Manabendra Saharia

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Current Affiliation

Assistant Professor
Dept. of Civil Engineering
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Research Bio

My primary interest is in developing techniques and systems for monitoring, forecasting, and mitigating natural hazards such as floods and droughts, with a special focus on the worst-affected regions of the world. My research seeks to understand the complex relationships between various aspects of the water cycle using data-driven and physics-based models.

Research Interests

Flood and drought forecasting, land surface and hydrologic modeling, radar and satellite precipitation, statistics, and machine Learning, crowdsourcing.

Professional Experience

2019-Present **Assistant Professor**, *Dept. of Civil Engineering*, Indian Institute of Technology Delhi.

2019 **Postdoctoral Research Associate**, NASA Goddard Space Flight Center, USA.
- A West Africa Land Data Assimilation System (LDAS) for Forecasting Extreme Hydrological Events

2017–2018 **Postdoctoral Researcher**, National Center for Atmospheric Research, Colorado, USA.
- Developing a real-time and distributed HUC-based modeling system for ensemble streamflow forecasting over large domains.
- Uncertainty quantification and sensitivity analysis of flood frequency estimates.

2013–2017 **Graduate Research Assistant**, *Advanced Radar Research Center*, The University of Oklahoma.
- The Flooded Locations And Simulated Hydrographs (FLASH). Funded by NOAA.

2011–2013 **Graduate Research Assistant**, *HWRL*, University of Texas at Arlington.
- Developed an ensemble forecasting system for the West Gulf River Forecast Center.

Education

2013–2017 **Ph.D. in Water Resources Engineering**, *University of Oklahoma*, Norman, OK.
- **Dissertation**: Characterization and Prediction of Flash Flood Severity.

2011–2013 **M.S. in Water Resources Engineering**, *University of Texas at Arlington*, Arlington, TX.
- **Thesis**: Ensemble Streamflow Forecasting For The Upper Trinity River Basin In Texas

2007–2011 **B.Tech. in Civil Engineering**, *National Institute of Technology, Silchar*, Assam, India.
- **Major Project**: Flood Forecasting in Multiple River Sections using Artificial Neural Networks

Academic Service

2020 Technical Committee, International Conference on Sustainable Water Resources Management (SWARM), Guwahati

2019 Conference Co-Chair, Computer Vision for Atmospheric Events Analysis (CVAE), ACPR 2019 Workshop, Auckland, New Zealand

In-progress Journal Publications

1. **Saharia, M.**, Kirstetter, P.E., Vergara, H., Gourley, J.J., Hong, Y., "Impact of rainfall spatial variability on flash flood severity".

Journal Publications

1. Sunghee Kim, Sadeghi, H., Limon, R.A., **Saharia, M.**, Seo, D.J., Philpott, A., Bell, F., Brown, J., He, K., 2018 "Assessing the Skill of Medium-Range Ensemble Precipitation and Streamflow Forecasts from the Hydrologic Ensemble Forecast Service (HEFS) for the Upper Trinity River Basin in North Texas", Journal of Hydrometeorology, 19, 1467–1483,
2. **Saharia, M.**, Kirstetter, P.E., Vergara, H., Gourley, J.J., Hong, Y., 2017. "Characterization of Floods in the United States", Journal of Hydrology 548, 524–535.
3. **Saharia, M.**, Kirstetter, P.E., Vergara, H., Gourley, J.J., Hong, Y., Giroud, M., 2017. "Mapping Flash Flood Severity in the United States", Journal of Hydrometeorology, 18, 397–411.
4. Li, W., Liu, C., Hong, Y., Zhang, X., Wan, Z., **Saharia, M.**, Sun, W., Yao, D., Chen, W., Chen, S., others, 2016. "A public Cloud-based China's Landslide Inventory Database (CsLID): development, zone, and spatiotemporal analysis for significant historical events, 1949-2011", Journal of Mountain Science 13, 1275–1285.
5. Li, W., Liu, C., Hong, Y., **Saharia, M.**, Sun, W., Yao, D., Chen, W., 2016. "Rainstorm-induced shallow landslides process and evaluation–a case study from three hot spots, China", Geomatics, Natural Hazards and Risk, 1–11.
6. Zhang, Y., Hong, Y., Wang, X., Gourley, J.J., Xue, X., **Saharia, M.**, Ni, G., Wang, G., Huang, Y., Chen, S., others, 2014. "Hydrometeorological Analysis and Remote Sensing of Extremes: Was the July 2012 Beijing Flood Event Detectable and Predictable by Global Satellite Observing and Global Weather Modeling Systems?", Journal of Hydrometeorology.
7. Shen, Y., Xiong, A., Hong, Y., Yu, J., Pan, Y., Chen, Z., **Saharia, M.**, 2014. "Uncertainty analysis of five satellite-based precipitation products and evaluation of three optimally merged multi-algorithm products over the Tibetan Plateau", International Journal of Remote Sensing 35, 6843–6858.
8. Roy, P., **Saharia, M.**, Choudhury, P., 2014. River Reaches Flood Flow Prediction using PRNN Models. International Journal of Civil, Structural, Environmental and Infrastructure Engineering Research and Development (IJCSEIERD) 1, 119–126.
9. **Saharia, M.**, Bhattacharjya, R.K., 2012. "Geomorphology-based time-lagged recurrent neural networks for runoff forecasting", KSCE Journal of Civil Engineering 16, 862–869.
10. Jain, S.K., Kumar, V., **Saharia, M.**, 2012. "Analysis of Rainfall and Temperature trends in North-East India", International Journal of Climatology.

Book Chapters

1. **Saharia, M.**, Li, L., Hong, Y., Wang, J., Adler, R. F., Policelli, F. S., Shahid, H., Irwn, D., Korme, T., and Okello, L. (2016). "Real-time hydrologic prediction system in East Africa through SERVIR", Hydrologic Remote Sensing - Capacity Building for Sustainability and Resilience, CRC Press, Taylor and Francis Group.
2. Shen, Y., Anyuan, X., Hong, Y., Jingjing, Y., Yang, P., Zhuoqi, C., and **Saharia, M.** (2016). "Uncertainty Analysis of Five Satellite-Based Precipitation Products and Evaluation of Three Optimally

Merged Multi-algorithm Products over the Tibetan Plateau", Hydrologic Remote Sensing - Capacity Building for Sustainability and Resilience, CRC Press, Taylor and Francis Group.

Invited Talks [Technical]

15 July 2020 "Role of Machine Learning in Civil Engineering", Faculty Development Program, Jorhat Engineering College, Assam.

20 Nov 2019 "Flood Defense - Plausible solutions rather than possible", *Transforming NE region through Science and Technology Interventions*, Assam Administrative Staff College, Guwahati.

15 Nov 2019 "A Water Alliance for Tomorrow", *River-research to Evolve Sustainable-projects for People with Eco-friendly Climate-resilient Technology (RESPECT)*, IIT Guwahati.

Grants and Fellowships

Both as Principal Investigator (PI) and Co-Principal Investigator (Co-PI)

August 2020 **Funding agency** - Office of the Principal Scientific Adviser to the Govt. of India, **Period** 2020-21, **Project title** - Developing a real-time localized flood awareness system for National Capital Region (NCR) using citizen science and satellite remote sensing, **[PI]**

July 2020 **Funding agency** - High Performance Computing Center, IIT Delhi, **Period** 2020-21, **Project title** - Establishing an LDAS over India, **[PI]**

Apr 2020 New Faculty Grant, Indian IIT Delhi

2019-2022 Young Faculty Incentive Fellowship, IIT Delhi

Mar 2018 Early Career Scientist Assembly (ECSA) Award, National Center for Atmospheric Research

Awards and Mentions

Mar 2017 Citation and cash award in the oral presentation category of the Student Water Conference, Oklahoma Water Resources Center, Mar 23, 2017.

Mar 2017 Advanced Radar Research Center Student Paper Cash Award *in recognition of research accomplishments and scholarly publication*

Feb 2017 First prize and cash award in the oral presentation category of the Student Research and Creativity Day, University of Oklahoma, Feb 24, 2017.

Jan 2017 Advanced Radar Research Center Student Paper Cash Award *in recognition of research accomplishments and scholarly publication*

Mar 2016 First prize and cash award in the oral presentation category of the Student Research and Creativity Day, University of Oklahoma, March 4, 2016.

Oct 2015 Student Recognition, President's Monthly Research and Development Highlights, Volume 10, Issue 7, University of Oklahoma

Oct 2015 Best Poster Award in the Graduate Student Poster Contest, Annual Meeting of the Society of Environmental Journalists (SEJ),Norman, October 7-11, 2015

Conference Presentations

(This is not a comprehensive list)

1. Newman, A.J., **Saharia, M.**, Stone, A., Holmes, K. (2019) "Understanding uncertainty contributions throughout the hydrologic modeling system in stochastic flood frequency analysis", AMS Annual Meeting, Phoenix, USA.

2. Wood, A.W., **Saharia, M.**, Clark E., Clark, M., Nijssen, B., (2019) "Application of an Ensemble Modeling Approach for Assimilating Observations to Improve Hydrologic and Streamflow Predictions", AMS Annual Meeting, Phoenix, USA.
3. **Saharia, M.**, Newman, A.J., Stone, A., Holmes, K. (2018) "Identifying potentially neglected sources of uncertainty in flood frequency estimation using a multi-model framework", AGU Annual Meeting 2018, Washington DC. **[Selected for Oral]**
4. Wood, A.W., Clark E., **Saharia, M.**, Clark, M., Nijssen, B., (2018) "Application of an ensemble-based modeling approach for assimilating observations to improve hydrologic and streamflow predictions", AGU Annual Meeting 2018, Washington DC. **[Oral]**
5. Wood, A.W., **Saharia, M.**, Clark, M., Bennett, A., Nijssen, B., Clark, E., Newman, A. (2018) "Development and Demonstration of Ensemble Hydrologic Data Assimilation Strategies for a Real-Time Distributed Regional Hydrologic Forecast System", AMS Annual Meeting 2018, Austin, Texas. **[Oral]**
6. **Saharia, M.**, Kirstetter, PE, Gourley, JJ., Vergara, H. and Hong, Y (2018) "Accounting for rainfall spatial variability in the prediction of flash floods", AMS Annual Meeting 2018, Austin, Texas. **[Poster]**
7. **Saharia, M.**, Wood, A.W., Clark, M., Bennett, A., Nijssen, B., Clark, E., Newman, A. (2017) "Distributed HUC-based modeling with SUMMA for ensemble streamflow forecasting over large regional domains", AGU Annual Meeting 2017 **[Poster]**
8. **Saharia, M.**, Kirstetter, PE, Gourley, JJ., Vergara, H. and Hong, Y. (2017) "Impact of Rainfall Spatial Variability on Flash Flood Severity", Student Water Conference, Oklahoma Water Resources Center, Mar 23-24, Oklahoma. **[Oral presentation award]**
9. **Saharia, M.**, Kirstetter, PE, Gourley, JJ., Vergara, H. and Hong, Y. (2017) "Impact of Rainfall Spatial Variability on Flash Flood Severity", EGU General Assembly, Apr 23-28, Austria. **[Oral]**
10. **Saharia, M.**, Kirstetter, PE, Gourley, JJ., Vergara, H. and Hong, Y. (2017) "How can we measure the severity of flash floods?", Research and Creativity Day, Feb 24, University of Oklahoma. **[Best Oral Presentation award]**
11. **Saharia, M.**, Kirstetter, PE, Gourley, JJ., Vergara, H. and Hong, Y. (2016) "Accounting for Rainfall Spatial Variability in Prediction of Flash Floods", AGU Fall Meeting, Dec 12-16, San Francisco. **[Oral]**
12. **Saharia, M.**, Kirstetter, PE, Gourley, JJ., Vergara, H. and Hong, Y. (2016) "Accounting for Rainfall Spatial Variability in Prediction of Flash Floods", 9th European Conference on Radar in Meteorology, Oct 10, Turkey. **[Oral]**
13. Hong,Y., Gourley, JJ., **Saharia, M.**, Flamig, Z., Clark, R., Zhang, K., Muthike, Denus., Hasan, Emad., Cappelaere, P., Frye, S., Handy, M., Nyaga, J. (2016) "Forecasting and Communicating Water-Related Disasters in Africa", SAGE, Nepal. **[Poster]**
14. **Saharia, M.**, Kirstetter, PE, Gourley, JJ., Vergara, H. and Hong, Y. (2016) "Mapping the flashiest regions of the United States", Research and Creativity Day, Mar 4 University of Oklahoma. **[Best Oral Presentation award]**
15. Kirstetter, PE., **Saharia, M.** , Gourley, JJ., Vergara, H. and Hong, Y. (2016) "Toward estimating the probability of flood severity over the United States", AMS Annual Meeting, 2016, New Orleans.[Oral]
16. **Saharia, M.**, Kirstetter, PE, Gourley, JJ., Vergara, H. and Hong, Y. (2015) "Mapping Flash Flood Severity in the United States", AGU Fall Meeting, Dec 14-18, San Francisco, California. **[Oral]**
17. **Saharia, M.**, Kirstetter, PE, Gourley, JJ., Vergara, H. and Hong, Y. (2015) "Where are the flashiest basins of the United States?", Annual Meeting of the Society of Environmental Journalists (SEJ), Oct 7-11, Norman, Oklahoma. [Poster] **[Best Poster Award]**
18. **Saharia, M.**, Kirstetter, PE, Gourley, JJ., Vergara, H. and Hong, Y. (2015) "Characterization and Prediction of Flash Flood Severity in the United States", 2015 International Symposium on Earth-Science Challenges, Sep 20-23, Norman, Oklahoma. **[Oral]**
19. **Saharia, M.**, Kirstetter, PE, Gourley, JJ., Vergara, H. and Hong, Y. (2014) "Characterization of Floods in the United States", AGU Fall Meeting, Dec 15-19, San Francisco, California. [Poster]
20. **Saharia, M.**, Seo., Dong-Jun, Corby, R. and He, K. (2013) "Short-range ensemble streamflow forecasting

of the Upper Trinity River – Evaluation via hindcasting experiments", AGU Meeting of the Americas, May 14-17, Cancun, Mexico. **[Oral]**

21. **Saharia, M.**, Seo., Dong-Jun, Corby, R. and Bell,F. (2013) "Increasing lead time in short-range streamflow forecasting via the Hydrologic Ensemble Forecast Service (HEFS)", NWS/OHD Seminar, Silver Spring, MD.
22. **Saharia, M.**, Bhattacharjya, R. K. and Satish, M. (2011) "Catchment Runoff Forecasting using Time-Lagged Recurrent Neural Networks".4th ASCE-EWRI International Perspective on Water Resources & the Environment (IPWE 2011), January 4-6, National University of Singapore, Singapore.
23. Roy, P., Choudhury, P. and **Saharia, M.** (2011). "River Reaches Flood Flow Prediction using TLRN models". 4th ASCE-EWRI International Perspective on Water Resources & the Environment (IPWE 2011), January 4-6, National University of Singapore, Singapore.
24. **Saharia, M.** and Bhattacharjya. R. K. (2011). "Comparison of ANN-based Runoff-prediction Models Trained by Eight Different Learning Algorithms".4th ASCE-EWRI International Perspective on Water Resources & the Environment (IPWE 2011), January 4-6, National University of Singapore, Singapore.
25. Roy, P., Choudhury, P. and **Saharia, M.** (2010). "Dynamic ANN Modeling for Flood Forecasting in a River Network". International Conference on Modeling, Optimization and Computing (ICMOC 2010), American Institute of Physics Conf. Proc., NIT Durgapur, India.

Teaching Experience

Sum, 2019-20	Course Instructor, CVL 282 Engineering Hydrology, IIT Delhi
II, 2019-20	Course Instructor, CVL 381 Design of Hydraulic Structures, IIT Delhi
II, 2019-20	Course Instructor, CVP 731 Simulation Lab II, IIT Delhi
I, 2019-20	Course Instructor, NEN 100 Professional Ethics and Social Responsibility, IIT Delhi
Spring 2017	Teaching Assistant for CEES 5843 Hydrology - Co-taught and organized lecture series
Spring 2016	Teaching Assistant for CEES 5903 Remote Sensing Hydrology)

Workshops Participated

Oct 2019	River-research to Evolve Sustainable-Projects for People with Eco-friendly Climate-resilient Technology (RESPECT), IIT Guwahati
Sep 2017	The 2016 Multi-Radar/Multi-Sensor (MRMS) HMT-Hydro Testbed Experiment (Served as Coordinator)
May-Jul 2015	National Flood Interoperability Experiment, Summer Institute, National Water Center, Tuscaloosa, Alabama (8 Weeks)
Jan 2011	HEPEX Workshop, National Weather Center, Silver Spring, Maryland (3 days)

Professional Memberships

American Geophysical Union
American Meteorological Society
American Society of Civil Engineers

Reviewer

Journal of Hydrology
Water Resources Research
Journal of Hydrometeorology
Journal of Flood Risk Management

Popular Writing

1. **Saharia, Manabendra** "Can a Sanctuary in Brahmaputra Save River Dolphins?", Nov 29, 2016. The Assam Tribune (Lead editorial)
2. **Saharia, Manabendra** "An ASEAN university in North-East", Mar 8, 2016. The Assam Tribune (Editorial)

Relevant Skills

Programming	R, Python, Bash, MATLAB, FORTRAN
Hydrology	LISF, SUMMA, FUSE, CREST/EF5, QGIS, SAC-SMA, CHPS/HEFS, WMS, Neuro Solutions, BASINS4, HEC-RAS
Web	PHP, SQL, HTML/CSS, Hugo
Miscellaneous	Git, LaTeX
Natural Languages	English (Native), Assamese (Native), Hindi (Professional), Bengali (Moderate), Persian (Basic and learning)

Personal Interests

Educational outreach, mentoring, volunteering, writing columns, Fitness