

Dr. Ing. ANKIT AGARWAL

Complexity Science, Potsdam Institute for Climate Impact Research, Germany
🌐 <https://www.pik-potsdam.de/members/agarwal>,
✉ agarwal@pik-potsdam.de; ✉ aagarwal@uni-potsdam.de
☎ +49-152-1745-1022, 📞 +49 331 977 5433, Skype ID: akkyiitd

Academic Appointments

Potsdam Institute for Climate Impact Research, Potsdam, Germany Postdoctoral candidate in Transdisciplinary Concepts and Methods (Research domain IV) under the supervision of Prof. Jürgen Kurths.	Oct'18-present
Potsdam Institute for Climate Impact Research, Potsdam, Germany Guest doctoral researcher in Transdisciplinary Concepts and Methods (Research domain IV) under the supervision of Prof. Jürgen Kurths.	Oct'15- Sept'18
GFZ German Research Centre for Geosciences, Potsdam, Germany Visiting doctoral researcher in Helmholtz Centre Potsdam, Section 5.4 hydrology under the supervision of Prof. Bruno Merz.	Oct'15- Sept'18
University of Potsdam, Potsdam, Germany Doctoral researcher at "Natural Hazards and Risk in a changing world (NatRiskChange)" Graduate school funded by DFG.	Oct'15- Sept'18
Technical University-Dresden, Germany Visiting researcher at the "Institute for Hydrology and Meteorology, Technical University-Dresden, Germany" funded by DAAD.	Sept'14- March'15

Education

Ph.D. , Hydrology Institute for Earth and Environmental Sciences, University of Potsdam, Potsdam, Germany <i>Advisors:</i> Prof. Dr. H.C. Mult. Jürgen Kurths, Potsdam Institute for climate impact research, Germany Prof. Dr. Bruno Merz, GFZ Potsdam, Germany Dr. Norbert Marwan, Potsdam Institute for climate impact research, Germany PhD thesis: https://publishup.uni-potsdam.de/frontdoor/index/index/docId/42395	Oct'15- Sept'18
Master of Technology (M. Tech.), Water Resource Engineering (1st Rank holder) Indian Institute of Technology, New Delhi, India Institute for Hydrology and Meteorology, Technical University of Dresden, Germany <i>Advisors:</i> Prof. Rakesh Khosa, Indian Institute of Technology, New Delhi, India Prof. Dr. Christian Bernhofer, Technical University, Dresden, Germany Dr. Maheswaran Rathinasamy (Inspire Faculty at IIT-Delhi, India)	July'13-July'15
Bachelor of Engineering (B.E), Civil Engineering (2nd Rank holder) M.B.M. Engineering College, Jai Narayan Vyas University of Jodhpur, Rajasthan, India	Aug'09-Aug'13

Awards/Scholarships

- Awarded "start-up funding for 9 months by **DFG German Research Foundation** to pursue a postdoc at Potsdam Institute for Climate Impact Research, Germany.
- Fellowship to pursue doctoral research at Graduate school "Natural Hazard and Risk in a changing world (NatRiskChange)" by **DFG German Research Foundation**.

- **Singapore University of Technology and Design (SUTD)** Graduate Award Fellowship.
- **DAAD fellowship** to complete research work in Technical University-Dresden (Germany).
- Alumni Award for being department and University topper in M.B.M. Engineering College (Bachelor of Engineering) in 2012
- MHRD fellowship to Pursue Master of Technology at Indian Institute of Delhi, India
- Central Sector Scheme (NSF) Award, 2009 for college and university students by the government of India for showing academic excellence.
- Best Student Award for the year 2008 in high school.
- Awarded “yellow belt” in Rajasthan State Judo Championship (India).

Research Interests

- Developing multiscale approach and tools for the data driven analysis of complex systems in hydro-climatology. The theoretical frameworks I use for the purpose are Networks, Nonlinear Data Analysis, Wavelets and Applied Statistics (statistics of extreme/rare events, statistical/machine learning, and different flavors of regression).
- Stochastic Hydrology, Hydrological Modelling, Geomorphology, Scaling Concepts, Application of wavelet analysis in understanding the hydrologic system. Hydrologic forecasting.

Professional training

International Teaching Professional – I attended certified course on International Teaching Professional (ITP) at Potsdam Graduate School, University of Potsdam from August 2017 to September 2018. The program includes “didactic training on teaching”, “independent planning and implementation of a university course”, “mutual teaching observation of the other participants and giving feedback” and “subject-specific feedback by a mentor experienced in academic teaching”.

Professional training workshop on “**Water and Environmental Management**” led by University of Pierre & Marie Curie and Veolia.

Certified professional training workshop on various key aspects such as “**argumentation in scientific writing**”, “**transparent and efficient data storage**”, “**data management**” “**Slides writing**” and “**communication and presentation**” organized by Potsdam Graduate School, University of Potsdam.

Publications

1. Peer reviewed articles

Agarwal, A., Maheswaran, R., Marwan, N., Caesar, L., and Kurths, J.: Wavelet-based multiscale similarity measure for complex networks, *European Physics Journal-B*, <https://doi.org/10.1140/epjb/e2018-90460-6>.

Agarwal, A., Marwan, N., Maheswaran, R., Merz, B. and Kurths, J.: Quantifying the roles of single stations within homogeneous regions using complex network analysis, *Journal of Hydrology*, doi:10.1016/j.jhydrol.2018.06.050, 2018.

Agarwal, A., Marwan, N., Rathinasamy, M., Merz, B. and Kurths, J.: Multi-scale event synchronization analysis for unravelling climate processes: a wavelet-based approach, *Nonlinear Process. Geophys.*, 24(4), 599–611, doi:10.5194/npg-24-599-2017, 2017.

Agarwal, A., Marwan, N., Rathinasamy, M., Ozturk, U., Merz, B. and Kurths, J.: Optimal Design of Hydrometric Station Networks Based on Complex Network Analysis, *Hydrol. Earth Syst. Sci. Discuss.*, 1–21, doi:10.5194/hess-2018-113, 2018.

Ozturk, U., Marwan, N., Korup, O., Saito, H., **Agarwal, A.**, Grossman, M. J., Zaiki, M., and Kurths, J.: Complex networks for tracking extreme rainfall during typhoons, *Chaos*. <https://aip.scitation.org/doi/pdf/10.1063/1.5004480>.

Shukla, R., **Agarwal, A.**, Sachdeva, K., Kurths, J., and Joshi, P.K: Climate change perception: Analysis of climate change and risk perception among farmer types of Indian Western Himalayas. *Climatic Change*. <https://link.springer.com/article/10.1007/s10584-018-2314-z>

Rathinasamy, M., **Agarwal, A.**, Parmar, V., Khosa, R., & Bairwa, A. (2017). Partial wavelet coherence analysis for understanding the standalone relationship between Indian Precipitation and Teleconnection patterns. *arXiv preprint arXiv:1702.06568*.

Agarwal, A., Maheswaran, R., Kurths, J., & Khosa, R. (2016). Wavelet Spectrum and self-organizing maps-based approach for hydrologic regionalization-a case study in the western United States. *Water Resources Management*, 30(12), 4399-4413.

Agarwal, A., Maheswaran, R., Sehgal, V., Khosa, R., Sivakumar, B., & Bernhofer, C. (2016). Hydrologic regionalization using wavelet-based multiscale entropy method. *Journal of Hydrology*, 538, 22-32.

Bronstert, A., **Agarwal, A.**, Boessenkool, B., Crisologo, I., Fischer, M., Heistermann, M., Köhn-Reich, L., López-Tarazón, J. A., Moran, T., Ozturk, U., Reinhardt-Imjela, C. and Wendi, D.: Forensic hydro-meteorological analysis of an extreme flash flood: The 2016-05-29 event in Braunsbach, SW Germany, *Sci. Total Environ.*, 630, 977–991, doi:10.1016/j.scitotenv.2018.02.241, 2018.

Ozturk, U., Wendi, D., Crisologo, I., Riemer, A., **Agarwal, A.**, Vogel, K., López-Tarazón, J. A. and Korup, O.: Rare flash floods and debris flows in southern Germany, *Sci. Total Environ.*, 626, 941–952, doi:10.1016/j.scitotenv.2018.01.172, 2018.

Bronstert, A., **Agarwal, A.**, Boessenkool, B., Fischer, M., Heistermann, M., Köhn-Reich, L., Moran T., Wendi, D. (2017): The flood of Braunsbach on May 29, 2016 - the origin, course and damage of a "centuries event". Part 1: Meteorological and hydrological analysis- hydrology & water management, 61, (3), 150-162; DOI: 10.5675 / HyWa_2017,3_1

Vogel, K., Ozturk, U., Riemer, A., Laudan, J., Sieg, T., Wendi, D., **Agarwal, A.**, Rozer, V., Korup, O., Thieken, A (2017): The flood of Braunsbach on May 29, 2016 - the origin, course and damage of a "centuries event". Part 2: Geomorphological processes and damage analysis - Hydrology & Water Management, 61, (3), 163-175; DOI: 10.5675 / HyWa_2017,3_2.

2. Submitted peer reviewed articles

Agarwal, A., Marwan, N., Maheswaran, R., Krishnan, R., Kurths, J., and Merz, B.: Unraveling the spatial diversity of Indian precipitation teleconnections. (Scientific Reports- submitted in July 2018).

Agarwal, A., Caesar, L., Marwan, N., Maheswaran, R., Merz, B., and Kurths, J.: Detection of short- and long-range teleconnections in SST patterns on different time scales. (Climate dynamics- submitted in Sept 2018).

Buschmann, S., Hoffmann, P., Agarwal, A., Marwan, N., and Nocke, T.: GPU-based, interactive Exploration of large spatio-temporal Climate Networks. (Computer Networks)

Ekhtiari, N., Agarwal, A., Marwan, N., and Donner, R.: Disentangling the multi-scale interdependence between precipitation and sea-surface temperature: A coupled networks approach. *Chaos: An interdisciplinary journal*.

3. Book Chapters

Agarwal, A., Marwan, N., Ozturk, U., & Maheswaran, R. (2019). Unfolding Community Structure in Rainfall Network of Germany Using Complex Network-Based Approach. In *Water Resources and Environmental Engineering II* (pp. 179-193). Springer, Singapore.

Chaudhary, S., **Agarwal, A.**, & Nakamura, T. (2019). Rainfall Projection in Yamuna River Basin, India, Using Statistical Downscaling. In *Water Resources and Environmental Engineering II* (pp. 15-23). Springer, Singapore.

4. Conference proceeding and workshop presentation

Ankit Agarwal, Norbert Marwan, Rathinasamy Maheswaran, Bruno Merz, Raghavan Krishnan, Juergen Kurths: Unravelling Regionwise Teleconnections of Indian Rainfall Using Event Synchronization-Based Multiscale Nonlinear Method. *Asian Oceanic Geosciences meeting-2018; 06/2018*.

Ankit Agarwal, Norbert Marwan, Rathinasamy Maheswaran, Bruno Merz, Juergen Kurths: Complex network-based approach for identification of influential and expandable station across rainfall network. *European Geophysical Union 2018; 04/2018*.

Ankit Agarwal, Norbert Marwan, Rathinasamy Maheswaran, Bruno Merz, Juergen Kurths: Multiscale complex network analysis: An approach to study spatiotemporal rainfall pattern in south Germany. European Geophysical Union 2017; 04/2017.

Jonas Laudan, Ugur Öztürk, Tobias Sieg, Dadiyorto Wendi, Adrian Riemer, **Ankit Agarwal**, Viktor Rözer, Oliver Korup, Annegret Thieken, and Kristin Vogel. A retrospective analysis of the flash flood in Braunsbach on May 29th, 2016. EGU2017-13464, European Geophysical Union 2016, Vienna; 04/2017.

Axel Bronstert, **Agarwal Ankit**, Boessenkool Berry, Fischer Madlen, Heistermann Maik, Köhn-Reich Lisei, Moran Thomas, and Wendi Dadiyorto. The Braunsbach Flashflood of May 29, 2016: A forensic analysis of the meteorological origin and the hydrological development an extreme hydro-meteorological event. EGU2017-2942, European Geophysical Union 2016, Vienna; 04/20167.

Ankit Agarwal, Norbert Marwan, Rathinasamy Maheswaran, Ugur Ozturk, Bruno Merz, Juergen Kurths: Multiscale event synchronization analysis for unraveling climate processes: A wavelet-based approach. American Geophysical Union 2016, San Francisco; 12/2016

Ankit Agarwal, Norbert Marwan, Rathinasamy Maheswaran, Ugur Ozturk, Bruno Merz, Juergen Kurths: Multiscale event synchronization measure: A wavelet-based approach. Perspectives in Nonlinear Dynamics 2016, Humboldt-University Berlin, Germany; 07/2016, DOI:10.13140/RG.2.2.16589.64485.

Ugur Ozturk, **Ankit Agarwal**, Norbert Marwan, Jürgen Kurths, Oliver Korup: Spatiotemporal Pattern of Seasonal Extreme Rainfall over Japan Using Complex Networks. International school and conference of network science, Seoul 2016, South Korea; 05/2016

Ankit Agarwal, Rathinasamy Maheswaran, Juergen Kurths, Rakesh Khosa: Wavelet Spectrum and Self-Organizing Maps-Based Approach for Hydrologic Regionalization -a Case Study in the Western United States. Water Resources Management, European Geophysical Union-2016; 04/2016

Ankit Agarwal, Maheswaran Rathinasamy, Rakesh Khosa: Hydrologic Regionalization Using Wavelet Based Multi-Scale Entropy Method. American Geophysical Union-2015, San Fransisco, USA; 12/2015, DOI:10.13140/RG.2.1.2155.5289

5. Technical Reports (In German)

Agarwal, A., B. Boessenkool, M. Fischer, I. Hahn, L. Köhn, J. Laudan, T. Moran, U. Oztürk, A. Riemer, V. Rözer, T. Sieg, K. Vogel, D. Wendi, A. Bronstert, A. THIEKEN (2016): Die Sturzflut in Braunsbach, Mai 2016 - Eine Bestandsaufnahme und Ereignisbeschreibung. Taskforce im Rahmen des DFG-Graduiertenkollegs Natural Hazards and Risks in a Changing World, Universität Potsdam. 20 S.

6. Thesis

Ankit Agarwal. "Unravelling spatio-temporal climatic patterns using multi-scale complex network." Ph.D. diss., University of Potsdam, Potsdam, Germany, 2018. DOI: 10.25932/publishup-42395

Ankit Agarwal. "Hydrologic Regionalization Using Wavelet based Multiscale Entropy Technique." M.Tech, Indian Institute of Technology, DELHI, 2015. DOI: 10.13140/RG.2.1.2175.5287

7. Scientific Blogs

Ankit Agarwal. Quantifying the Roles of Single Rain Gauges within Homogeneous Regions of a Rainfall Network. Scientific Trends 2018.

Roopam Shukla and **Ankit Agarwal**. Do Perceptions of Climate Change and its Impacts Differ Among Farmers in Indian Western Himalayas? Scientific Trends 2019.

Teaching Experience



Experimental course (Field work)



Classroom Teaching

- Hydrometric methods (measurement of discharge and soil moisture) in the Harz Mountains.

Spring 2016: Bachelor students (2nd year)



- Hydrometric methods (measurement of discharge and soil moisture) in the Harz Mountains

Spring 2017: Bachelor students (2nd year)



- MATLAB Programming

Summer 2017: Master students (1st year)



Professional affiliation and Activities

- American Geophysical Union.
- European Geophysical Union.
- Young Hydrologist Society
- **Referee for Journals:** Journal of Hydrology, International Journal of Biometeorology, EPL, Acta Geophysica, Chaos, Renewable and sustainable energy etc.

Technical Expertise

Computer Programming

- Proficient in MATLAB, R, and Python. Previous experience with C (certified with NIIT), and FORTRAN

Word Processing Applications

- TEX (LATEX, BIBTEX), most general word processing packages (for Windows, OS X, and Linux platforms)

Operating Systems

- Apple OS X, Linux, UNIX and Microsoft Windows family

Presentation tools

- Keynote, Latex classes, other general presentation packages (for Windows and Linux platforms)

Mathematics

- Dynamical Systems, Linear Algebra, Complex Networks, Graph Theory, Stochastic Processes, Applied Mathematics, Real and Complex Analysis, Wavelets, Recurrence plots.

Other Academic Activities

1. Courses attended during Ph.D.

Hydrological methods of risk and damage estimation, Experimental Hydrology, Complex network analysis, Recurrence plots, Hydrometeorology data, and processes: From observation to modeling, copula method, Bayesian network approach, Uncertainties in environmental data, 'R' programming.

2. Task force Activity:

Braunschbach Flash Flood 2016 (Intense field work for data collection) || Reports and papers are available online.

3. Networks and collaboration

Dr. Maheswaran Rathinasamy (MVGR College of Engineering, India)

- Visited MVGR College of Engineering, Vizianagaram in August 2016 for 3 weeks.
- Presented work in a seminar organized for Bachelor students

Prof Tai Nakamura, Asian Institute of Technology, Thailand

- The current project in collaboration with Siddarth Chaudhary at Asian Institute of Technology: Identification of Extreme Rainfall-induced Natural Hazards Using Complex Network Analysis

Prof. Bellie Sivakumar, New South Wales University, Australia

- Finished one collaborated project: Hydrologic Regionalization using wavelet-based multiscale entropy method

4. Completed Academics projects during master (2013-2015)

Hydrologic Regionalization using Wavelet based Multi-scale Entropy method (*Sept'14- April '15*).

Description: A new technique "wavelet based multi-scale entropy" is introduced and used to

regionalize the entire catchments in the United States.
K-means clustering is employed to cluster them in a homogenous group.

Statistical downscaling of GCM outputs using SVM and GP models and future extreme event modeling, India (May- Aug'14)

Description: Project aimed at modeling and predicting monthly precipitation in nearby future using downscale data of outputs of GCM in Krishna river basin, India.

<https://sites.google.com/site/climaticdownscalingtool/home>

Indian Institute of Technology parking lot analysis and recommendation (Jan. - April'14)

Description: Led my team of four members in the Modelling of parking lots to accommodate peak inflows along with efficient use of parking space using GPS, LIDAR, ARC-GIS and Google Earth.

5. Field work during Bachelor (2009-2013)

Field Intern: Delhi Metro Rail Corporation Ltd. (A joint venture of India and Govt. of Delhi) (May-June'12)

- Successfully done the site work in Jaipur Metro construction.
- To understand the various design structure in drawing to execute them on site with an exploration of fundamental concepts.

Field Intern: Rajasthan State Road Development & Construction Corporation Ltd. (Government of Rajasthan Undertaking) (June-July'11)

- Successfully done the Site work at the construction of Police headquarter in Jaipur.
- To understand the various design structure in drawing to execute them on site with Exploration of fundamental concepts.

Languages

Proficient in English and Hindi and other regional languages.

Important links

Publons: Certified academic journal review profile

<https://publons.com/researcher/1644094/ankit-agarwal/>

ResearchID

[X-6301-2018](#)

ORCID

[0000-0001-8572-7046](#)

References

1. Prof. Dr. Jürgen Kurths

Potsdam Institute for Climate Impact Research
Head of Research Domain Transdisciplinary Concepts & Methods
Email: Kurths@pik-potsdam.de

3. Dr. Norbert Marwan

Potsdam Institute for Climate Impact Research
Deputy co-chair of research domain Transdisciplinary Concepts and Methods
Speaker of the flagship project Time series analysis
Email: marwan@pik-potsdam.de

2. Prof. Dr. Bruno Merz

GFZ Helmholtz center, Potsdam, Head Section 5.4
Hydrology
Email: bmerz@gfz-potsdam.de

4. Prof. Dr. Christian Bernhofer

Director of Institute, Professor, and head of Meteorology.
Department of Hydrology and Meteorology, Technical University, Dresden, Germany
Email: christian.bernhofer@tu-dresden.de

5. Prof. Dr. Manfred Buchroithner

Director of Institute, professor and head of Cartography Institute
for Cartography
Technical University, Dresden, Germany
Email: manfred.buchroithner@tu-dresden.de

7. Dr. Raghavan Krishnan

Scientist G, Indian Institute of Tropical Meteorology
Email: krish@tropmet.res.in

6. Prof. Dr. Rakesh Khosa

Program coordinator, Professor
Water Resource Engineering Department, Indian Institute
of Technology, Delhi, India
Email: Rakesh.khosa@gmail.com

8. Dr. Maheswaran Rathinasamy

Associate Professor at MVGR college of Engineering,
Vizianagaram, India
Former Humboldt fellowship Awardee at Potsdam
Institute for Climate Impact Research and Inspire faculty
at IIT-Delhi.
Email: maheswaran27@yahoo.co.in