Anamika Shreevastava
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Education

2016 – 2020	🔖	**Ph.D., Purdue University** Department of Civil and Environmental Engineering, Interdisciplinary Graduate Program in Ecological Sciences and Engineering Thesis: *Dynamics of fractal intra-urban heat islets* Advisor: Prof. P. Suresh C. Rao
2014 – 2016	🔖	**M.S., Purdue University** Department of Civil and Architectural Engineering Thesis: *Estimating anthropogenic heat flux from building energy usage for different Urban Land Cover Land Use types at city-scale*
2010 – 2014	🔖	**B. Tech., Indian Institute of Technology, Roorkee** Department of Civil Engineering Thesis: *Designing an intensive urban storm-water drainage network and a compact, cost-efficient wastewater treatment plant for the IIT Roorkee campus.*

Professional Appointments

2021 – ongoing	🔖	**NASA Postdoctoral Program Fellow** Jet Propulsion Laboratory, California Institute of Technology Research focus: *Extreme heat impacts in large metropolitan cities* Advisor: Dr. Glynn Hulley

Research Interests

Addressing the inequity of extreme weather impacts

🔖 Who suffers the brunt of extreme heat in cities? What can we do toward environmental and climate justice and judiciously alleviate the burden from those who most bear it?

Urban micro-climate monitoring and remote sensing

🔖 Urban heat islands are spatially heterogeneous. Where in cities do the hot spots emerge persistently? How do these vary in the event of a heatwave?

Climate conscious urban design

🔖 Can improved urban design combat extreme heat? What is an optimal growth trajectory for developing cities? How can we make our metropolises climate resilient for a century?

Fellowships and Awards

2024 – 2026	🔖	**Science PI of NASA ROSES Land Cover Land Use Change (LCLUC)** grant
2021 – 2023	🔖	**NASA Postdoctoral Program Fellowship** at JPL
2020	🔖	ASP Postdoctoral Fellowship at NCAR, Boulder (declined)
2017 – 2020	🔖	**NASA Earth and Space Science Fellowship** (NESSF, now called FINESST)
2020	🔖	**Ron Wukasch Environmental Engineering Award**
2017	🔖	**Best Student Presentation Award** by the American Meteorological Society
2016 – 2018	🔖	US Green Building Council's LEED Accredited Professional

Research Experience

NASA Jet Propulsion Laboratory   2021-ongoing

- Investigated the effects of temperature and humidity on heat stress by analyzing dry and humid heat waves in Los Angeles. Results were published in the *Journal of Applied Meteorology and Climatology* and was featured as NASA HQ's climate news piece of the month.
- Developed a novel algorithm for NASA's upcoming earth observation mission called Surface Biology and Geology (SBG), enabling the detection of subpixel thermal anomalies, which was published in *Journal of Geophysical Research Biogeosciences*.
- Served as a science communicator of extreme heat research to dignitaries who visit JPL from organizations such as the Indian Space Research Organization, LA and CA government offices, and NASA HQ leadership.

NOAA-CREST at City College New York   Spring 2019

- Researched the impact of heat waves on intra-urban heat islets using the Weather Research Forecast (WRF) model under the guidance of Prof. Prathap Ramamurthy at NOAA Center for Remote Sensing and Earth Science Technology (CREST).
- Results were published in *Environmental Research Letters*.

World Urban Database and Access Portal Tool (WUDAPT)   2015 – 2017

- Evaluated the heat flux and thermal comfort associated with each urban Local Climate Zone (LCZ), and the impact of the city-scale spatial organization of LCZs on the local temperatures.
- Research findings were published in the *Bulletin of the American Meteorological Society* and my contributions were awarded the Best Student Paper award at the American Meteorological Society conference 2017.

Technische Universität (TU), Dresden   Summer 2016, Summer 2017

- Pursued parts of my doctoral thesis under guidance of an international collaborative network of researchers, *Synthesis of Complex Networks*, over a series of multi-city workshops and visits between Helmholtz Centre for Environmental Research (UFZ), Magdeburg; Technical University (TU), Dresden; University of Florida, Gainesville; and Purdue University.
- Introduced the concept of *intra*-urban heat *islets* by studying the urban heat island from complex systems lens. Results were published in *Physical Reviews E* and *Scientific Reports*.

Environmental Management Centre and Indian Institute of Technology, Mumbai   2016

- Conducted a resilience analysis of 100 climate-proofing strategies by global cities. The findings were presented at the American Meteorological Society conference 2017.

Teaching and Mentoring Experience

Graduate Teaching Assistant, Purdue University

- Undergraduate course on **Principles of Geomatics** (Civil Eng.)   Fall 2014
- Undergraduate course on **Applied Statics** (Mech Eng.)   Spring 2015
- Responsibilities included classroom instruction, fieldwork, designing lab experiments, holding tutorial sessions, and grading. Enrollments ranged over 100 students.

Graduate Instructor, Purdue University

- Interdisciplinary graduate-level class on **Resilient Cities**.   Spring 2016, 2017
- Taught urban land use land cover mapping techniques for various applications.
- Responsibilities included peer-to-peer mentoring, experiment design, accessing and processing multi-dimensional climate datasets, and data analytics in Python.

Teaching and Mentoring Experience (continued)

Science Advisor for NASA DEVELOP program   Spring 2023

- Served as Science Advisor on a NASA DEVELOP program which cultivates the next generation of leaders by matching a group of interns with science advisors at NASA centers.
- Supported and guided their Applied Science research project (in collaboration with City of Los Angeles, Office of Forest Management) on quantifying the impact of trees in urban environments and their relation to the mitigation of local urban heat islands.

Mentor for K-12 teachers' STAR program   Summer 2022, 2023

- Served as a teacher and mentor over two summer terms to JPL intern, Marisol Zepeda, who is a high-school science teacher. California's STEM Teacher and Researcher (STAR) Program is a nine-week summer research internship offered to K-12 STEM teachers working in underserved communities to enhance their curriculum.
- Provided training in basic urban heat research techniques and translating those insights into innovative lesson plans and classroom activities targeted at K-12 science students.

Teaching research methodology to graduate students

- **Local Climate Zone:** Taught the workflow of Local Climate Zones mapping - a random-forest-based supervised classification for Urban Form and Function using Google Earth and SAGA GIS to graduate student groups in research groups at TU Dresden, UFZ Magdeburg, and IIT Mumbai in the early years of WUDAPT (2016-2017).
- **Urban remote sensing:** Every summer the media offices at JPL get inundated with requests for remotely sensed images of cities across the world. We train a class of summer interns in urban thermal sharpening - data access, cleaning, thermal sharpening algorithm, and visualization in Python and QGIS to produce publication-quality urban thermal images to meet that demand. The outputs are available here and a recorded version is available on youtube.

Mentoring graduate students

- Alex Ulin, intern at JPL, *University of Southern California*   Summer 2021
  Research: Modelling the relationship between Land Surface and Air Temperature
- Dain Kim, intern at JPL, *Boston University*   Summer 2023
  Research: Studying aquatic heatwaves in San Francisco Bay Delta
- Hunsoo Song, *Purdue University*   2023
  Research: Developing Homogeneous 3D Land Cover Clusters classification system
- Diego Ramos Aguilera, *University of Southern California*   2023
  Research: Assessment of exposure, vulnerability, and adaptive capacity for Los Angeles

Journal Publications

1. **Shreevastava, A.**, Thompson, J. & Hulley, G. (2023). Algorithms for detecting sub-pixel elevated temperature features for the nasa surface biology and geology (sbg) designated observable. *Journal of Geophysical Research: Biogeosciences*. doi:10.1029/2022JG007370

2. **Shreevastava, A.**, Raymond, C. & Hulley, G. C. (2023). Contrasting intra-urban signatures of humid and dry heatwaves over southern california. *Journal of Applied Meteorology and Climatology*. doi:10.1175/JAMC-D-22-0149.1

3. **Shreevastava, A.**, Prasanth, S., Ramamurthy, P. & Rao, P. (2021). Scale-dependent response of the urban heat island to the european heatwave of 2018. *Environmental Research Letters*. doi:10.1088/1748-9326/ac25bb

4. **Shreevastava, A.**, Rao, P. & McGrath, G. (2019). Emergent self-similarity and scaling properties of fractal intra-urban heat islets for diverse global cities. ***Physical Reviews E***. doi:`10.1103/PhysRevE.100.032142`

5. **Shreevastava, A.**, Bhalachandran, S., McGrath, G., Huber, M. & Rao, P. (2019). Paradoxical impact of sprawling intra-urban heat islets: Reducing mean surface temperatures while enhancing local extremes. ***Scientific Reports***. doi:`10.1038/s41598-019-56091-w`

6. Bhalachandran, S., Chavas, D., Marks Jr, F., Dubey, S., **Shreevastava, A.** & Krishnamurti, T. (2019). Characterizing the energetics of vortex scale and subvortex scale asymmetries during tropical cyclone rapid intensity changes. ***Journal of the Atmospheric Sciences***. doi:`10.1175/JAS-D-19-0067.1`

7. **Shreevastava, A.**, Rao, P. S. C. & McGrath, G. S. (2018). Spatial analysis of the surface urban heat island. ***SPIE Land Surface and Cryosphere Remote Sensing***, *10777*, 15–22.

8. Ching, J., Mills, G., Bechtel, B., ..., **Shreevastava, A.** et al. (2018). WUDAPT: An urban weather, climate, and environmental modeling infrastructure for the anthropocene. ***Bulletin of the American Meteorological Society***, *99*(9), 1907–1924. doi:`10.1175/BAMS-D-16-0236.1`

Journal articles under review or in preparation

1. **Shreevastava, A.**, Hulley, G. & co-authors. (2023). *Unequal heat exposure in urban areas: Unraveling the role of historic redlining and present-day inequities in los angeles*. **(in prep.)**

2. Raymond, C., **Shreevastava, A.**, Slinskey, E. & Waliser, D. (2023). *Linkages between atmospheric rivers and humid heat across the united states*. **Natural Hazards and Earth System Sciences (accepted)**.

3. Kalmus, P., Ekanayaka, A., **Shreevastava, A.** et al. (2023a). *Global projections of uncompensable and fatal humid heat*. **PLOS Climate (under review)**.

4. Kalmus, P., Ekanayaka, A., **Shreevastava, A.** et al. (2023b). *Fatal humid heat conditions projected to 2300*. **Geophysical Research Letters (under review)**.

Invited Talks and Seminars

2023	**NASA ECOSTRESS Science team meeting**, Ventura, CA	
2022	**NASA Surface Biology and Geology Science Team meeting**, Washington DC	
2020	**City College New York, New York**, NY (online)	
	Phoenix Sustainability Initiative seminar, University of Chicago, Chicago, IL (online)	
	Senseable City Lab, MIT, Cambridge, MA	
	Winter Workshop on Complex Systems, Lausanne, Switzerland	
2019	**Centre for Advaced Spatial Analysis (CASA), University College London**, London, UK	
	NASA Land Cover Land Use Change (LCLUC) Science Team meeting, Rockville, MD	
2018	**Colorado State University**, Fort Collins, CO	
	NASA Ames, Mountainview, CA	
	University of Florida, Gainesville, FL	
2017	**Technische Universität (TU)**, Dresden, Germany	
2016	**Helmholtz Centre for Environmental Research (UFZ)**, Magdeburg, Germany	
	Environmental Management Centre (EMC), Mumbai, India	

Conference Presentations

2023   🔖 High-resolution observations of heatwaves over global megacities in 2022 using ECO-STRESS: A case study of New Delhi, Paris, and Los Angeles. ***IEEE International Geoscience and Remote Sensing Symposium, Pasadena, CA***

        🔖 Evaluating the use of Surface Biology and Geology (SBG) midwave and thermal infrared band specifications for the detection and retrieval of elevated temperature features. ***International Workshop on High-Resolution Thermal EO, ESRIN-ESA***

2022   🔖 Assessment of algorithms for detecting high temperature phenomena and thermal anomalies for the NASA Surface Biology and Geology (SBG) mission. ***Living Planet Symposium 2022, Bonn, Germany***

2021   🔖 The dual personality of Southern California heatwaves: Case study of Los Angeles during Aug/Sep 2020. ***AGU Fall Meeting, Online***

        🔖 Assessment of algorithms for detecting high temperature phenomena for the NASA Surface Biology and Geology (SBG) mission. ***AGU Fall Meeting, Online***

2019   🔖 The paradox of sprawl vs compact urban morphology for mitigating extreme heat in cities. ***AGU Fall Meeting, San Francisco, CA.***

2018   🔖 Fractal topography of the intra-urban thermal landscape. ***Nonlinear Geophysics. AGU Fall Meeting, Washington, DC.***

        🔖 Spatial analysis of the Surface Urban Heat Island. ***SPIE Asia-Pacific Remote Sensing Conference, Honolulu, HI.*** doi:`10.1117/12.2501441`.

2017   🔖 Characterizing the intra-urban spatial structure of High Heat Stress Zones. ***Global Environment Change. AGU Fall meeting, New Orleans, LA.***

        🔖 Incorporation of urban form and function for improved correlation between Land Use Types and Land Surface Temperatures. ***13th Symposium of the Urban Environment. 97th AMS Annual Meeting, Seattle, WA.***

        🔖 A Resilience Analysis of 100 Climate Proofing Strategies of the C-40 Cities. ***97th AMS Annual Meeting, Seattle, WA.***

Professional Services

🔖 **Science Advisor** to an AGU Thriving Earth Exchange initiative: Assessing Heat Vulnerability in Olympia, WA in collaboration with Dr. Pamela Braff, Director of Climate Programs, Olympia.

🔖 **Review panel member** for the NASA ROSES Inter-disciplinary Research program: *Environmental and Climate Justice Using Earth Observations* theme.

🔖 **Review panel member** for the NASA FINESST (Future Investigators in NASA Earth and Space Science and Technology) Fellowship typically awarded to graduate students.

🔖 **Reviewer** for NSF CAREER (Faculty Early Career Development Program) Award.

🔖 **Session chair** for the session on Remote Sensing for Urban Climate at the 2023 IEEE International Geoscience and Remote Sensing Symposium (IGARSS), Pasadena, CA.

🔖 **Journal reviewer** for Nature Cities, Environmental Research Letters, MDPI Atmosphere, MDPI Sustainability, IEEE Transactions on Geoscience and Remote Sensing, European Journal of Remote Sensing, and others.

🔖 **Co-organizer** of a Symposium called "*Trajectories of Paradigm shifts*" with the interdisciplinary graduate program of Ecological Science and Engineering at Purdue University.

Media and Outreach activities

🔖 **Speaker and mentor** at EarthHacks, an online environmental hackathon. Taught the participants how to downscale Surface Temperature data from ECOSTRESS for urban heat island applications (Link to the tutorial).

🔖 **Featured by NASA HQ's climate news piece** of the month for my research on impacts of dry versus humid heatwaves on neighborhoods of Los Angeles.

Media and Outreach activities (continued)

- **Interviewed** with Texas Climate News and NPR's LAist podcast on extreme heat in cities.
- **Developed a novel science visualization** for the seminal collaborative article by the European Space Agency (ESA) and NASA, highlighting urban thermal remote sensing using ECO-STRESS. The visualization was then adopted as cover page of the international Thermal Earth Observations workshop held in ESRIN, Italy: `https://thermal2023.esa.int/`
- **Served as a science communicator** of urban heat research outreach for NASA JPL stakeholders such as ISRO delegates, CA External Affairs team, CA Deputy Secretary for Climate Change.

Relevant Graduate Courses

Complex Systems	Resilient Hybrid Infrastructure Networks, Introduction to Complex Networks, Perspectives of Complex Systems: Theory and Application.
Atmospheric Sciences	Land Surface Modeling, Environmental Informatics (ML/AI algorithms), Boundary-Layer Meteorology, Global Change Modeling.
Remote Sensing and GIS	Geospatial Modeling and Analysis, Geographical Information Systems.
Smart Cities	Smart Cities Analytics (ML algorithms for urban systems), Urban Ecosystem Services.

Technical Skills

Coding	Python, MATLAB, R, version control- git.
Geospatial	R (using rgeos, rgdal, raster, sp, etc.), Python (using netCDF, wrf-python, xarray, cartopy, etc.) ArcGIS, QGIS, Google Earth Engine.
Computational	Weather Research Forecast (WRF), Statistical modeling, Networks modeling, Machine Learning algorithms in Python (using scikit-learn, igraph, geopandas, etc.)

Cultural and Leadership Activities

2010-2013	Member of IIT Roorkee's Music Section.
2014	Captain of IIT Roorkee's Music Section. Led a team of nearly 60 undergraduate student musicians and the organization of two 1.5-hour-long music concerts on campus per semester.
2014-2019	Founding member of a Purdue-based Indian-western fusion band "*Tatvam*". Performed as a singer and guitarist in 50+ shows across Illinois and Indiana. Won Battle of the Bands 2017 at Purdue University.
2022	Performed as an actor with Theater Arts at CalTech in a two-act musical theater production called "*From the Earth to the Moon*", an adaptation of Jules Verne' classic novel. The recorded movie version is available on youtube.
2023	Currently working with the Director of Theater Arts at CalTech on developing a new musical with a focus on climate change communication using NASA earth observation data.