

# Poulomi Ganguli, Ph. D.

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Assistant Professor  
Department of Agricultural and Food Engineering,  
Specialization: Land and Water Resources Engineering  
Indian Institute of Technology Kharagpur, Kharagpur, India

## Research Interests

My research interest is at the intersection between hydrology and climate extremes, with particular emphasis on statistical modeling of ranges of hydroclimatic extremes while relating these statistical properties to physics and dynamics of the atmosphere. My research focuses on modeling and estimation of hydroclimatic events in multivariate context, which can help more accurate assessment of risk of extreme events, especially droughts, low flows and floods, and compound extremes in hydrology. I have applied my skills to different aspects of the field of hydroclimatic extremes, such as analysis of precipitation, both in point and regional scales.

## Areas of Research

*Hydroclimatology and hydrological extremes, Statistical hydrology, hydrometeorology, Hydroinformatics, data assimilation, Climate model evaluations, Climate change impact assessment on surface and subsurface hydrology, Climate dynamics, Complex networks, Climate-water-energy nexus*

## Education

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July 2008 – October 2012	<b>Indian Institute of Technology</b> , Bombay, India, CPI: 9.25/10 <b>Ph.D.</b> , Civil Engineering (Advisor: Prof. M. Janga Reddy) <b>Thesis:</b> Multivariate Frequency Analysis and Predictive Uncertainty Assessment of Droughts using copulas ( <b>Best Dissertation award in Civil Engineering</b> )
July 2005 – May 2007	<b>Indian Institute of Technology</b> , Kharagpur, India, CPI: 9.42/10 <b>M.Tech.</b> , Water Resources Development and Management (Advisor: Prof. M. K. Jha) <b>Thesis:</b> Development of computer tool for analyzing aquifer system
July 2001 – May 2005	<b>College of Agricultural Engineering, University of Agricultural Sciences Dharwad</b> , CPI: 8.97/10 ( <b>University Gold Medal</b> ) <b>B.Tech</b> , Agricultural Engineering (Advisor: Er. Vijay Kumar Palled) <b>Thesis:</b> Performance and Emission Characteristics of Biodiesel Fuel from Jatropha in a Direct Injection Compression Ignition Engine

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## Awards and Fellowships

- Fellowships**
- 2017: **Alexander von Humboldt** Research Fellowship (**Host Institute** Section: Engineering Hydrology, GFZ Potsdam, Germany)
  - 2016: Postdoctoral fellowship at McMaster Water Resources and Hydrologic Modeling Group (NSERC FloodNet, Canada), McMaster University
  - 2013: Postdoctoral fellowship at Northeastern University (NSF Expedition in Computing)
  - 2005-07: MHRD, Govt. of India scholarship to pursue M. Tech degree at IIT Kharagpur
  - 2005-06: Indira Gandhi postgraduate scholarship, University Grant Commission, New Delhi
  - 2001-05: Merit Scholarship from Govt. of Karnataka for pursuing B.Tech degree program
  - 2004-2007: TATA Motors Golden Jubilee Scholarship
  - 2002-2004: TATA Motors Silver Jubilee Scholarship
  - 2004: All India 27<sup>th</sup> rank (95.54 percentile) in Graduate Aptitude Test in Engineering (GATE) - 2004
  - 1999: TATA Hitachi Scholarship (at Grade 10<sup>th</sup>)

- Honors and Awards**
- 2013: **Best PhD dissertation award** in Civil Engineering, IIT Bombay
  - 2007: Employee performance award (July – December 2007) at Evalueserve India for team work
  - 2005: **University of Agricultural Sciences, Dharwad Gold Medal** for Securing First Rank in B.Tech
- Honors and Awards**
- 2005: Faruk Anwar Co. Raichur Gold Medal in B. Tech
  - 2005: Sri. Veerabhadrappa Channappa Mataldinni Gold Medal in B. Tech
  - 2005: Gangu Bai R Patil Cash award in B. Tech
  - 2005: Sri. S. Eshwarappa, Raichur cash award in B. Tech

## Professional Experience

July 2018 – present	<b>Assistant Professor</b> , Department of Agricultural and Food Engineering, IIT Kharagpur
June 2017 – June 2018	<b>Scientist (Research Fellow)</b> , Section Hydrology, Helmholtz Center Potsdam, GFZ German Research Center for Geosciences, Potsdam, Germany
May 2016 – May 2017	<b>Postdoctoral Fellow</b> , Department of Civil Engineering, McMaster University, Hamilton, Canada
May 2013 – December 2015	<b>Postdoctoral Fellow</b> , Department of Civil and Environmental Engineering, Northeastern University, Boston, USA
December 2012 – April 2013	<b>Assistant Professor</b> , School of Civil Engineering, Kalinga Institute of Industrial Technology (KIIT) University, Bhubaneswar, India
August 2007 – April 2008	<b>Patent Analyst</b> , Intellectual Property Group, Evalueserve, Gurgaon, India

## Referred Journal Publications (†in review, \*Submitted)

Citation Statistics: *Google scholar* Citations **334**, h-index **10**; *Scopus* Citations **246**, h-index **9**

ORCID: [orcid.org/0000-0002-2372-1121](http://orcid.org/0000-0002-2372-1121)

- 2018** 1. \***Ganguli, P.**, Merz, B. Extreme coastal water levels exacerbate fluvial flood hazards in Northwestern Europe. *Submitted*.
- 2017** 2. †**Ganguli, P.**, Coulibaly, P. Assessment of future changes in Intensity-Duration-Frequency curves for Southern Ontario using North American (NA)-CORDEX models with nonstationary methods. *Submitted* to Journal of Hydrology. MS#: HYDROL26633.
3. **Ganguli, P.**, Coulibaly, P. (2017). Does nonstationarity in rainfall require nonstationary Intensity-Duration-Frequency Curves? *Hydrology and Earth System Sciences*, 21(12):6461-6483. IF\* 4.437
4. **Ganguli, P.**, Kumar, D., Ganguly, A.R (2017). US power production at risk from water stress in a changing climate. *Nature Scientific Report*. 7 (11983), DOI: 10.1038/s41598-017-12133-9. IF 4.847 (*Featured as a Top 100 in Scientific Reports Earth Sciences Papers in 2017*)
- 2016** 5. **Ganguli, P.**, Ganguly, A.R. (2016). Space-time trends in US meteorological droughts. *Journal of Hydrology: Regional Studies*. 8, 235-259, IF 3.17
6. **Ganguli, P.**, Ganguly, A.R. (2016). Robustness of meteorological droughts in dynamically downscaled climate simulations. *Journal of the American Water Resources Association (JAWRA)*. 52(1): 138-167, IF 1.717
- 2015** 7. Ganguly, A.R., Kumar, D., **Ganguli, P.**, Short, G., Klausner, J. (2015). Nonstationarity and deep uncertainty: Water stress on US power production. *Computing in Science and Engineering Magazine*, 17(6): 53 – 60, IF 2.074

- 2014 8. Ganguly, A.R., Kodra, E.A., Banerjee, A., Boriah, S., Chatterjee, S., Chatterjee, S., Choudhary, A., Das, D., Faghmous, J., **Ganguli, P.**, Ghosh, S., Hayhoe, K., Hays, C., Hendrix, W., Fu, Q., Kawale, J., Kumar, D., Kumar, V., Liess, S., Mawalagedara, R., Mithal, V., Oglesby, R., Salvi, K., Snyder, P.K., Steinhäuser, K., Wang, D., Wuebbles, D (2014). Toward enhanced understanding and projections of climate extremes using physics –guided data mining techniques. *Non-linear processes in Geophysics*. 21, 777-795. IF: 1.394
9. **Ganguli, P.**, Reddy, M.J. (2014) Ensemble prediction of regional droughts using climate inputs and SVM-copula approach. *Hydrological Processes*. 28, 4989–5009. IF: 3.014
10. **Ganguli, P.** (2014) Probabilistic analysis of extreme droughts in southern Maharashtra using bivariate copulas. *ISH Journal of Hydraulic Engineering*. 20(1): 90-101. DOI: 10.1080/09715010.2013.843279. SJR: 0.158
- 2013 11. **Ganguli, P.**, Reddy, M.J. (2013) Probabilistic assessment of flood risks using trivariate copulas. *Theoretical and Applied Climatology*. 111 (1-2): 341-360. IF: 2.640
12. **Ganguli, P.**, Reddy, M.J. (2013) Analysis of ENSO based climate variability in modulating drought risks over Western Rajasthan in India. *Journal of Earth System Sciences*. 1: 253 – 269. IF: 0.955
13. **Ganguli, P.**, Reddy, M.J. (2013) Evaluation of trends and multivariate frequency analysis of droughts in three meteorological subdivisions of western India. *International Journal of Climatology*. 34(3): 911-928. IF: 3.76
14. Reddy, M.J., **Ganguli, P.** (2013) Spatio-temporal analysis and derivation of copula-based intensity-area-frequency curves for droughts in western Rajasthan (India). *Stochastic Environmental Research and Risk Assessment*. 27(8):1975-1989. IF: 2.629
- 2012 15. **Ganguli, P.**, Reddy, M.J. (2012) Risk assessment of droughts in Gujarat using bivariate copulas. *Water Resources Management*. 26(11): 3301-3327. IF: 2.848
16. Reddy, M.J., **Ganguli, P.** (2012). Bivariate flood frequency analysis of Upper Godavari River flows using Archimedean copulas. *Water Resources Management*. 26(14): 3995-4018. IF: 2.848
17. Reddy, M.J., **Ganguli, P.** (2012) Application of copulas for derivation of drought Severity-Duration-Frequency curves. *Hydrological Processes*. 26(11): 1672-1685. IF: 3.014
18. Reddy, M.J., **Ganguli, P.** (2012) Risk assessment of hydro-climatic variability on groundwater levels in the Manjara Basin aquifer in India using Archimedean copulas. *ASCE Journal of Hydrologic Engineering*. 17(12): 1345 – 1357. IF: 1.694

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\*indicates Impact Factor reported in the journal website

## Scholarly Presentations and Conference Proceedings

- 2018 1. **Ganguli, P.**, Merz, B. (2018). Risk of compound flooding from coastal and fluvial floods over Northwestern Europe. *EGU Abstract*, Vol. 20, EGU2018-1929, 2018.
- 2017 2. **Ganguli, P.** (2017). *Guest lecture* on Frequency Analysis in Hydrology: focused on flood frequency (probability) distributions. Department of Civil Engineering University of Manitoba, Winnipeg, Canada, November 9, 2017.
3. **Ganguli, P.**, Coulibaly, P. (2017). Assessing nonstationarity in rainfall extremes and changes in future design rainfall in NA-CORDEX regional climate models across Southern Ontario. Poster: The FloodNet Annual General Meeting, Montreal, June, 27-28, 2017.
4. **Ganguli, P.**, Coulibaly, P. (2017). Assessing nonstationarity in extreme rainfall records in Southern Ontario. Paper ID: 243896, Oral: ASCE-EWRI Congress, Sacramento, California, May, 21-25, 2017.
- 2016 5. **Ganguli, P.**, Coulibaly, P. (2016). Extreme rainfall nonstationary investigation and evaluation of nonstationary-based Intensity-Duration-Frequency (IDF) curves for Southern Ontario region in a changing climate. Poster: The FloodNet Annual General Meeting, Vaughn, Toronto, September 19, 2016.

- 2014 6. **Ganguli, P.**, Kumar, D., Yun, J., Short, G., Klausner, J., Ganguly, A.R. (2014). Water stress on US power production at decadal time horizons. Poster: AGU Fall meeting, San Francisco, California, December 15, 2014, paper no. GC13B-0633.
- 2013 7. **Ganguli, P.**, Ganguly, A.R. (2013). Severity-duration-frequency curves of meteorological droughts over US. **Oral:** AGU Fall meeting, San Francisco, California, December 12, 2013, paper no. H44C – 04.
8. Mawalagedara, R., **Ganguli, P.**, Ganguly, A. R., Oglesby R.J. (2013). Hydrology and water resources of Tropical Island and implications of global warming: Case studies over Puerto Rico. Poster: AGU Fall meeting, San Francisco, California, December 13, 2013, poster no. GC51A.
- Invited Talk** 9. **Ganguli, P.** (2013). Characterization and short-term prediction of droughts over India using copula-based approaches. Presented at Expedition biweekly meeting at Northeastern University, Boston, MA, July 26, 2013.
- 2012 10. **Ganguli, P.**, Reddy, M.J. (2012). Copula-based drought severity-area-frequency analysis in Western Rajasthan, India. 21st Century Watershed Technology: Improving Water Quality and Environment, **Oral:** ASABE, Bari, Italy, May 27-June 1st, 2012. (Received travel grants from **Department of Science & Technology** and **Council of Scientific and Industrial Research**, India). DOI: 10.13031/2013.41421.
- 2011 11. **Ganguli, P.**, Reddy, M.J. (2011) Bivariate Archimedean copula in drought frequency analysis in Maharashtra. **Oral:** International Congress of Environmental Research, SVNIT Surat, India, December 15-17, 2011.
12. **Ganguli, P.**, Reddy, M.J. (2011). Hydro-climatic variability study of Manjara Basin aquifer using bivariate Archimedean copula. **Oral:** International Conference on Sustainable Water Resources Management and Climate Change Adaptation, NIT Durgapur, India, February 17-19, 2011.
- 2010 13. **Ganguli, P.**, Reddy, M.J. (2010). Probabilistic characterization of hydrologic extremes using bivariate copulas. **Oral:** 9th International Conference on Hydro-science and Engineering (ICHE-2010). IIT Madras, India, August 2-5, 2010.
14. Reddy, M.J., **Ganguli, P.** (2010). Multivariate statistical analysis of flood flows using copulas. **Oral:** National conference on Sustainable Water Resources Management and Impact of Climate Change (SWRM-2010). BITS-Pilani campus, Hyderabad, India, March 5-6, 2010.
- 2009 15. **Ganguli, P.**, Reddy, M.J., Rastogi, A.K. (2009). Estimation of groundwater recharge using Support Vector Regression. **Oral:** FSES-2009, IIT Kharagpur, India, December 17-19, 2009
- 2007 16. **Ganguli, P.**, Jha, M. K. (2007). Computer-aided analysis of well interference in confined and unconfined aquifer systems. **Oral:** National Conference on Technologies for Sustainable Utilization of Natural Resources (TechSUNR-2007). JITM Paralakhemundi, Orissa, India, February 24-25, 2007.

## Book Chapter

Blumenfeld, L., Hall, T., Henderson, H., Bressler, L., Moskos, C., **Ganguli, P.**, Kumar, D., Ganguly, A. R. (2017). Climate and human stresses on the water-energy-food nexus. Ed., S. Shekhar, H. Xiong, X. Zhou. Encyclopedia of GIS, Springer, 179 - 188.

## Copyright/Patent

Jha, M.K., **Ganguli, P.** (2007). Aquifer Manager: A Comprehensive Suit of Computer Tools for Forward and Inverse Modeling of Groundwater Systems. Registration No. SW-3559/2007, copyrighted on July 16, 2007 by SRIC IIT Kharagpur.

## Reports

- Ganguly, A. R., Ganguli, P., and Kumar, D. (2014). Water Stress on U.S. Power Production at Decadal Time Horizons. United States. DOI:10.2172/1339441.

- Expedition Annual Report (2015) for the period 09/01/2014-8/31/2015, Collaborative Research: Understanding Climate Change: A Data Driven Approach, **Contributed to Climate Extremes and Uncertainty** section. NSF Award ID 1029771.

## Non-peer Reviewed Publications

- **Ganguli, P.** (2016) Copula theory: Introduction and application to meteorological droughts. LAP Lambert Academic Publishing. ISBN 978-3-659-96041-3, pp. 277.
- **Ganguli, P.** (2007) Development of computer tools for analyzing aquifer systems. M. Tech. Thesis, Indian Institute of Technology Kharagpur, India.

## Teaching, Mentoring & Administrative Experience

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| <b>Teaching</b>                  | <ul style="list-style-type: none"> <li>▪ <b>Time Series &amp; Spatial Statistics</b>, assisted PI at Northeastern University, graduate course (~ 30 students); Fall 2013</li> <li>▪ <b>Fluid Mechanics II</b>, KIIT University, as an <b>Instructor</b> for the undergraduate Civil Engineering (~ 85 students); Spring 2013</li> <li>▪ <b>Fluid Mechanics &amp; Hydraulic Machinery</b>, KIIT University, as an <b>Instructor</b> for the undergraduate Electrical Engineering (~ 85 students); Spring 2013</li> <li>▪ <b>Fluid Mechanics Lab</b>, KIIT University, as an <b>Instructor</b> for the undergraduate Civil Engineering (~ 85 students); Spring 2013</li> </ul>   |
| <b>Teaching Assistant</b>        | <ul style="list-style-type: none"> <li>▪ <b>Applied Hydraulic Engineering</b>, IIT Bombay, undergraduate course (~ 40 students); Spring 2012</li> <li>▪ <b>Probability &amp; Statistics for Civil Engineers</b>, IIT Bombay, dual degree Honors course (~ 30 students); Spring 2009</li> <li>▪ <b>Advanced Experimental Fluid Mechanics</b>, IIT Bombay, graduate course (~ 12 students); Spring 2009</li> <li>▪ <b>Fluid Mechanics Lab</b>, IIT Bombay, undergraduate course; Spring 2010</li> <li>▪ <b>Fluid Mechanics Lab</b>, IIT Bombay, undergraduate course; Spring 2011</li> </ul>   |
| <b>Mentoring and Outreach</b>    | <ul style="list-style-type: none"> <li>▪ Janet Yun, 'Role of model uncertainty and internal variability in estimating water stress on US power production', undergraduate student in Civil Engineering and research intern at Sustainability &amp; Data Sciences Lab, Northeastern University, Spring 2014 (in collaboration with Prof. A. Ganguly)</li> <li>▪ Domenico Rusciano, graduate student in Energy System Sciences and research intern at Sustainability &amp; Data Sciences Lab, Northeastern University, Summer 2014 (in collaboration with Prof. A. Ganguly)</li> <li>▪ S Sarangi, S Mohanty, Y Yadav, A Kumar, S Satpathy, &amp; G Kumar, undergraduate students at School of Civil Engineering, KIIT University, Spring 2013 (in collaboration with Dr. R. Bayya)</li> <li>▪ <b>"Disrupt Climate Data" Challenge. The fifth Climate Change Annual Symposium, York University, Toronto, organized by Ontario Climate Consortium</b>, May, 11-12, 2017. Invited as a <b>mentor of student team</b> to help them understand the challenges of translating climate uncertainty into actionable insights for impact assessment.</li> <li>▪ Nominated to serve as a judge for the Outstanding Student Poster and PICCO (OSPP) Award contest at the EGU General Assembly, 2018.</li> </ul> |
| <b>Administrative Experience</b> | <ul style="list-style-type: none"> <li>▪ Faculty Advisor, 2<sup>nd</sup> year undergrad students in Civil Engineering, KIIT University; Spring 2013</li> <li>▪ Department Placement coordinator for Ph.D. students in Civil Engineering, IIT Bombay; December 2011~ August 2012</li> </ul>   |

### Contributor to Sponsored Projects

- May, 2013-December 2014: Expeditions in Computing: Understanding Climate Change A Data-driven Approach, NSF Award # 1029711, 5 year \$10 M funded by the **National Science Foundation (NSF)**. Project team led by University of Minnesota with associate partner (Co-PI) Prof. A. R. Ganguly from Northeastern University
- February 2014 – September 2014: Water Availability in United States under Climate and Population Change, DOE purchase order # DE – AR0000482, 1 year \$ 85 k funded by **Advanced Research Project Agency – Energy (ARPA-E)**, a wing of US Dept. of Energy (Role: self as a **Co-Principal Investigator**)
- January 2015 – December 2015: High-dimensional Statistical Machine Learning for Spatiotemporal Climate Data, NSF Award # 1447587, 3 year \$ 3.5 M funded by **NSF**, PI Prof. A. R. Ganguly from Northeastern University
- May 2016 – Current: NSERC FloodNet Canada, 5 year C\$ 11M, funded by the **Natural Science and Engineering Research Council of Canada (NSERC)**, PI Prof. Paulin Coulibaly from McMaster University; project comprises 21 sub-projects involving 12 universities and different partners from Government, industry and non-profit organizations across Canada

### Contributor to Proposals

- 2015** ▪ Collaborative Research: Data Science for Water Sustainability - Adapting to Climate Change; Budget: \$5 M in 5 years with 5 universities
- 2014** ▪ Water Availability in the United States under Climate & Population Change; Budget \$85k for 1 year
- 2013** ▪ PREPARED: Precipitation and Runoff Extremes Projections for Adaptive Resilience & Effective Decisions; Budget: \$2.9 M in 5 years
- 2013** ▪ Collaborative Research: Water in the 21st Century: A Data-Guided Approach; Budget: \$10 M in 5 years with 5 universities

### Professional Engagement

#### Reviewer

- **Total number of manuscripts reviewed since 2012: 45**, Journal of Hydrology (21), Advances in Water Resources (2), Nature Scientific Report (2), Journal of Earth System Sciences (3), ISH Journal of Hydrologic Engineering (3), Hydrology (1), Atmospheric Research (1), Hydrological Sciences Journal (1), Water Resources Research (1), Journal of Computing in Civil Engineering (1), International Journal of Climatology (1), Computers and Electronics in Agriculture (1), Water (1), Journal of Integrated Disaster Risk Management (1), Environmental Processes (1), Natural Hazard Earth System Sciences Discuss. (1), Global and Planetary Change (1), Journal of Hydrologic Engineering (1), Hydrology and Earth System Sciences (1)
- **Outstanding reviewer recognition** from **Journal of Hydrology**, October 2016, June 2017.
- **Outstanding reviewer recognition** from **Advances in Water Resources**, May 2018.

#### Member

- Indian Society of Hydraulics (Life Member, Membership #: LM 910), European Geophysical Union (Regular)