# 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 Sciences; 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, time reverse imaging, data assimilation, high performance computing, numerical methods, signal processing, etc.

Education

- **Ph.D in Earth Science**, Australian National University, Canberra, Australia 2015
- **MS in Computational Science**, Florida State University, Tallahassee, USA 2008
- **M.Sc in Applied Mathematics**, University of Dhaka, Bangladesh 2001
- **B.Sc in Mathematics**, University of Dhaka, Bangladesh 1999
  (Minor in Physics and Statistics)

Computer Skills

- Operating systems: Linux, Mac and Windows
- Programming Language: Python, Fortran, Matlab, R, C/C++, PHP, Shell scripting
- Atmospheric Modeling: Lin-Rood shallow water finite volume model, Adjoint and Tangent linear model
- Hydrodynamic Modeling: JAGURS (parallelized), GeoClaw, ANUGA (parallelized)
- HPC Platforms: MPI, OpenMP, Slurm, Torque
- Others: PyTorch, Singularity, GMT, GrADS, NetCDF, HDF5, awk, Git, ObsPy, SAC, SQL

Professional Experience

- **Postdoctoral Research Associate**, University of Colorado Boulder 2018-present
  - Used historical data to understand the causes of the 1946 Aleutian earthquake tsunami.
  - Implemented a data assimilation (DA) method with ship-borne GPS data in Ocean science.
- **Project Researcher**, Earthquake Research Institute, University of Tokyo, Japan 2017–2018
  - Initiated a project to understand source characteristic of a complex earthquake.
  - Developed an adjoint sensitivity method to identify optimal set of stations.
- **Assistant professor in Mathematics**, BRAC University, Bangladesh 2015–2018
  - Taught several courses in mathematics, for example, Calculus, Differential equations, Linear Algebra and Fourier Analysis, etc.
  - Performed duties as a convenor of scrutinizing committee, course coordinator, and member of course curriculum committee.
  - Organized the Regional Round of the 8th National Undergraduate Mathematics Olympiad-2016.

- ✪ **Doctoral Researcher**, Australian National University, Australia 2011–2015
  - Developed the first time reverse imaging method for tsunami source inversion.
  - Investigated the importance of model parameterization in source study.
  - Used remote sensing data (digital elevation models) for simulating tsunami inundation
- ✪ **Research Assistant**, Florida State University
  - Worked on numerical weather prediction and developed new algorithms using DA method.
- ✪ **Lecturer/Senior Lecturer (Mathematics)**, BRAC University, Bangladesh

## Professional development

- ✧ Deep Learning with Python and PyTorch offered by IBM (completed)
- ✧ Machine Learning with Python: A practical introduction offered by IBM (completed)
- ✧ Artificial Intelligence for Earth System Science (AI4ESS) Summer School, 2020
- ✧ 2020 InSAR Processing and Theory with GMTSAR (online short courses)
- ✧ Crustal Deformation Modeling Workshop, June 10-14, 2019, Golden, Colorado

## Graduate Course-work at FSU

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

## Relevant Courses I taught as a lead instructor

- ✧ Calculus
- ✧ Linear Algebra
- ✧ Differential Equations
- ✧ Numerical Analysis
- ✧ Fortran Programming
- ✧ Mathematical Methods
- ✧ Mathematics Lab (using Python)

## Selected Publications

- ✧ **M. J. Hossen**, Iyan E. Mulia, David Mencin and Anne F. Sheehan (2020). " Data assimilation with ship-borne GPS data in the Cascadia subduction zone", (Submitted to Earth and Space Science, Under review).
- ✧ **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.
- ✧ Toshitaka Baba, Sebastien Allgeyer, **Jakir Hossen**, Phil R. Cummins, Hiroaki Tsushima, Kentaro Imai, Kei Yamashita, Toshihiro 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 Modeling, Volume 111, Pages 46-54, ISSN 1463-5003.
- ✧ 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, 4483–4505.
- ✧ **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.
- ✧ Jonathan Griffin, Hamzah Latief, Widjo Kongko, Sven Harig, Nick Horspool, Raditya Hanung, Aditia Rojali, Nicola Maher, Annika Fuchs, **Jakir Hossen**, Supriyati Upi, Dewanto Edi, Natalja Rakowsky, Phil Cummins. "An evaluation of onshore digital elevation models for modelling tsunami

inundation zones." *Frontiers in Earth Science* 3 (2015): 32.

✧ **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.

## 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).

## Honors and Awards

- CIRES visiting fellowship, University of Colorado Boulder 2018–2020
- Travel award to attend PNW Earthquake Science Workshop, Seattle 2019
- Travel grant to join MCS RCN Modeling Workshop, Eugene, Oregon 2019
- Travel scholarship, 2019 SAGE/GAGE Workshop 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

## 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