Aasma Acharya

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EDUCATION

Climate Science, Masters
Concentration – Climate Modelling
George Mason University, Fairfax, Virginia · August 2025

- Thesis: Assessing the Surface Urban Heat Island and Urban Precipitation Anomalies: An Analysis of Richmond, Virginia
- Relevant Coursework: Climate Data, Numerical Simulation in Weather/Climate, Earth System Modeling, GIS Algorithms & Python Programming

Bachelor of Science, Physics
Tribhuvan University, Nepal · Dec 2019

- Thesis: Spectral Analysis of Aerosol Optical Depth Over AERONET Sites of Nepal
- Relevant Coursework: Physics, Mathematics, Statistics

TECHNICAL SKILLS

- **Programming & Data Processing:** Python (NumPy, Pandas, SciPy, Xarray, Dask, Seaborn, Matplotlib, Cartopy, Plotly, Shapely), Python Object Oriented Programming
- **Geospatial & Climate Data Analysis:** ArcGIS Pro, Geopandas, Rasterio, Pyproj, Basemap, rioxarray
- **Data Visualization:** Matplotlib, Plotly, Cartopy, GIS-based interactive tools
- **Big data and High-performance computing (HPC):** SLURM job scheduling, parallel computing, Bash scripting, large dataset processing on HPC clusters
- **Operating Systems and Environment Management**: Linux/Unix, Windows, Conda virtual environments
- **Software and Tools**: Python, ArcGIS Pro, MATLAB, LaTeX

EXPERIENCE

Graduate Research Assistant

Virginia Climate Centre, George Mason University   **June 2023- Present**

- **Mapped urban climate risk hotspots** by integrating high-resolution 4 km precipitation and 5 km land surface temperature data, identifying zones of concurrent extreme heat and rainfall in Richmond, VA to support heat stress and pluvial flood vulnerability assessment
- **Analyzed over 1,160 hours of Surface Urban Heat Island-influenced extreme rainfall** across 10 summers, revealing a +3-hour lag between peak heat and downwind rainfall intensification addressing **urban flood and heat compound hazard.**
- **Developed anomaly-based indicators** to quantify urban–nonurban precipitation contrast, improving detection of localized climate extremes relevant to adaptation planning in high-density areas
- **Processed over +3 TB of climate and hydrometeorological data**, streamlining integration of hourly Stage IV QPE and ERA5 reanalysis to support mesoscale short duration extreme precipitation analysis
- **Optimized large-scale data workflows** for more than 1,000 rainfall events using Dask and SLURM on the Hopper HPC cluster, cutting composite analysis time by over 60%
- **Built scalable Python pipelines** to automate hydrologic data transformation across GRIB, NetCDF, and HDF formats using xarray, pandas, NumPy, and custom logic for multi-format data preprocessing
- **Automated cloud-based data acquisition workflows** from CDS, NASA GES DISC, NOAA S3, and THREDDS servers using requests, s3fs, pydap, and h5py, enabling consistent retrieval and delivering reproducible, spatially refined climate risk outputs.

Research Group: Aerosol and Air Quality, Mesoscale Dynamics and Remote Sensing   September 2022 – May 2023
· Investigated rainfall patterns over Southern CONUS cities using reanalysis datasets and spatial precipitation pattern synthesis using observational and reanalysis datasets to validate model-generated precipitation estimates.

PROJECTS

Simulating climate response to increased urban land fraction using CLM in CESM 2.1.5
Earth System Modeling – Spring 2025

- Performed a sensitivity experiment using CESM 2.1.5 with the Community Land Model (CLM) to assess how increase in urban land fraction (tall and medium-density built-up areas) influence ground temperature, surface energy fluxes, and other land-atmosphere thermal variables.
- Utilized NCAR's Derecho supercomputer to run CESM simulations and the Casper for postprocessing and visualization using JupyterLab

Urban Heat Island & Local Climate Zone Analysis
GIS Algorithms in Python – Fall 2024
- Implemented spatial analysis and Python-based GIS programming to classify urban and rural domains based on built-up land surface data to assess Urban Heat Island patterns through Local Climate Zone classification.

Short-Term vs. Long-Term Climate Predictability
Predictability in Weather and Climate – Fall 2023

- Applied ANOVA and F-score analysis to evaluate how climate predictability varies with forecast lead times (daily to seasonal), identifying temporal windows of higher forecast skill in observational and reanalysis datasets.

Wildfire Emissions Analysis (2020 Western US Wildfires)
Atmospheric Aerosols – Fall 2024

- Compared 11 emissions inventories and model output for recent 2020 Western U.S. wildfires to evaluate their feasibility and consistency for ensemble-based air quality modeling as part of group project.

Emission mapping for multispecies of atmospheric pollutants
Climate Data Analysis – Fall 2022

- Developed 1-km monthly gridded emission maps for multiple atmospheric pollutants over CONUS using the NEI dataset, supporting fine-scale visualization of anthropogenic and wildfire emissions.

PUBLICATION

Acharya, A., Adhikari, B., Bhattarai, P., Jha, G., Acharya, S., & Shah, R. (2020). Spectral analysis of aerosol optical depth over AERONET sites of Nepal. *BIBECHANA*, *17*, 80–88. https://doi.org/10.3126/bibechana.v17i0.26507

CONFERENCES & PROFESSIONAL DEVELOPMENT

- **Poster Presenter**, *2025 Summer Student Conference Program by NSF NCAR, UCAR, UCP, and CIRES*— Presented thesis research on Surface Urban Heat Island impacts on extreme precipitation in Richmond, VA.
- **Participant**, *NCAR | UCAR MMM CELSIUS Summer Visitor Program, 2025* — Engaged in a weeklong collaborative research discussion, professional development workshops, and career guidance sessions with NCAR scientists.