

SHREYA GUHA

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WORK EXPERIENCE:

- **Graduate Research Assistant** (Aug 2020 – present)
George Mason University; Fairfax VA
[Working with the air pollution data in the cities Beijing, Zhenzhou, Nanjing in China to understand the impact of the regulations launched by the Chinese government in 2013 in the atmosphere and on public health]
- **Researcher** (Mar 2019- Jun 2019)
George Mason University; Fairfax VA
[Worked on the prediction of drought persistence or intensification over west central India.]
- **Research Assistant** (Jan 2018 – Aug 2018)
George Mason University; Fairfax VA
[Worked with huge sets of precipitation and soil moisture data sets obtained from various climate models over the Indian subcontinent to study their predictability with ENSO.]
- **Junior Research Fellow** (Jun 2017-Nov 2017)
ISRO RTG AWARE; Vijayawada, India
[Worked with ISRO under the government of India to process huge data sets of temperature, pressure, wind at various levels and precipitation obtained from various climate models for operational seasonal climate forecast over Andhra Pradesh, India.]
- **Editor** (Oct 2015 – Jun 2016)
Kali, Kolom o Easel; Kolkata; India
[Edited two issues:
1. "Tritiyo Porishor"; which deals with everything non-binary; and
2. "Unishe"; which deals with the Bengali language movement in Assam]

Volunteering activities:

- **Reviewer of So to Speak: GMU's graduate feminist journal of language and art** (September 2021-Present)
[Fiction and Non-Fiction]
- **Member of Room 7 of Sustainable Developmental Goal (SDG) at GMU** (June 2021-Present)
[Affordable and Clean Energy on campus]
- **Treasurer** (Jul 2019 – Aug 2020)
AOES-GSA, GMU; Fairfax, VA
- **Assistant** (Mar 2017 – May 2017)
Rural NGO; Purulia, India
[Worked with rural women to help them become financially independent by promoting use of climatologically sustainable cheap goods to make economically viable sellable products.]
- **Teacher** (Sep 2016 – Feb 2017)
NGO, Kolkata
[Worked with slum children and tried to come up with a different linguistical syllabus for teaching them better]
- **Member** (Jul 2015 – Jul 2016)
Graduate Student Association; Calcutta University; Kolkata; India
[Chief Event Organiser, Host, Rapporteur for national and international level seminars]

Technical skills:

- **Languages known:** R, GrADS, MATLAB, NETCDO, ANSI-C, FORTRAN-95

- **Operating Systems:** Windows, Linux
- **Software:** MS Office, ENVI, ARCGIS, Winrar, Panoply
- **Others:** Plotting and analysis of Tephigrams and weather maps;
Postprocessing and interpretation of multispectral, hyperspectral, IR and visible band images obtained from satellites, RADARs and LiDARs;
Handling spatial data, different map projections, mapping and presenting GIS data, map overlay, geoprocessing, spatial joins, queries, attribute data, basic ArcPy;
Numerical Analysis and Analysing simulation of climate models.

Academic Projects:

- **PM_{2.5} variability with meteorology from reanalysis and ground-based monitors across locations (Jun-Aug 2021, to be presented at CMAS 2021)**
[Air pollution is one of the most important eco-environmental problems throughout the world and its concentrations are sensitive to both source emission levels and meteorological fluctuations. The purpose of this study is to identify differences in covarying meteorological factors between reanalysis and observed meteorological data sets across locations such that more effective and integrated air quality policies can be drafted in the future. We utilize two approaches to quantify the effects of ground-based observed (from National Climatic Data Center [NCDC]) and reanalysis model values (taken from Climate Forecast System version 2 [CFSv2]) of meteorological variables on PM_{2.5} emission levels (downloaded from AirNow Beijing and the US Environmental Protection Agency [EPA] website) for the years 2011 to 2020 for the cities Beijing, China and Washington DC, USA. We consider temperature, precipitation, relative humidity, wind speed & direction at 2m above ground level and planetary boundary layer height. The first approach applies Kolmogorov-Zubrenko filters and linear regression models to study long-term, seasonal, and short-term components of the pollutant signals and its meteorological components. The second approach applies general additive models to quantify relationships between meteorology and PM_{2.5} fluctuations at the given locations with the two different sets of meteorological data. We perform a holdout analysis to evaluate the predictive performances of all models. In Beijing, reanalysis meteorological data show very weak relationships with PM_{2.5} concentrations, whereas the observed data are very significant for the short-term scale, with the average daily PM_{2.5} increasing by $1\mu\text{g m}^{-3}$ per $\sim 3.5^\circ\text{C}$ average temperature increase. In continuing analysis, we are comparing the results between Beijing and Washington, DC.]
- **How is air pollution deteriorating water quality of the river Yamuna at Delhi, India? (Jan-May 2021)**
[River Yamuna is one of the principal rivers of northern India and in November 2019, it made international headlines following Diwali/Deepavali, a national festival, when the river was covered with toxic foam in the capital city of Delhi. For the current study, we have considered the time frame of January 2015-February 2020. As foam is quite difficult to quantify, a foaming factor is constructed following the foaming index as per Ruzicko et al. (2009). Kolmogorov-Zubrenko filters are applied to find the annual, seasonal and short-term pollutant variations and the meteorological fluctuations. The main meteorological variables studied are temperature and wind. Other pollutants studied are P, NH₃, SO₄ and total dissolved solids (TDS). Biological implications of the foaming incidents are also evaluated using the Biological Oxygen Demand (BOD). It was found that, other than PM_{2.5}, SO₄ also consisted significantly to foam formation in the short-term scale, with significant help from meteorological variables. But, however, for the marine life, for the short-term scale, it was not the PM_{2.5} rather the TDS and the SO₄ which were the most significant.]
- **Case Study: Why isn't there any policy to restrict growing air pollution in India? (Sep-Dec 2020)**
[India is the third most polluted country in the world in terms of air as of 2019, with its capital Delhi being the most polluted capital of the world, with an average yearly emission of 113.5 particulate matter (PM) 2.5. Out of the 30 most polluted cities of Asia, 22 are situated in India. Previously, India has adapted several international and national climate policies to protect the environment. Currently, India is not a part of

COP25 and its National Clean Air Program (2017) lacks detailed planning. Out of the several sources of air pollution in India, this case study focusses on vehicular transportation in Delhi and the even-odd scheme adapted in December 2015 to curb it. We have provided alternative solutions to restrict urban air pollution resulting from vehicles and compared the solutions with China, Mexico and Europe. The most persistent problems for evidence-based policymaking in India came with the relevant subjects being nascent there, with the lack of infrastructure in terms of data and tools, lack of experts in committee of science policy and the nonchalance of media and the general public when it came to environmental issues. We have also provided some recommendations regarding how the government can choose to combat these problems.]

- **Using an Improved Coupling Drought Index to predict the persistence of meteorological drought over West central India** (June 2019- Aug 2020)

[The objective of this study is to investigate the role of the atmospheric boundary layer (ABL) and hence, roles of evaporation and convection in the process of intensification or persistence of meteorological droughts in west central India. The reason of choice of this region is that it is seen to be statistically significant in terms of spatial extent of droughts from 1951-2010. Although local geographic factors influence rainfall in this region, the main source of precipitation is the Southwest monsoons during the months of June, July, August and September (JJAS); which are affected by the tropical sea surface anomalies; and hence by El Nino/Southern Oscillation (ENSO), Indian Ocean Dipole (IOD) and other synoptic systems (like monsoon depressions) which are due to the dynamical instabilities of the mean circulation. These affect the slowly changing variable soil moisture; the soil moisture anomalies then affect the summer rainfall. However, most of the land-atmosphere coupling studies conducted earlier over India ignore the role of the ABL which controls the major thermodynamics and dynamical circulations. Hence, here we try to apply the concept of coupling drought index (CDI) during the periods of monsoon onset (March, April, and May [MAM]) over the entire spatial extent over the time-period of 1979-2010; when the atmosphere represents somewhat transitional coupling conditions, to identify regions of dry and wet coupling regions. Here, however, while testing the normality of the soil moisture anomaly curves, we have replaced the Kolmogorov-Smirnov Test with the Anderson-Darling test to build an improved CDI to gain more accuracy and sensitivity. Thereby, it is expected to predict whether drought will persist, intensify, or recover over the study region. The results from the developed index indicated that the drought conditions would neither intensify nor recover over the study region for the year 2011 and would continue to persist as it was for the past three decades. The observations validate this result.]

- **Small steps to promote effective drought management in SW India** (April – May 2020)

[The objective of this study is to communicate science properly with the landlords, peasants and NGOs operating in the drought affected Southwestern region of India; such that, agriculture can be carried out in a much more sustainable way over the area. Switching to food crops like barley, wheat etc that can grow on dry soils instead of water intensive cash crops like sugarcane should be beneficial for the environment as well as for the collective financial profit for landlords and peasants farming in drought intensive areas.]

- **Using Remote Sensing Techniques to analyse vegetation loss due to Forest fires in Bandipur, India during February, 2019** (Mar 2019 – May 2019)

[In February 2019, massive forest fires broke out in numerous parts of the Bandipur National Park; which is a tropical dry forest located at the intersection of the Deccan Plateau and the Western Ghats mountain range. The fire damaged approximately about 10,000 acres of forest area in Bandipur itself; damaging ecology there; and had spread to other regions as well. This study aims to use satellite sensor imagery in combination with spatial analysis as provided by Geographical Information System platforms to monitor and analyse the implications of the forest fires in terms of change in landscape by taking into consideration the factors of vegetation profiles. The spectral profiles of different vegetation indices are compared before and after the incident to look at the changes in diversity in flora and land use in the forest. The damaged area is then calculated using various algorithms.]

- **Airframe Icing as an effect of tropopause level rise and ways to combat it** (Jul 2017 – Sep 2017)

[Presented at AeroMetSci-2017; organized by WMO; Toulouse; France; November 2017

Poster link: https://www.wmo.int/aemp/sites/default/files/Poster_Guha_Session_3_AeroMetSci-2017.pdf]

- **Simulation of Synoptic features during monsoon onset over GWB, India with Dynamic Coupled Model – CFSv2** (Jul 2015 – Jul 2016)

[The aim of this study is to examine the performance of the Climate Forecast System version 2 (CFSv2) in simulating the variability associated with the propagation of Bay of Bengal (BOB) branch of summer monsoon system till the onset over Gangetic West Bengal (GWB), India. The skill of the coupled model is examined for the years 2011 to 2015 individually with tropospheric temperature (TT) (600-200 hPa), sea surface temperature (SST), mean sea level pressure (MSLP), winds at 850 and 500 hPa pressure levels and rainfall. The CFSv2 coupled model has been able to capture the position / variation during the onset however, the model has not been able to estimate the intensity in some occasions. The result shows that the model slightly overestimates the tropospheric temperature and pressure gradients.]

[Results presented in an oral presentation in the International Workshop on Climate Extremes: Observation, Analysis and Modelling (INTCOAM-2017), 2017]

Education:

- **PhD in Civil and Infrastructure Engineering** (Aug 2020- present) GPA: 3.89/4.00
George Mason University; Fairfax, VA
- **MS in Earth System Science** (Jan 2018- Aug 2020) GPA: 3.56/4.00
George Mason University; Fairfax, VA
- **MSc in Atmospheric Science** (Aug 2014 – Jul 2016) GPA: 5.086/6.00 or 3.38/4.00
University of Calcutta; Kolkata, India
- **BSc in Mathematics (Hons), Physics, Statistics**
University of Calcutta; Kolkata; India

Courses taken: Environmental Engineering Systems, Research Methods in Civil Engineering, Evidence-based Policy making, Air Pollution Formation and Control, Water Quality; Physical Climate System, Numerical Simulation in Weather Systems, Atmospheric Dynamics, Physical and Dynamical Oceanography, Geospatial Science Fundamentals, Land-Climate Interactions, Remote Sensing, The Lithosphere, Geographic Information System, GGS Colloquium, Climate Dynamics Seminar; Synoptic Meteorology, General Climatology, Air Pollution and Atmospheric Chemistry; Cloud Physics and Atmospheric Electricity; Meteorological Instrumentation and Observation; Atmospheric Data Analysis; Seismology, geophysics and geodesic; Upper Atmospheric Dynamics; Agro & Hydro Meteorology; Introduction to Global Modelling; Atmospheric Weather Extremes.

Grants, Scholarships and Medals:

- **2016:** Awarded Silver Medal for ranking 2nd in MSc in Atmospheric Science in University of Calcutta
- **2017-18:** Graduate Tuition Grant Spring awarded by George Mason University (GMU)
- **2018-19:** Graduate Scholarship Spring awarded by GMU
- **2020-21:** Stay Mason Student Support Fund awarded by GMU
- **2020-21:** Graduate Tuition Grant Spring awarded by GMU

Hobbies and Extracurricular Activities:

- **Creative Writing, translating, blogging**
[Latest publication: Translated a short story of Jeffrey Whitmore from English to Bengali for February “Book Fair” issue of a little magazine based in Kolkata.
Irregularly blogs in Bengali at <https://shreyarkherorkhata.wordpress.com/>]
- **Travelling**
[Recent trips in 2019 summer include cheap visits to Armenia and NYC]

- **Theatre**

- [Chair Member (Jul 2014 – Jul 2016)]**

- Drama house; Calcutta University Masters

- Scriptwriter, Director, Actor

- Staged two socio-political plays with an ensemble cast:

- 1. "Dupurbela songe Bela"; a newsroom satire; and;

- 2. "Bhobishyoter Bhoot"; highlighting corruptions, superstitions and malpractices prevalent through the ages.

- Participated in an audio drama about Kolkata and its culture.

- Chair Member (Jul 2012 – Jul 2014)**

- Drama Club; Calcutta University Bachelors

- Scriptwriter, Director, Actor

- Staged two comic plays based on current issues; one on film fraternity and the other on arranged marriages.]

- **Quizzing**

- [Member (Jul 2014 – Jul 2016)]**

- Quizzing Team; Calcutta University

- Participated and won several inter and intra-college quizzes]

- **Others**

- [Cooking and Sketching]