Dr. Md Jakir Hossen

Curriculum vitae

Contact Information

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Scholar ID

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Summary of Qualifications

Experienced professional with a solid academic background and a demonstrated commitment to carry out high quality research on Geophysical Science, Environmental Science and Numerical Weather Prediction; Described as a "numerical modeler" with exceptional ability to use numerical analysis techniques and numerical optimization routines; Strong mathematical background builds upon several years of teaching at university and undergraduate & graduate course work; Proficient in the use of programming languages (Python, MATLAB, FORTRAN, C/C++, R) with extensive knowledge of inverse theory, data assimilation, signal processing and remote sensing.

Education

- **Ph.D in Earth Sciences**, Australian National University, Canberra, Australia, Nov 2015
- **MS in Computational Science**, Florida State University (FSU), Dec 2008, GPA: 3.67/4.0
- **M.Sc, Applied Mathematics**, University of Dhaka, Bangladesh, Sep 2001, First class (Grade A)
- **B.Sc in Mathematics**, University of Dhaka, Bangladesh, June 1999, First class (Grade A) (Minor in Physics and Statistics)

Computer Skills

- Operating systems: Linux, Windows and Mac OS
- Programming Language: Python, FORTRAN, C/C++, Matlab, R, Shell scripting
- Atmospheric Modeling: Lin-Rood shallow water finite volume model, Tangent linear model, Adjoint model
- Tsunami Modeling: JAGURS (parallelized), GeoClaw, ANUGA (parallelized)
- Others: PyTorch, GMT, GrADS, MPI, OpenMP, NetCDF, HDF5, awk, sed, Git, ObsPy, SAC

Honors and Awards

- CIRES visiting fellowship, University of Colorado Boulder 2018–2020
- Travel award to attend PNW Earthquake Science Workshop, Seattle, Washington 2019
- Travel grant to attend MCS RCN Megathrust Modeling Workshop, Eugene, Oregon 2019
- Travel scholarship, 2019 SAGE/GAGE workshop organized by IRIS and UNAVCO 2019
- Scholarship, Australian National University (ANU) 2011–2015
  - ANU PhD Scholarship
  - RSES Supplementary Scholarship
  - ANU HDR Merit Scholarship
- President's list, Florida State University 2007

Professional Experience

- **Postdoctoral Associate**, University of Colorado Boulder 2018-present
  – Developing a methodology for a guidance to build an optimal sea-floor observation network in the Cascadia subduction zone
  – Implementing data assimilation method with ship-borne GPS data in Ocean science
  Supervisor: Professor Anne F. Sheehan
- **Project Researcher**, Earthquake Research Institute, University of Tokyo, Japan 2017-2018
  – Developed an adjoint sensitivity approach for tsunami source inversion
  Supervisor: Professor Kenji Satake
- **Assistant professor in Mathematics**, BRAC University, Dhaka, Bangladesh 2015–2018
  – My responsibilities were to prepare and deliver lectures in the class, make questions and grade exam scripts, and advise students on academic matters
  – Performed duties as a Convenor of scrutinizing committee; course Coordinator; member of course curriculum committee and moderation committee
- **PhD Research**, Australian National University, Australia 2011-2015
  – Developed the first time reverse imaging method for tsunami source inversion
  – Investigated the importance of model parameterization, including dispersion, source kinematics, and source discretization, in tsunami source study
  Advisor: Professor Phil R. Cummins
- **Senior Lecturer in Mathematics**, BRAC University, Dhaka, Bangladesh 2009–2011
- **Research Assistant**, Florida State University 2006 - 2008
  – Worked to develop a methodology for identifying adaptive observation location
  – Acquired knowledge on numerical linear algebra, numerical optimization, data assimilation and numerical weather prediction
  – Improved computational skills by utilizing numerical techniques and optimization
  Advisor: Professor Ionel M. Navon
- **Lecturer in Mathematics**, BRAC University, Dhaka, Bangladesh 2002–2006

Courses I taught at BRAC University

- ❑ Fundamentals of Mathematics
- ❑ Fortran Programming
- ❑ Differential Calculus and Coordinate Geometry
- ❑ Integral Calculus and Differential Equations
- ❑ Complex Variable and Laplace Transformations
- ❑ Differential Geometry
- ❑ Calculus
- ❑ Real Analysis I
- ❑ Vector Mechanics
- ❑ Discrete Mathematics
- ❑ Mathematical Methods
- ❑ Mathematics Lab (using Python)

Graduate Course-work at FSU

- ✧ Introduction to Scientific Programming
- ✧ Foundations of Computational Mathematics I
- ✧ Advanced Dynamic Meteorology I
- ✧ Survey of Numerical PDEs
- ✧ Numerical Optimization
- ✧ Applied Computational Science I
- ✧ Applied Computational Science II
- ✧ Computational Aspects of Data Assimilation

Online course-work (offered by IBM)

- ✧ Deep Learning with Python and PyTorch (completed with 91% mark)
- ✧ Machine Learning with Python: A practical introduction (ongoing)

Virtual Summer School

- ❑ Artificial Intelligence for Earth System Science (AI4ESS) Summer School, 2020

Selected Publications

- **M. J. Hossen**, I. M. Navon and F. Fang."A penalized four-dimensional variational data assimilation method for reducing forecast error related to adaptive observations." *International Journal for Numerical Methods in Fluids*, 70(10):1207–1220, 2012.
- **M. J. Hossen**, I. M. Navon and Dacian N. Daescu."Effect of random perturbations on adaptive observation techniques." *International Journal for Numerical Methods in Fluids*, 69(1):110–123, 2012.
- **M. J. Hossen**, P. R. Cummins, J. Dettmer, and T. Baba (2015), Time reverse imaging for far-field tsunami forecasting: 2011 Tohoku earthquake case study, Geophys. Res. Lett., 42, 9906-9915.
- **M. J. Hossen**, P. R. Cummins, J. Dettmer, and T. Baba (2015), Tsunami waveform inversion for sea surface displacement following the 2011 Tohoku earthquake: Importance of dispersion and source kinematics, J. Geophys. Res. Solid Earth, 120, 6452-6473.
- Dettmer J., R. Hawkins, P. R. Cummins, **M. J. Hossen**, M. Sambridge, D. Inazu, and R. Hino (2016), Tsunami source uncertainty estimation: the 2011 Japan Tsunami, J. Geophys. Res. Solid Earth, 121.
- T. Baba, S. Allgeyer, **M. J. Hossen**, P. R. Cummins, H. Tsushima, K. Imai, K. Yamashita, T. Kato (2017), Accurate numerical simulation of the far-field tsunami caused by the 2011 Tohoku earthquake, including the effects of Boussinesq dispersion, seawater density stratification, elastic loading, and gravitational potential change, In Ocean Modelling, Volume 111, Pages 46-54, ISSN 1463-5003.
- **Hossen, M. J.**, Gusman, A. R., Satake, K., & Cummins, P. R. (2018). An adjoint sensitivity method applied to time reverse imaging of tsunami source for the 2009 Samoa earthquake. Geophysical Research Letters, 45, 627-636.
- **M. J. Hossen**, Iyan E. Mulia, David Mencin and Anne F. Sheehan. " Data assimilation with ship-borne GPS data in the Cascadia subduction zone" (To be submitted soon).

Press Conference

- ✪ Time Reverse Imaging of Tsunami Waveforms. M. J. Hossen, P. R. Cummins, and J. Dettmer. Salt Lake City, UT: Spring meeting Acoust. Soc. Am., 2016. This work included a scientific talk and a contribution to the press conference for the meeting.
- ✪ Our work is published in many media including sciencedaily.com, newswise.com, natureworldnews.com, phys.org.

Conference Talks

- ✪ American Geophysical Union (AGU) Fall Meeting: Washington DC (2018, Oral), San Francisco (2013 & 2019 Poster).
- ✪ Seismological Society of America meeting 2019, Seattle, Washington, USA (Oral).
- ✪ Asian Oceanic Geoscience Society (AOGS) Annual Meeting: Singapore (2017, Oral), Beijing, China (2016, Oral), Sapporo Japan (2014, Oral), Brisbane, Australia (2013, Oral).
- ✪ JpGU-AGU joint meeting 2017, Chiba, Japan (Oral).

References

Professor Anne F. Sheehan, Department of Geological Sciences, University of Colorado Boulder, Phone: +1 (303)-492-4597, Email: anne.sheehan@colorado.edu

Professor Phil R. Cummins, Research School of Earth Sciences, Australian National University, Phone: (+61) (2) 6125 1217 Email: phil.cummins@anu.edu.au

Professor Kenji Satake, Earthquake Research Institute, The University of Tokyo, Japan, Phone: +81-3-5841-0219 Email: satake@eri.u-tokyo.ac.jp