MITHUN DEB

Offshore Wind and Ocean Dynamics
Marine and Coastal Research Laboratory
Pacific Northwest National Laboratory
(571) 265-9815, mithun.deb@pnnl.gov

OVERVIEW

I am passionate about estuarine hydro-environmental problems and natural hazards and am motivated to contribute to the field of coastal engineering. My areas of expertise are mainly numerical modeling of hydrodynamics and waves and field works that can help to mitigate coastal vulnerability and environmental and economic loss.

Research Interests: Coastal Engineering, numerical modeling, marine renewable energy, estuarine hydrodynamics, wetlands, hurricane surge and waves, flood risk management, remote sensing & GIS.

EDUCATION

Ph.D. in Civil Engineering   2015-2020
University of Delaware, Newark, DE 19716, USA
    Advisor: Dr. James T. Kirby

M.Sc in Civil and Infrastructure Engineering   2013-2015
George Mason University, Fairfax, VA 22030, USA
    Advisor: Dr. Celso Ferreira

B.Sc in Civil and Environmental Engineering   2007-2011
Shahjalal University of Science and Technology, Sylhet, Bangladesh

PROFESSIONAL EXPERIENCE

Earth Scientist (S&E II)   2022-Present
Offshore Wind and Ocean Dynamics, CSD/MCRL, Pacific Northwest National Laboratory

Postdoctoral Research Associate   2020-2022
Offshore Wind and Ocean Dynamics, CSD/MCRL, Pacific Northwest National Laboratory

 Ongoing Projects:

□ Integrated Coastal Modeling (ICoM): Developing an integrated terrestrial-coastal modeling system (DHSVM-FVCOM-RIFT)
Team: Zhaoqing Yang, Mithun Deb, Taiping Wang, Ning Sun, Karthik Balaguru, Wenwei Xu, David Judi (ICoM team website), *Sponsor: Office of Science, U.S. Department of Energy*

□ Tidal Energy Resource Refinement: Theoretical and numerical analysis
Team: Zhaoqing Yang, Mithun Deb, Taiping Wang; Georgia Tech - Kevin Haas, Matthew Falcone, *Sponsor: Water Power Technologies Office, U.S. Department of Energy*

☐ Tidal Turbulence Modeling: Regional scale RANS model development, validation and application for tidal energy resource assessment
Team: Zhaoqing Yang, Mithun Deb, Taiping Wang; NREL - Levi Kilcher, *Sponsor: Water Power Technologies Office, U.S. Department of Energy*

Graduate Research Assistant
2015-2020
Center for Applied Coastal Research, University of Delaware

☐ Field and modeling studies of salt marshes for providing possible remedial steps to restore a healthier marsh environment in the Delaware Bay. Developed a comprehensive, 3D model system for a rapidly eroding salt marsh system, and measured data sets for the model verification.

☐ Proposed and implemented a new set of 2D shallow water equations to improve the present-day limitations in numerical modeling of salt marsh flooding and draining.

☐ Field works include extensive bathymetric surveying in channels, current velocity measurements using NORTEK ADCPs deployed in several major channels, HOBO tide gauges on marsh platform, and deployment of rapid-sampling RBR pressure gauges in tidal flats.

Graduate Research Assistant
2013-2015
Mason Flood Hazards Research Lab, George Mason University

☐ Storm surge and wave modeling in the coastal regions of Bangladesh. Research findings have highlighted the importance of the coupled wave and hydrodynamic modeling to calculate storm surges in a region with poor observational coverage.

☐ Storm surge modeling and hazard analysis in Chesapeake Bay, Virginia using ADCIRC coastal circulation model. Results demonstrated the efficacy of wetlands in storm surge attenuation and also supported planning of wetlands restoration projects that has multi-objective benefits for the society.

☐ River planform channel dynamics and bank migration hazard assessment using historical Landsat imagery's of different periods and hydrologic data.

Lecturer
2012-2013
Civil Engineering, Stamford University Bangladesh

☐ Instructed beginner level under-graduate courses on Environmental and Water Resources Engineering.

AWARDS & FELLOWSHIPS

Graduate Research Award, University of Delaware
2020
The Civil Engineering Graduate Research award recognizes excellence in research conducted by a graduate student enrolled in a Master's or PhD degree program in any discipline of Civil Engineering.

Professional Development Award, University of Delaware
2019
For participating in the 2020 Ocean Sciences Meeting

Professional Development Award, University of Delaware
2018
For participating in the 36TH International Conference on Coastal Engineering 2018

Microsoft Azure for Research
2015
"Gifting letter: Microsoft Research offers to make available one Microsoft Azure Platform 12-month account to George Mason University at no cost for research purposes. The estimated total market value of this offer is USD 20,000."

Distinguished Graduate Fellowship, George Mason University   2013

"Mr. Mithun Deb was named as the first recipient of the Balfour Beatty Distinguished Graduate Fellowship, made possible through a gift from the international construction and infrastructure services company, Balfour Beatty."

INVITED TALKS AND SEMINARS

1. Deb, M., Present-day limitations and challenges in numerical modeling of tidal hydrodynamics inside an eroding salt marsh system, Physical Sciences Seminar Series, Virginia Institute of Marine Science, College of William & Mary, VA, Feb 6, 2020

2. Deb, M., Numerical modeling of coastal, estuarine and urban hydrodynamic processes and associated hazards, Civil and Environmental Engineering seminar, Rowan University, Glassboro, NJ, Jan 30, 2020

3. Deb, M., Hydrodynamics in an eroding salt marsh environment: model validation and performance limitations, COFDL talk in Applied Ocean Physics & Engineering, The Woods Hole Oceanographic Institution, Woods Hole, MA, Nov 15, 2019

PEER-REVIEWED JOURNAL PAPERS [Google Scholar]

Number of citations: 164 (Google Scholar, 11/11/2022)

1. Deb, M., Kirby, J. T., Shi, F. and Abdolali, A., "A surface porosity approach for eliminating artificial ponding in coastal salt marsh simulations", *Coastal Engineering* **In Pres**, (2022).

2. Deb, M., Abdolali, A., Kirby, J. T. and Shi, F., "Hydrodynamic modeling of a complex salt marsh system: Importance of channel shoreline and bathymetric resolution", *Coastal Engineering* **173**, (2022).

3. Deb, M., Abdolali, A., Kirby, J. T., Shi, F. and Guiteras, S., "Sensitivity of tidal hydrodynamics to morphology changes in a multi-inlet rapidly eroding salt marsh system: A numerical study", *Earth Surface Processes and Landforms* **47(5)**, 1157– 1182 (2021).

4. Yang, Z., Wang, T., Branch, R., Xiao, Z. and Deb, M., "Tidal stream energy resource characterization in the Salish Sea", *Renewable Energy* **172**, 188-208 (2021).

5. Deb, M. and Ferreira, C. M., "Simulation of cyclone-induced storm surges in the low-lying delta of Bangladesh using coupled hydrodynamic and wave model (SWAN + ADCIRC)", *J Flood Risk Management* **11**, S750-S765 (2018).

6. Deb, M. and Ferreira, C. M., "Potential impacts of the Sunderban mangrove degradation on future coastal flooding in Bangladesh", *Journal of Hydro-environment Research* **17**, 30-46 (2017).

7. Deb, M. and Ferreira, C. M., "Planform channel dynamics and bank migration hazard assessment of a highly sinuous river in the north-eastern zone of Bangladesh", *Environmental Earth Sciences* **73**, 6613–6623 (2015).

8. Das, D., Deb, M. and Kar, K. K., "River Change Detection and Bankline Erosion Recognition using Remote Sensing and GIS", *Forum geografic* **XIII(1)**, 12-17 (2014).

9. Deb, M., Das, D. and Uddin, M., "Evaluation of Meandering Characteristics Using RS & GIS of Manu River", *Journal of Water Resource and Protection* **4(3)**, 163-171 (2012).

UNDER REVISION

1. Deb, M., Sun, N., Yang, Z., Wang, T., Judi, D. R., Xiao, Z. and Wigmosta, M. S. (2022) *Interacting effects of watershed and coastal processes on the evolution of compound flooding during Hurricane Irene*, Under review in Earth's Future (https://agupubs.onlinelibrary.wiley.com/journal/23284277)

TECHNICAL REPORTS

1. Deb, M., Kirby, J. T., Shi, F. and Abdolali, A. (2020) "Tidal hydrodynamics in a multi-inlet wetland system: Toward improved modeling of salt marsh flooding and draining", Research Report No. CACR-20-04, Center for Applied Coastal Research, Department of Civil and Environmental Engineering, University of Delaware. (online pdf link)

2. Kirby, J. T., Kukulka, T., Shi, F. and Deb, M. (2019) "A Hydrodynamic Modeling System for the Delaware Coast Environment: Final report to Delaware Department of Natural Resources and Environmental Control Shoreline and Waterway management Section", Research Report No. CACR-19-0X, Center for Applied Coastal Research, Department of Civil and Environmental Engineering, University of Delaware.

3. Deb, M., Abdolali, A., Kirby, J. T. and Shi, F. (2018) "Hydrodynamics, sediment transport and wind waves in an eroding salt marsh environment. Bombay Hook National Wildlife Refuge, Delaware", Research Report No. CACR-18-04, Center for Applied Coastal Research, Department of Civil and Environmental Engineering, University of Delaware.(online pdf link)

4. Deb, M., Abdolali, A., McDowell, C., Kirby, J. T., Sommerfield, C. and Shi, F. (2018) "Hydrodynamic, survey and sediment data collection. Bombay Hook National Wildlife Refuge, Delaware", Research Report No. CACR-18-03, Center for Applied Coastal Research, Department of Civil and Environmental Engineering, University of Delaware.(online pdf link)

CONFERENCE ABSTRACTS AND PRESENTATIONS

1. Deb, M., Sun, N., Yang, Z., Wang, T., Judi, D. R. and Wigmosta, M. S. (2022) "The role of interacting watershed-coastal processes in modulating compound flood in a convergent estuary", *AGU Fall Meeting 2022*, Chicago, IL, Dec 12 - 16

2. Sun, N., Wigmosta, M. S., Yang, Z., Eldardiry, H.A., Deb, M., Wang, T. and Judi, D. R. (2022) "Future floods and changing flood-producing mechanisms across the Delaware River Basin", *AGU Fall Meeting 2022*, Chicago, IL, Dec 12 - 16

3. Judi, D. R., Sun, N., Wigmosta, M. S., Yang, Z., Eldardiry, H.A., Deb, M. and Wang, T. (2022) "Long-Term Simulations using Coupled Models to Characterize Pluvial, Fluvial, and Coastal Flooding in the Delaware River Basin in a Changing Climate", *AGU Fall Meeting 2022*, Chicago, IL, Dec 12 - 16

4. Yang, Z., Deb, M., Wang, T., Haas, K. A. and Medina, G. G. (2022) "Application of the IEC technical specification for tidal energy resource characterization", *Pan American Marine Energy Conference 2022*, Ensenada, Mexico, June 19 - 22

5. Yang, Z., Deb, M., Wang, T. and Kilcher, L. (2022) "Turbulence Modeling to Support Tidal Energy Resource Characterization in the Western Passage, USA", *UMERC+METS 2022 Conference*, OR, September 13–15

6. Yang, Z., Wang, T. and Deb, M. (2022) "Characterizing tidal stream energy in the Salish Sea", *2022 Salish Sea Ecosystem Conference*, WA, April 26 - 28

7. Deb, M., Yang, Z., Wang, T., Sun, N., Judi, D. R. and Wigmosta, M. S. (2022) "Compound flood modeling in a shallow convergent estuary: An integrated approach using FVCOM and DHSVM", *Ocean Sciences Meeting 2022*, Honolulu, HI, Feb 27 - Mar 4

8. Yang, Z., Deb, M. and Wang, T. (2022) "Tidal energy resource characterization following IEC standards – a case study in Tacoma Narrow, WA", *Ocean Sciences Meeting 2022*, Honolulu, HI, Feb 27 - Mar 4

9. Falcone, M., Haas, K. A., Deb, M. and Yang, Z. (2022) "Investigation of tidal energy resource assessment estimates and associated assumptions using numerical modeling", *Ocean Sciences Meeting 2022*, Honolulu, HI, Feb 27 - Mar 4

10. Deb, M., Yang, Z., Wang, T., Sun, N., Balaguru, K., Xu, W., Judi, D. R. and Wigmosta, M. S. (2021) "Sensitivity of compound flooding potential to idealized large-scale tropical cyclone environments", *AGU Fall Meeting 2021*, New Orleans, Louisiana, Dec 13 - 17

11. Zang X., Judi, D. R., Li, X., Rakowski, C. L., Sun, N., Yang, Z., Wigmosta, M. S., Wang, T. and Deb, M. (2021) "The effect of DEM resolution and accuracy on urban flooding simulation: a case study in the Philadelphia metropolitan region", *AGU Fall Meeting 2021*, New Orleans, Louisiana, Dec 13 - 17.

12. Deb, M., Yang, Z. and Wang, T. (2021) "Quantifying tidal current asymmetry in the Salish Sea using a high-resolution 3D model", *CERF 2021*, Seattle, WA, November 8-11.

13. Yang, Z., Deb, M., and Wang, T. (2021) "Tidal Current Asymmetry and Resource Characterization in San Juan Islands, WA, USA", *The 14th European Wave and Tidal Energy Conference*, Abstract submitted, Plymouth, UK, September 5-9.

14. Deb, M., Yang, Z. and Wang, T. (2021) "The importance of tidal current asymmetry in marine renewable energy resource assessment", *2021 Postgraduate Research Symposium*, Pacific Northwest National Laboratory, WA, August 10.

15. Deb, M., Kirby, J. T., Shi, F. and Abdolali, A. (2020) "Eliminating the effect of artificial ponding in salt marsh flooding and draining", *Ocean Sciences 2020*, San Diego, California, February 16-21.

16. Deb, M., Kirby, J. T., and Shi, F. (2020) "Increased tidal asymmetry and channel erosion from anthropogenic and natural changes in a multi-Inlet wetland system: Bombay Hook NWR, DE", *Delaware Wetlands Conference 2020*, Wilmington, January 29-30.

17. Deb, M., Abdolali, A., Kirby, J. T. and Shi, F. (2018) "Treatment of artificial ponding in numerical simulation of salt marsh hydrodynamics", *AGU Fall Meeting 2018*, Washington, D.C., Dec 10-14.

18. Deb, M., Abdolali, A., Kirby, J. T., Shi, F. and Wu, G. (2018) "Sub-grid modeling of coupled hydrodynamic, vegetative and morphodynamic processes in a salt marsh environment", *36th International Conference on Coastal Engineering*, Baltimore, Jul 30 - Aug 3.

19. Deb, M., Kirby, J. T., Abdolali, A. and Shi, F. (2018) "Hydrodynamics of an eroding salt marsh environment", *Ocean Sciences 2018*, Portland, Feb 11-16.

20. Deb, M., Kirby, J. T., Abdolali, A. and Shi, F. (2018) "Flow hydrodynamics in an erosive salt marsh environment: Bombay Hook National Wildlife Refuge, DE", *Delaware Wetlands Conference 2018*, Wilmington, Feb 1-2

21. Shi, F., Kirby, J. T., Wu, G., Abdolali, A. and Deb, M. (2016) "Subgrid Modeling Geomorphological and Ecological Processes in Salt Marsh Evolution", *AGU Fall Meeting 2016*, San Francisco, CA

22. Abdolali, A., Shi, F., Deb, M. and Kirby, J. T. (2016) "Field and modeling studies of salt marshes in Bombay Hook National Wildlife Refuge in Delaware", Restore America's Estuaries, *8th National Summit on Coastal and Estuarine Restoration and 25th Biennial Meeting of The Coastal Society*

23. Deb, M., Kirby, J. T., Abdolali, A. and Shi, F. (2016) "Salt Marsh Response to Wind Waves in a Confined Tidal Flat: Bombay Hook National Wildlife Refuge, Delaware", *14th Estuarine and Coastal Modeling Conference (ECM14)*, Kingston, Rhode Island

24. Deb, M., Kirby, J. T., Abdolali, A. and Shi, F. (2016) "Modeling wind waves in a confined tidal flat area: Bombay Hook National Wildlife Refuge, Delaware", *Delaware Wetlands Conference 2016*, Wilmington, DE

25. Abdolali, A., Kirby, James., Shi, F. and Deb, M. (2016) "Subgrid Modeling Geomorphological and Ecological Processes in Salt Marsh Evolution in Delaware", *Delaware Wetlands Conference 2016*, Wilmington, DE

26. Deb, M., and Ferreira, C. M. (2015) "Assessment of Coastal Vulnerability to Storm Surge Hazards in the Bay of Bengal Region: A case study for Bangladesh", *American Water Resources Association (AWRA) National Capital Region Symposium 2015*, Washington, DC.

27. Deb, M., Lawler, S. and Ferreira, C. M.(2014) "Towards accurate representation of wetlands in storm surge modeling: Tradeoffs between resolution and computational demand", *Annual American Water Resources Association (AWRA) Conference*, Tysons Corner, VA.

28. Lawler, S., Deb, M. and Ferreira, C. M.(2014) "Assessing the role of Chesapeake Bay wetlands in attenuation of storm surges using coastal circulation model and real-time data collection", *Annual American Water Resources Association (AWRA) Conference*, Tysons Corner, VA.

29. Deb, M., Lawler, S. and Ferreira, C. M. (2014) "Reducing Hurricane Flood Risk: Quantifying wetlands storm surge attenuation rate in the Chesapeake Bay region", *American Geophysical Union (AGU) Science and Policy Conference 2014*, Washington, DC.

30. Lawler, S., Deb, M. and Ferreira, C. M. (2014) "Monitoring Storm Surge: Hydrodynamic Processes in Coastal and Estuarine Wetlands", *World Environmental & Water Resources Congress 2014, American Society of Civil Engineering (ASCE)*, Portland, Oregon.

31. Deb, M., Lawler, S. and Ferreira, C. M. (2014) "Coastal Storm Surge Mitigation: Analysis and Modeling of Chesapeake Bay Wetlands", *World Environmental & Water Resources Congress 2014*, American Society of Civil Engineering (ASCE), Portland, Oregon.

32. Deb, M., Lawler, S. and Ferreira, C. M. (2014) "Application of Unstructured mesh, SWAN+ADCIRC model to evaluate the role of wetlands in attenuating storm surges, Chesapeake Bay region", *American Water Resources Association (AWRA) National Capital Region Symposium 2014*, Washington, DC.

33. Deb, M., Lawler, S. and Ferreira, C. M. (2014) "Assessment of the role of wetlands in the attenuation of storm surges using coastal circulation model (ADCIRC) in the Chesapeake Bay region", *Chesapeake Modeling Symposium 2014*, Annapolis, MD.

34. Lawler, S., Deb, M. and Ferreira, C. M. (2014) "Storm Surge Attenuation In Chesapeake Bay Wetlands: Analysis And Modeling", *American Water Resources Association (AWRA) National Capital Region Symposium 2014*, Washington, DC.

35. Lawler, S., Deb, M. and Ferreira, C. M. (2014) "Evaluating the role of emergent wetlands in the Chesapeake Bay region to attenuate storm surge", *7th National Summit on Coastal and Estuarine Restoration, and the 24th Biennial Meeting of the Coastal Society*, Annapolis, MD.

36. Deb, M., Lawler, S. and Ferreira, C. M. (2014) "Role of wetlands in attenuation of storm surges using coastal circulation model (ADCIRC), Chesapeake Bay region", *European Geophysical Union General Assembly 2014*, Vienna, Austria.

37. Lawler, S., Deb, M. and Ferreira, C. M. (2014) "Coastal Storm Surge Mitigation: Analysis And Modeling Of Chesapeake Bay Wetlands?", *American Geophysical Union (AGU) 2014 Ocean Sciences Meeting*, Honolulu, Hawaii. 2014.

38. Deb, M., Lawler, S. and Ferreira, C. M. (2014) "The role of wetlands in storm surge attenuation: Sensitivity analyses of land cover type and mesh resolution", *Young Coastal Scientists and Engineers Conference 2014*, University of Delaware, Newark, DE.

39. Lawler, S., Deb, M. and Ferreira, C. M. "A high density storm surge monitoring network: Can we better understand hurricane flooding attenuation by wetlands?", *American Geophysical Union (AGU) 2013 Fall Meeting*, San Francisco, California. 2013.

PROFESSIONAL TRAINING

1. WAVES SUMMER SCHOOL 2019, Organized by NOAA Center for Weather and Climate Prediction, University of Maryland, College Park, MD, Jul 22-26, 2019

2. FUNWAVE-TVD Workshop 2018, Organized by CACR, University of Delaware and the US Army Engineer Research and Development Center, Newark, DE, Jul 25–27, 2018

3. 2015 ADCIRC User's Group Meeting and ADCIRC Boot Camp, NOAA Center for Weather and Climate Prediction, College Park, MD, Mar 30-31, 2015

4. 2014 WRF for Hurricanes Tutorial, NOAA Center for Weather and Climate Prediction, College Park, MD, Jan 14-16, 2014

SYNERGISTIC ACTIVITIES

Reviewer of the following international scientific journals: *Natural Hazards and Earth System Sciences* (Copernicus), *Natural Hazards* (Springer), *Journal of Waterway, Port, Coastal, and Ocean Engineering* (ASCE), *Environmental Earth Sciences* (Springer), *Marine Geodesy* (Taylor & Francis), and *Marine Technology Society Journal (MTSJ)*

COLLABORATORS

Zhaoqing Yang, Taiping Wang, Ning Sun, Karthik Balaguru, David Judi (PNNL); James T. Kirby, Fengyan Shi (UDel); Celso Ferreira (GMU); Ali Abdolali (NOAA); Levi Kilcher, Aidan Bharath (NREL); Kevin A. Haas (Georgia Tech); Sai Ravela (MIT); Susan Guiteras (USFWS); Soumendra Nath Kuiry (IIT Madras)

MEMBERSHIP

☐ American Geophysical Union (AGU)

☐ American Society of Civil Engineers (A.S.C.E.)

☐ Coasts, Oceans, Ports, and Rivers Institute (COPRI-ASCE)

SOFTWARE CAPABILITIES

☐ MATLAB, FORTRAN, ArcGIS, High Performance Computing (HPC)

☐ Finite Volume Community Ocean Model (FVCOM), ADCIRC, SWAN, DELFT3D, FUNWAVE-TVD, FEMA-WHAFIS, CShore

LANGUAGE PROFICIENCY

☐ Bangla (native language); English; Hindi.

REFERENCES

☐ **Dr. James T. Kirby**, Edward C. Davis Professor of Civil Engineering, Center for Applied Coastal Research, Department of Civil and Environmental Engineering, University of Delaware, Newark, Delaware 19716 USA, Phone: (302) 831-2438, Fax: (302) 831-1228, e-mail: kirby@udel.edu, web: http://www1.udel.edu/kirby/

☐ **Dr. Fengyan Shi**, Professor, Center for Applied Coastal Research, Department of Civil and Environmental Engineering, University of Delaware, Newark, Delaware 19716 USA, Phone: (302) 831-2449, e-mail: fyshi@udel.edu, web: https://www.ce.udel.edu/people/faculty-profile/?id=13

☐ **Dr. Zhaoqing Yang**, Chief Scientist, Marine and Coastal Research Laboratory, Pacific Northwest National Laboratory, 1529 West Sequim Bay Road Sequim, Washington 98382 USA, Phone: (360) 683-4151, e-mail: zhaoqing.yang@pnnl.gov,
web: https://marine.pnnl.gov/staff/staff_info.asp?staff_num=971

☐ **Dr. Celso Ferreira**, Associate Professor, Civil, Environmental, and Infrastructure Engineering, George Mason University, Fairfax, Virginia 22030 USA, Phone: (703) 993-1782, e-mail: cferrei3@gmu.edu, web: https://volgenau.gmu.edu/profile/view/9960