Mohammad Saud Afzal

Contact Information

Department of Civil Engineering
Indian Institute of Technology, Kharagpur
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Research Interests

Numerical modeling, Offshore Wind Energy, Waves, Hydrodynamics, Sediment Transport, Computational Fluid Dynamics, Port Planning, Design of coastal structures , Coastal Engineering in Arctic Areas

Education

Norwegian University of Science and Technology, Trondheim, Norway

PhD., Department of Marine Technology, Sept 2013-March 2017

- Title: *Three-dimensional streaming in seabed boundary layer*
- Advisor: Dag Myrhaug, Professor and Lars Erik Holmedal, Professor

M.S., Coastal and Marine Engineering and Management, June 2013

- MSc Thesis: *3D Numerical Modeling of Sediment Transport under combined current and waves*
- Advisor: Øivind A. Arntsen, Associate Professor
- *Average Grade: A*

Indian Institute of Technology, Kanpur, India

B.Tech., Civil Engineering , July 2008

Work Experience

Assistant Professor — Nov 2017- Present
Department of Civil Engineering,
Indian Institue of Technology, Kharagpur

Post-Doc — Jan 2017- Nov 2017
Department of Civil and Enviromental Engineering,
Norwegian University of Science and Technology

Hydraulic Engineer and Modeler — July 2008- June 2011
Marine and Coastal Division,
DHI India Water and Environment Pvt Ltd
Supervisor: Dr Ajay Pradhan

Research Assistant — Jan 2013 to July 2013
Sustainable Arctic Marine and Coastal Technology,
Norwegian University of Science and Technology
Supervisor: Professor Sveinung Løset

Research Assistant — Jan 2013 to July 2013
Marine Civil Engineering,
Norwegian University of Science and Technology
Supervisor: Associate Prof Raed Lubbad

Internship — Aug 2012 to Sep 2012
Department of Civil and Environmental Engineering
Norwegian University of Science and Technology
Supervisor: Associate Professor Øivind A. Arntsen

Summer Intern May 2007- Jul 2007
Department of Environmental and Hydraulic Engineering,
E2 Consulting Engineers, Oakland, California USA
Supervisor: Dr Chip Poalinelli

Awards

EU Visiting Professor Fellowship
- European Union. Trondheim, Norway June 2018
  - Awarded fellowship to visit Norwegian Univeristy of Science and Technology, Trondheim-NO as a visiting professor.

EU Visiting scholar Fellowship
- European Union, Delft, Netherlands July 2017
  - Awarded fellowship to visit TU Delft as a visiting scholar.

ASME Scholarship
- ASME, San Francisco June 2014
  - Awarded scholarship to attend OMAE 2014 in San Francisco, Californmnia, US.

Erasmus Mundus Scholarship 2011-13
- European Union. Delft, Netherlands Aug 2011
  - Awarded full scholarship to pursue MS in Coastal and Marine Engineering and Management from consortium of TU Delft, Netherlands, NTNU and University of Southampton.

Highest Marks in Mathematics
- Uttar Pradesh State Science Department 2003
  - Highest marks in Mathematics in class 12th in ISC board and also Smt Vimla Srivastava Gold Medal in 2003 at Little Flower High School.

Students Supervision

Doctoral Students Supervision : 7 Ongoing
Department of Civil Engineering,
Indian Institue of Technology, Kharagpur

MSc Students Supervision : 1 Ongoing, 5 Finished
Norwegian University of Science and Technoilogy and,
Indian Institue of Technology, Kharagpur

Btech/BSc Students Supervision : 3 Ongoing
Department of Civil Engineering,
Indian Institue of Technology, Kharagpur

Teaching Experience

Courses Taught at IIT Kharagpur
CE 21003 - Hydraulics
CE 29006 - Water Resources Engg. Laboratory
CE 69005 - Computer Applications in Free Surface Flow
CE 60111 - Viscous Fluid Flow
CE 60124 - Turbulent Fluid Flow
CE 13001 - Engineering Drawing and Computer Graphics

Courses Taught at NTNU
MR8303 - Kinematics and Dynamics of Ocean Surface Waves
MR8304 - Seabed Boundary Layer Flow
TMR4235 - Stochastic Theory of Sealoads

TBA 4145 - Port and Coastal Facilities
TBA 4265 - Marine Physical Environment

Journal and International Conference Publications

Kumar, L., **Afzal, M.S.** and Afzal, M.M., **(2020)**. Mapping shoreline change using machine learning: a case study from the eastern Indian coast. *Acta Geophysica*, 68 (4), pp.1127–1143.

Gazi, A.H. and **Afzal, M.S.**, **(2020)**. A review on hydrodynamics of horseshoe vortex at a vertical cylinder mounted on a flat bed and its implication to scour at a cylinder. *Acta Geophysica*, 68(3), pp.861-875.

Dutta, D., Mandal, A. and **Afzal, M.S.**, **(2020)**. Discharge performance of plan view of multi-cycle W-form and circular arc labyrinth weir using machine learning. *Flow Measurement and Instrumentation*, 73, p.101740.

Afzal, M.S., Bihs, H. and Kumar, L., **(2020)**. Computational fluid dynamics modeling of abutment scour under steady current using the level set method. *International Journal of Sediment Research*. 35 355-364

Islam, M.A., Lubbad, R. and **Afzal, M.S.**, **(2020)**. A Probabilistic Model of Coastal Bluff-Top Erosion in High Latitudes Due to Thermoabrasion: A Case Study from Baydaratskaya Bay in the Kara Sea. *Journal of Marine Science and Engineering*, 8(3), p.169.

Gazi, A.H., Purkayastha, S. and **Afzal, M.S.**, **(2020)**. The equilibrium scour depth around a pier under the action of collinear waves and current. *Journal of Marine Science and Engineering*, 8(1), p.36.

Gazi, A.H. and **Afzal, M.S.**, **(2020)**. A new mathematical model to calculate the equilibrium scour depth around a pier. *Acta Geophysica*, 68(1), pp.181-187.

Gazi, A.H., **Afzal, M.S.** and Dey, S., **(2019)**. Scour around piers under waves: Current status of research and its future prospect. *Water*, 11(11), p.2212.

Afzal, M.S. and Lubbad, R., **(2019)**. Development of predictive tool for coastal erosion in Arctic—A review. *Lecture Notes in Civil Engineering*, 23, 59-69

Ong, M.C., Kamath, A., Bihs, H. and **Afzal, M.S.**, **(2017)**. Numerical simulation of free-surface waves past two semi-submerged horizontal circular cylinders in tandem. *Marine Structures*, 52, pp.1-14.

Afzal, M.S., Holmedal, L.E. and Myrhaug, D., **(2015)**. Three-dimensional streaming in the seabed boundary layer beneath propagating waves with an angle of attack on the current. *Journal of Geophysical Research: Oceans*, 120(6), pp.4370-4391.

Afzal, M.S., Bihs, H., Kamath, A. and Arntsen, Ø.A., **(2015)**. Three-dimensional numerical modeling of pier scour under current and waves using level-set method. *Journal of Offshore Mechanics and Arctic Engineering*, 137(3), 032001-032007.

Lubbad R., Katherina A., **Afzal, M.S.**, Depina I. **(2018)**. Numerical Modelling of Arctic Coastal Erosion due to Thermodenudation. Proceedings of AIC2018 Transportation infrastructure engineering in cold regions, pp 34-35.

Afzal, M.S., Holmedal, L.E. and Myrhaug, D., **(2016)**. Effect of bottom roughness on sediment transport due to streaming beneath linear propagating waves with an angle of attack on current. Scour and Erosion: Proceedings of the 8th International Conference on Scour and Erosion.

Afzal, M.S., Holmedal, L.E. and Myrhaug, D., **(2015)**. Sediment transport in wave-current bottom boundary layer under linear propagating waves at an angle with the current. Coastal Sediments 2015 The Proceedings of the Coastal Sediments 2015.

Afzal, M.S., Holmedal, L.E., Myrhaug, D. and Wang, H. **(2015)**. Sediment transport beneath horizontally uniform linear waves plus current in coastal areas. Proceedings of MekIT'15 Eighth National Conference on Computational Mechanics.

Ahmad, N., **Afzal, M.S.**, Bihs, H., Kamath, A. and Arntsen, Ø.A., **(2015)**. Three-dimensional numerical modelling of local scour around a non-slender cylinder under varying wave conditions. 36th IAHR World Congress Proceedings.

Afzal, M.S., Bihs, H., Kamath, A. and Arntsen, Ø.A., **(2014)**. 3D Numerical Modelling of Contraction Scour under Steady Current Using the Level Set Method. Proceedings of the 11th International Conference on Hydroscience and Engineering.

Afzal, M.S., Bihs, H. and Arntsen, Ø.A., **(2014)**. Three Dimensional Numerical Modelling of Pier Scour Under Current and Waves Using Level Set Method. Proceedings ASME 2014 33rd International Conference on Ocean, Offshore and Arctic Engineering, Volume 2: CFD and VIV.

Afzal, M.S., Bihs, H., Kamath, A. and Arntsen, Ø.A., **(2013)**. REEF3D : An Advanced Wave Energy Design Tool for the Simulation of Wave Hydrodynamics and Sediment Transport. International Workshop on Ocean Wave Energy, . Department of Ocean Engineering, IIT Madras; Chennai. 2013-12-02 - 2013-12-03.

Research Projects

3D CFD Modeling of the Hydrodynamics and Local Scour Around Offshore Structures Under Combined Action of Current and Waves

- Funding Agency: SRIC (ISIRD, IIT Kharagpur) March 2018- March 2021
- Fund Sanctioned: **28 Lakh INR**
- Status: **Accepted and Ongoing**

Large Scale CFD modelling of the Hydrodynamics and scour around Offshore Wind Farms

- Funding Agency: SERB, Early Career Research March 2019- March 2022
- Fund Sanctioned: **30.38 Lakh INR**
- Status: **Accepted and Ongoing**

Predictive Tool for Arctic Coastal Hydrodynamics and Sediment Transport

- Funding Agency: National Centre for Polar and Ocean Research,Earth System Science Organisation, Ministry of Earth Sciences July 2019- March 2022
- Fund Sanctioned: **37.51 Lakh INR**
- Status: **Accepted and Ongoing**

Sea ice and iceberg observation and analysis in Western Barent Sea in 1987

- Sustainable Arctic Marine and Coastal Technology (SAMCoT) Jan 2013-Present
  - Analysis of sea ice and iceberg observation in Western Barent sea in 1987. This research will be used for further research models in arctic field development.
- Supervisor: Professor Sveinung Løset

Numerical Modeling of waves and sediment transport using MIKE 21

- Norwegian University of Science and Technology Jan 2013- Present

- Development of waves and sediment transport modeling template to be used in future for such type of studies. This includes site identification characteristics, type of data required for such studies and setting up the model.
- Supervisor: Asisstant Professor Raed Lubbad

Wave Propagation Over Rugged Topography using SWAN Model
- Norwegian University of Science and Technology Aug 2012-Sep 2012
  - The project was done during the summer job and as a part of specialization project for Marine Civil Engineering MSc degree at NTNU. It involved development of a tutorial of SWAN and wave propagation study in Mehamn area in Norway and its validation using physical model experiment of SINTEF.
- Supervisor: Associate Professor Øivind A Arntsen

Bachelor of Technology Project
- Indian Institute of Technology Kanpur, India August 2007-April 2008
  - 2D Numerical modeling of pollutant transport in rivers.
- Supervisor: Dr Pranab Mohapatra

Remedial Action Plan : Hydraulic and Environmental Summer Intern
- E2 Consulting Engineers, Emeryville, California USA May 2007-Jul 2007
  - Study of PGE Topock Site, CA and Remedial Action Plan for Controlling Pollution of Colorado River from Hazardous and Toxic Metal Waste from Gas pipeline in the region.
- Supervisor: Dr Chip Poalinelli

Simulating water flow in rivers
- Indian Institute of Technology Kanpur, India May 2006-Jul 2006
  - Simulating water flow in river channel through HECRAS Software.
- Supervisor: Dr Pranab Mohapatra

Remote Sensing
- Indian Institute of Technology Kanpur, India Jan 2006-Apr 2006
  - Remote Sensing Data Analysis of Lightning Flashes, Nox level and ozone in lower Stratosphere over Ganga Basin in different seasons, months spread over a period of 10 years and concluding that with increase in Lightning flashes and Nox level there is increase in formation of ozone. Also variation of ozone level in different months of the year.
- Supervisor: Dr Ramesh P Singh

Digital Elevation Model
- Indian Institute of Technology Kanpur, India Jan 2006-Apr 2006
  - Made digital elevation model of Andaman Region to study land feature disturbances because of Land Slides and Earthquakes through ARCVIEW and ERDAS software.
- Supervisor: Dr Javed Malik

Commercial Projects

Numerical Modeling of waves, hydrodynamics and sediment transport
- DHI India Jul 2008- Jun 2011
  - Worked on several wave modeling and hydrodynamic/ sedimentation studies in different areas of India in which i used MIKE 21/3 HD/ST and SW module.
    - Deep Water Port at Hugli, West Bengal India 2010
    - Shipyard/Offshore Fabrication Yard at Mahua, Bhavnagar, India 2009
    - Pre-Feasibility Study for development of Dahej Port,Gujarat, India 2009
    - ABG Shipyard , Dahej, Gujarat, India 2009
    - Dredging Malad Creek for the Development of Fishing and Passenger Traffic in North Mumbai, India 2008

- Mathematical studies at proposed port near Vadarevu, Nizampatnam, India 2008
- Project Lead: Dr Ajay Pradhan

Port Planning
- DHI India 2011
  - Prelimnary Port Planning of 3 minor ports (Palur, Bahuda Muhan and Barunei Muhan) in Orissa, India for M/s Jindal Steel and Power Limited.
- Project Lead: Dr Ajay Pradhan

Pipeline Project
- DHI India 2011
  - Expert Opinion on burial depth for sea water intake and outfall system for gas based combined cycle power plant of 700 MW capacity, Pipavav, Gujarat , India.
- Project Lead: Dr Ajay Pradhan

Littoral Transport Study
- DHI India 2010
  - Erosion and Accretion Study for the proposed Gopalpur Port upto Rushikulya River Mouth, Orissa, India. Did Coastline Evolution/ Shoreline Changes using MIKE LITPACK and Hydrodynamic and Sedimentation studies and modeling using MIKE 21.
- Project Lead: Dr Ajay Pradhan

Tidal Power Site Selection
- DHI Singapore 2010
  - Tidal Power Site Selection in Gulf of Kutch and Khambhat, Gujarat. Hydrodynamic study and modeling of Gulf of Kutch and Khambhat using MIKE 21 HD for site selection for tidal power generation by harnessing strong currents in the gulf.
- Project Lead: Peter Rasch

Intake and Outfall Studies
- DHI India 2009
  - Selection of Intake and Outfall locations for Krishnapatnam UMPP.Advection and Dispersion studies using MIKE 21/3, Littoral Transport studies using MIKE LITPACK. Designed Breakwater, Intake Channel and prepared project BOQ.
- Project Lead: Mr Rashmi Ranjan Patra

Integrated Coastal Zone Management
- DHI India 2008-2010
  - Consolidated Emergency Plan for the Proposed TPP, at Village Dehrand, Distt. Raigad, Maharashtra, on left bank of Dharamtar Creek where i helped in preparation of Onsite and Offsite emergency plan.
- Project Lead: Mr Rashmi Ranjan Patra

Professional Associations

- Member - American Society of Civil Engineers (ASCE) Sep 2011-Present
- Member - COPRI - Coasts, Oceans, Ports, Rivers Institute Sep 2011-Present
- Executive Member - Society of Civil Engineers, IIT Kanpur Jul 2004- Jul 2008

Administrative Experience

- HWRE Lab Incharge, Department of Civil Engineering IIT Kharagpur, July 2020-June 2023
- Assistant Warden, R.K Hall of Residence IIT Kharagpur, April 2019- April 2021
- NSS Program Officer, IIT Kharagpur, Jan-Dec 2019
- MoU coordinator between IIT Kharagpur and Norwegian University of Science and Technology (NTNU)

- Faculty Advisor for 1st Year UG Civil Engineering Students batch of 2018
- Sports Secretary Technology Club 2018
- Session in-charge for Research Scholar's Day, Civil Engg. Dept., 2018
- Board Member of NTNU Alumni India 2018-2021

Services rendered to other institutions

- Board Member of NTNU Alumni India
- Reviewer for Journal of Hydraulic Engineering (IF: 2.18, ASCE)
- Reviewer for Sedimentology (IF: 3.07, WILEY)
- Reviewer for Journal of Waterway, Port, Coastal, and Ocean Engineering (IF: 2.11, ASCE)
- Reviewer for Journal of Offshore Mechanics and Arctic Engineering (IF: 1.71, ASME)