Mahdi Hasan

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SUMMARY

Climate researcher with expertise in large-scale atmospheric and oceanic circulations, climate variability and change, air-sea interactions, and monsoonal extreme precipitation. Skilled in analyzing large observational and model datasets, applying advanced statistical analyses, and designing climate model experiments. Committed to advancing climate science and contributing to sustainable solutions for climate change and extreme events.

EDUCATION

Doctor of Philosophy in Marine, Earth and Atmospheric Sciences (Research Area: Climate Dynamics) July 2025
North Carolina State University, Raleigh, NC, USA
Dissertation: Internally and Externally Forced Interactions between Tropical Ocean and Hadley Circulation

Master of Science in Mechanical Engineering Dec 2019
North Carolina A&T State University, Greensboro, NC, USA
Thesis: Control of Separated Flow Using a Dielectric Barrier Discharge Plasma Actuator

Bachelor of Science in Mechanical Engineering Sept 2015
Chittagong University of Engineering & Technology, Chittagong, Bangladesh

EMPLOYMENT

Postdoctoral Research Scholar, North Carolina State University Aug 2025 - Present

- Conduct NCAR CESM2 model experiments and apply a hierarchical coupled modeling approach to understand drivers of Atlantic Sea Surface Temperature variability across timescales.
- Collaborate with multi-institutional teams on an NSF-funded research project, ensuring timely deliverables.
- Communicate scientific findings through peer-reviewed publications, and scientific presentations.
- Supervise and mentor graduate and undergraduate researchers on theory, data analysis, and scientific writing.

Graduate Research & Teaching Assistant, North Carolina State University Jan 2020 - Jul 2025

- Analyzed observations, atmospheric reanalysis, and model datasets to attribute natural variations and climate change to tropical atmospheric and oceanic circulations.
- Published peer-reviewed journal articles and presented findings at international conferences, workshops, and symposia.
- Delivered instructions in core atmospheric and earth science undergraduate courses, graded assignments, and provided feedback to 100+ students.

Graduate Research & Teaching Assistant, North Carolina A&T State University Jan 2018 - Dec 2019

- Conducted research on hydro-powered renewable energy and external aerodynamic fluid flow control using computational fluid dynamics (CFD) models.
- Published peer-reviewed articles and presented research at conferences.
- Instructed 100+ students on mechanical engineering courses on fluid mechanics, thermodynamics, and 200+ students on math courses, including Vector and Linear Algebra.

TECHNICAL SKILLS

Programming & Data Analysis	: Python (Xarray, Scipy, Pandas, Dask), Fortran, Matlab, Bash, R
Climate Modeling & Multi-physics Simulation	: CESM, Ansys Fluent, OpenFOAM
Post Processing	: CDO, Ncview, Tecplot, Paraview
Computer Aided Design	: SOLIDWORKS, AutoCAD
Operating System	: MacOS, Unix (High Performance Computing), Windows

NOTABLE HONORS & AWARDS

- Outstanding Student Presentation Award, International Workshop for mid-latitude air-sea interaction, 2021, Sapporo, Japan.
- Oral Presentation Award, Early Career Technical Conference, 2019, UAB, Birmingham, AL, USA.
- University Merit Scholarship, Chittagong University of Engineering & Technology (CUET), Bangladesh, 2011-2014.

- Board Scholarship in the Dhaka division, Bangladesh, based on the result in the Secondary School Certificate (SSC) Exam.

PROJECTS

- Determining the Role of Ocean Dynamics in Atlantic Sea Surface Temperature Variations Using a Hierarchy of Coupled Models (NSF funded).
  Role: Postdoctoral Researcher — Aug 2025 - Present
- Understanding the Role of ENSO on South Asian Summer Monsoon Predictability.
  Role: Lead Researcher — Aug 2025 - Present
- Climate Change Impact on Extreme Monsoon Rainfall Events over Bangladesh and Northeast India.
  Role: Collaborative Researcher — Jan 2023 - Dec 2023
- Mechanisms of Intrinsic and Anthropogenically Forced Climate Variations (NSF funded).
  Role: Graduate Researcher — Jan 2020 - Jul 2025

PUBLICATIONS

In Progress:

- **Hasan, M.**, Larson, S. (2025). Distinct Internal Tropical Pacific Sea Surface Temperature Patterns Drive Similar Uncertainty in the Hadley Circulation Trend, in revision, Nature Communications Earth & Environment.

Peer-Reviewed:

- **Hasan, M.**, Larson, S., McMonigal, K., Robinson, W., Aiyyer, A. (2024). Hemisphere-Dependent Impacts of ENSO and Atmospheric Eddies on Hadley Circulation. Journal of Climate, 37(24), 6533 6548.
- Fahad, A. A., **Hasan, M.**, Sharmili, N., Islam, S., Swenson, E. T., Roxy, M. K. (2024). Climate Change Quadruples Flood-causing Extreme Monsoon Rainfall Events in Bangladesh and Northeast India. Quarterly Journal of the Royal Meteorological Society, 150(760), 1267-1287.
- **Hasan, M.**, Larson, S., McMonigal, K., Hadley Cell Edge Modulates the Role of Ekman Heat Flux in a Future Climate, Geophysical Research Letters, 49(17), 2022.
- **Hasan, M.**, Atkinson, M., Investigation of a Dielectric Barrier Discharge Plasma Actuator to Control Turbulent Boundary Layer Separation, Applied Sciences Journal, MDPI, 2020, 10(6), 1911.
- **Hasan, M.**, Atkinson, M., Control of Flow Separation on A Hump Model Using A Dielectric Barrier Discharge Plasma Actuator, Journal of UAB ECTC, 18, 148-154, Nineteenth Early Career Technical Conference, University of Alabama, Birmingham, 2020.
- **Hasan, M.**, Kabir, A., Akib, Y., Dynamic Stall Investigation of Two-Dimensional Vertical Axis Wind Turbine Blades Using Computational Fluid Dynamics, AIP Conference Proceedings 2121, 120003, 2019.
- Akib, Y., Kabir, A., **Hasan, M.**, Critical Assessment of Altitude Adaptive Dual Bell Nozzle Using Computational Fluid Dynamics, International Journal of Engineering Materials and Manufacture 4(1) 15-21, 2019.
- Kabir, A., Akib, Y., **Hasan, M.**, Islam, J., Comparison of the Aerodynamic Performance of NACA 4415 and KFm-based Stepped Airfoils, 3rd International Conference on Mechanical Engineering (ICME), 2019, Bangladesh.
- Akib, Y., Kabir, A., **Hasan, M.**, Characteristics Analysis of Dual Bell Nozzle Using Computational Fluid Dynamics, 3rd International Conference on Mechanical, Industrial, and Materials Engineering (ICMIME), 2017, Rajshahi, Bangladesh

SCIENTIFIC PRESENTATIONS

- Hemisphere-dependent Response of Hadley Circulation to ENSO and Eddy Forcing, Poster, AGU Annual Meeting, 2024, Washington, D.C., USA.
- Hemisphere-dependent Response of Hadley Circulation to ENSO and Eddy Forcing, Oral, CESM Annual Workshop, 2024, National Center for Atmospheric Research, Boulder, CO, USA.
- The Hadley Cell Edge Modulates the Role of Ekman Heat Flux in a Future Climate, Poster, US CLIVAR Workshop on Confronting Earth System Model Trends with Observations, 2024, Boulder, CO, USA
- Coupling between Hadley Circulation Strength Variability and Wind-stress-driven Ocean Circulation is Hemisphere Dependent, Oral, AMS Annual Meeting, 37th Conference on Climate Variability and Change, 2024, Baltimore, MD, USA.

- Future Changes in the Role of Ekman Heat Flux on SST variability, Oral, AGU Fall Meeting,2022, Chicago, IL, USA.
- Future Changes in the Role of Ekman Heat Flux on Pacific SST variability, Oral, NCAR Climate Variability and Change Working Group, CESM Annual workshop, 2022 (Online).
- Air-sea Interaction Plays a Different Role in North Pacific Turbulent Heat Flux Exchange in Summer versus Winter, Poster, AGU Fall Meeting 2021, New Orleans, LA (Online).
- The Seasonally Varying Relationship between Air-Sea Fluxes and Large-scale SST in a Coupled Model Hierarchy, Oral, International Workshop for Midlatitude Air-Sea Interaction, 2021, Sapporo, Japan (Online).
- Control of Flow Separation on a Hump Model Using a Dielectric Barrier Discharge Plasma Actuator, Oral, Early Career Technical Conference, 2019, UAB, Birmingham, AL, USA.
- Investigation of Stratified Kelvin-Helmholtz Instability by Integro-Differential Scheme, Poster, 8th Annual College Of Engineering Poster Presentation, 2019, North Carolina A&T State University, Greensboro, NC, USA.

PROFESSIONAL SERVICE

Leadership

- Secretary, Graduate Student Association 2023 - 2024
  Department of Marine, Earth & Atmospheric Sciences, North Carolina State University
- Organizing Committee Member, 1st MEAS Symposium 2022
  Department of Marine, Earth & Atmospheric Sciences, North Carolina State University
- Steering Committee Member, Community Climate Committee 2020 - 2021
  Department of Marine, Earth & Atmospheric Sciences, North Carolina State University
- International Student Representative, Graduate Student Association 2020 – 2021
  Department of Marine, Earth & Atmospheric Sciences, North Carolina State University
- Publication Secretary, Engineering Students Association of Bangladesh (ESAB) 2013- 2015

Journal Review

Nature Communications, Journal of Climate, Geophysical Research Letters, Atmospheric Research, Journal of Geophysical Research: Atmospheres.

Outreach

Lectured on weather and climate and led hands-on weather experiments for rural and underrepresented high school students at NC State's SATELLITE Camp. May 2025

PROFESSIONAL DEVELOPMENT

- Workshop on Confronting Earth System Model Trends with Observations, March 2024, National Center for Atmospheric Research, Boulder, CO.
- CESM Tutorial Workshop, August 2021, National Center for Atmospheric Research, Boulder, CO (online).
- Python for Climate and Meteorology, March 2021, American Meteorological Society.
- Member: American Geophysical Union, American Meteorological Society.