changes and evaluate projects that are part of the Coastal Masterplan. Supported model set-up and QAQC; analyzed and documented model results and project impacts.
  - **Lake Borgne Gulf Sturgeon Monitoring and Habitat Characterization** (2021-2022): Collaborative study with external partners (Louisiana State University, U.S. Fish and Wildlife Service) to monitor Gulf Sturgeon movement and characterize habitat preferences. Improved, calibrated, and ran a Delft3D FM model to perform hindcast simulations of hydrodynamics

(including waves, salinity and temperature) of the Lake Borgne area and surrounding water bodies.

- **Mid-Barataria Sediment Diversion - Environmental Impact Statement (EIS) support and evaluation of diversion operation** (2018-2022): Large numerical modeling project (>1 million CPU hours) to assess impacts of the planned Mid-Barataria Sediment Diversion in southeast Louisiana on geomorphology, salinity, flooding, and water quality in the receiving area as well as the Mississippi River. Supported the modeling activities by automating several parts of the modeling framework, including QAQC and post-processing. Performed numerous assessments of diversion impacts, including a study into impacts on water levels near several communities in the Barataria Basin.

- **City of Jacksonville, Florida**
  - **A Citywide Probabilistic Compound Flood Model & Real-Time Forecasting System** (2024, ongoing): Project where 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.
- **National Fish and Wildlife Federation (NFWF)**
  - **Partnership for Our Working Coast** (2020-2022): Public-private partnership between The Water Institute and energy industry partners (Chevron, Shell, and Danos) along with the Greater Lafourche Port Commission (GLPC). The partnership took a science-based approach to find ways to maximize coastal restoration benefits from sediment that will be generated by a large-scale dredging project to deepen the Port's entrance channel. Led development of the Delft3D FM hydrodynamic and morphology models that formed the backbone of the modeling framework used to assess different marsh creation projects. Led the effort to set up, couple, and automate the modeling framework and coordinated with developers of other model subcomponents.
- **National Science Foundation (NSF)**
  - **Hurricane Sedimentation on Salt Marshes: Extent, Provenance, and Processes (2022, ongoing):** 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.
- **Virginia Institute of Marine Science (VIMS)**
  - **Chincoteague Island Modeling Study (2021-2022):** Modeling study to assess sediment transport patterns and morphology changes at the Assateague and Chincoteague Islands in Virginia. Provided guidance on development of the Delft3D 4 model and reviewed the model's set-up and results.
- **National Park Service**
  - **Bayou Greenbelt Feasibility: Hydraulic and Salinity Modeling to Evaluate the Bayou Greenbelt Greenway (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.

Deltares, The Netherlands (Graduate Intern [2017-2018])

- Master's thesis – "A new modelling method for representing the effect of spiral flow on the bed shear stress": Exploratory research to develop a new parameterization method for spiral flow in river bends, carried out using the Delft3D modeling suite. Investigated the shortcomings of three-dimensional and depth-averaged models in representing spiral flow and developed a new method to calculate the bed shear stress direction in rivers.

Rijkswaterstaat, The Netherlands (Executive Agency of the Dutch Ministry of Infrastructure and Water Management) (Intern [2017])

- Interned within an international collaboration program of several countries along the North Sea in Europe that aim to exchange coastal maintenance knowledge and experiences. Investigated coastal surveying and maintenance practices of each of the member countries. Developed a method for standardization of data analysis to enhance cross-border data-based coastal research.

eThekwini Metropolitan Municipality, Durban, South Africa (Graduate Research Project [2016])

- Research project at the municipality's Engineering Unit to assess flooding resilience of the low-lying central business district of Durban. Main responsibility entailed stormwater modeling with SWMM software (PCSWMM).

PUBLISHED WORKS

Peer-Reviewed Publications

Baustian, M.M., Jung, H., Liu, B., Moss, L.C., Foster-Martinez, M., Esposito, C.R., Georgiou, I.Y., Bregman, M.C., 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. Restor Ecol, 32: e14259. https://doi.org/10.1111/rec.14259

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.

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.

Technical Reports

Georgiou, I.Y., Bregman, M., Hemmerling, S.A., Partida, L., Pittman, G., Saharia, A., Wang, Y., (2024). Bayou Greenbelt Feasibility Study: Hydraulic and Salinity Modeling to Evaluate the Bayou Greenbelt Greenway. The Water Institute. Prepared for the National Park Service and funded by the Federal Emergency Management Agency. Baton Rouge, LA.

Bregman, M. C., Georgiou, I. Y., Miner, M., Khalil, S., Swartz, J. M., Raynie, R. (2023). *Assessing the Impact of In-Bay Borrow Pits on Estuarine Sediment Dynamics, Barataria Bay, Louisiana*. Prepared by The Water Institute for the Coastal Protection and Restoration Authority. Baton Rouge, LA.

Bregman, M., Hanegan, K., LeBlanc Hatfield, M., Lindquist, D., Foster-Martinez, M., Patton, B., Reed, D. J., Visser, J., Wang, Y., Zhanxian, W., & White, E. D. (2023). *2023 Coastal Master Plan: Attachment C4: Extended Project Narratives – ICM. Version 4.* (p. 302). Baton Rouge, Louisiana: Coastal Protection and Restoration Authority.

White, E. D., Bregman, M., Dalyander, S., Foster-Martinez, M. R., Georgiou, I., Hanegan, K., Lindquist, D., Miner, M., Reed, D. J., Visser, J. M., Wang, & Y., & Wang, Z. (2023). *2023 Coastal Master Plan: Attachment C2: 50-Year FWOA Model Output, Regional Summaries - ICM. Version 3.* (p. 194). Baton Rouge, Louisiana: Coastal Protection and Restoration Authority.

Georgiou, I. Y., Bregman, M., Messina, F., Di Leonardo, D., Wang, Y., Zou, S., Khalil, S., Raynie, R., Swartz, J., & Miner, M. (2023). *Sediment infilling rate of Lowermost Mississippi River borrow pits and impacts on downstream dredging*. Baton Rouge, LA: The Water Institute of the Gulf, Prepared for the Coastal Protection and Restoration Authority (CPRA) under Task Order 72.2.

Bregman, M., Messina, F., Miner, M., Georgiou, I. Y., & Wilson, C. S. (2023). *Inter-model comparisons between physical and numerical models: Comparisons of future projections between the numerical Basin Wide Model Version 4 and the Lower Mississippi River Physical Model* (No. P-00407-01). Baton Rouge, LA: Prepared for the Louisiana Coastal Protection and Restoration Authority by The Water Institute and Louisiana State University under Task Order 69.

Bregman, M., Jung, H., Liu, B., Baustian, M. M., Messina, F., & Georgiou, I. Y. (2022). *Basin Wide Model Version 4 Sensitivity Analysis* [Technical Memorandum]. The Water Institute. Produced for the Louisiana Coastal Protection and Restoration Authority under Task Order 77.

Messina, F., Bregman, M., Zou, S., Georgiou, I. Y., Dalyander, S., & Miner, M. (2022). *Lake Borgne Gulf Sturgeon monitoring and habitat characterization*. The Water Institute of the Gulf. Produced for and funded by Coastal Protection and Restoration Authority under Task Order 81.

Messina, F., Georgiou, I. Y., Bregman, M., Holm, G. O., & Marino, R. (2021). *Analysis of existing and predicted coastal water surface elevation trends in Breton Sound Basin: In support of the Mid-Breton Sediment Diversion Environmental Impact Statement*. The Water Institute. Prepared for and Funded by the Coastal Protection and Restoration Authority under Task Order 77.

Messina, F., Georgiou, I. Y., Bregman, M., Jung, H., Yuill, B. T., Liu, B., Cobell, Z., & Baustian, M. M. (2021). *Mid-Breton Sediment Diversion Engineering Modeling Support: Production Runs with the Basin Wide model Version 4* [Revised March 2022]. The Water Institute. Funded by the Coastal Protection and Restoration Authority under Task Order 77.

Georgiou, I. Y., Messina, F., Bregman, M., Jung, H., & Liu, B. (2021). *Approach to limit crevassing in the Basin Wide model Mid-Breton Production Runs using existing and additional simulations*. Baton Rouge, LA: The Water Institute of the Gulf.

Messina, F., Georgiou, I. Y., Bregman, M., Holm, G. O., & Marino, R. (2021). *Analysis of existing and predicted coastal water surface elevation trends in Breton Sound Basin: In support of the Mid-Breton Sediment Diversion Environmental Impact Statement*. Baton Rouge, LA.: The Water Institute of the Gulf. Prepared for and Funded by the Coastal Protection and Restoration Authority under Task Order 77.

Bregman, M., Messina, F., Jung, H., Yuill, B. T., Baustian, M. M., & Georgiou, I. Y. (2020). *Basin Wide Model Version 4: Basin Wide Model for Mid-Breton Sediment Diversion Modeling* (Task Order 51.3. Final Report). Baton Rouge, LA: The Water Institute of the Gulf. Funded by the Coastal Protection and Restoration Authority.

Bregman, M., Messina, F., Yuill, B., & Jung, H. (2019). *QA/QC Procedures for Mid-Barataria Sediment Diversion Alternatives Modeling* [Technical Memorandum under Task Orders 48 and 51]. The Water Institute, produced for the Coastal Protection and Restoration Authority.

Messina, F., Bregman, M., Jung, H., Yuill, B., & Roberts, H. (2019). *Mid-Barataria Sediment Diversion Engineering Modeling Support: Production Runs with the Basin Wide model Version 3* (Technical Memorandum). Baton Rouge, LA: The Water Institute of the Gulf. Prepared for and funded by the Coastal Protection and Restoration Authority.

Conference Proceedings and Presentations

Bregman, M. C., Swartz, J. M., Khalil, S., Raynie, R., Haywood, E., Miner, M. D., & Georgiou, I. Y. (2023). Local and Regional Effects of Sediment Mining Within a Deteriorating Estuary: Barataria Bay, Louisiana. In Coastal Sediments 2023 (pp. 2763–2776). WORLD SCIENTIFIC.

Sakib, M., Messina, F., Zou, S., Bregman, M., Georgiou, I. Y., Hein, C. J., & Fenster, M. S. (2023). Spit elongation and re-orientation controls downdrift sediment fluxes and inlet morphology. In The proceedings of the coastal sediments 2023 (Vols. 1-5, Vol. 1, pp. 90–102). World Scientific.

Graduate reports

Bregman, M. (2018). A new modelling method for representing the effect of spiral flow on the bed shear stress. (MSc thesis)

Aelfers, S. G. L., **Bregman**, M. C., Gulden, F. J. H., Hoek, J., & Maan, C. A. (2016). Flood Safety Durban (Graduate Research Project)