

# Arka Mitra, Ph.D.

Atmospheric Scientist | University of Illinois, Urbana-Champaign, IL USA  
+1-(217)-305-2998 | [arkam2@illinois.edu](mailto:arkam2@illinois.edu), [mitraarka27@gmail.com](mailto:mitraarka27@gmail.com) | [GitHub](#) | [LinkedIn](#) | Salem, OR

## SUMMARY

Atmospheric Scientist with 8+ years of experience in the integration of diverse satellite observations and geophysical modeling techniques. Expertise in developing novel data fusion algorithms, creating benchmark datasets for model validation, and applying AI/ML for regression, classification and computer vision in HPC environments. Strong background in atmospheric physics and radiative transfer, ideal for contributing to advanced data assimilation and modeling. Proven collaborator in DOE/NASA teams, with a track record of peer-reviewed publications advancing collaborative research and decision-making.

## CORE EXPERTISE

- **Development of Novel Geophysical Algorithms:**
  - Novel Remote Sensing techniques (Cloud-top entrainment, Cloud-top heights; Radar Wind Profiles)
  - Rigorous Validation & Error Budgeting of Climate Records (NASA satellites; ARM stations, etc.)
- **AI/ML for Geoscience:** Regression Models (ANN, etc.); Image Segmentation & Classification (CNN); Unsupervised Learning & Classification (PCA, SOM); Time-Series Forecasting (LSTM, Prophet)
- **Geospatial Data Systems:** NETCDF, HDF, Grib etc.; Raster & Vector Datasets; GIS techniques.
- **Radiative Transfer & Cloud Process Models:** LibRADTRAN, CM1, LES, etc.
- **HPC & Big Data Analytics:** Python & FORTRAN-based terabyte-data processing pipelines on HPC.
- **Research Communication & Collaboration:** PI/Co-PI on DOE/NASA-funded projects, NASA campaign support, cross-disciplinary team collaborations, peer-reviewed publishing.

## PROFESSIONAL EXPERIENCE

### **Academic Research Scientist, Climate Sciences**

Oct 2025 – Present

*University of Illinois Urbana-Champaign, Department of Climate, Meteorology & Atmospheric Sciences*

- Leading creation of 22-year satellite climate record of 2-layered cloud heights for NASA through fusion of multispectral and stereo satellite data to enable decadal trend analysis, alongside GCMs.

### **Postdoctoral Scientist – Wind Energy & Climate Science**

Mar 2023 – Sept 2025

*Argonne National Laboratory, Environmental Sciences Division*

- PI, DOE LDRD project (\$25k; Mar-Sep '25) to develop a novel satellite retrieval technique to derive key planetary boundary layer metrics (entrainment and vertical velocities) from satellite observations.
- Led the observational focus of the interdisciplinary DOE ORACLE project by designing Python-based pipelines leveraging satellite, NWP and reanalysis data, alongside wind farm models; provided actionable insights on extreme wind along U.S. West Coast using ML techniques (SOM, PCA).
- Analyzed complex datasets for DOE ARM program, validating satellite-derived radiative fluxes against ground observations at Eastern North Atlantic site to quantify drizzle processes and atmospheric impacts. Led 5 publications, co-authored 5 more.
- Continuing collaboration on ARM Radar Wind Retrievals & Sub-Cloud Evaporation projects (ANL).

### **Graduate Research Assistant – Satellite Remote Sensing**

Aug 2017 – Feb 2023

*University of Illinois Urbana-Champaign, Department of Atmospheric Sciences*

- Conducted error-budget analysis of cloud-top heights from NASA Terra-MODIS and MISR satellites, identifying trends over two decades and validating against ISS-CATS lidar for improved environmental data accuracy.
- Developed a novel multi-sensor fusion algorithm combining MISR stereoscopic and MODIS thermal infrared retrievals, leading to 75% improvement in cloud-top height estimates; co-proposed and secured NASA funding (\$1.2K over 3 years) to integrate into decision-support tools (Funding still operational; see Current Position).

**Graduate Project Scientist – Space Weather & ML-based Modeling**  
*Indian Institute of Geomagnetism, Middle & Upper Space Weather Division*

Jan 2017 – Jun 2017

- Developed a CNN-based model using satellite radio occultation data for ionospheric electrodynamics, leading to 2 peer-reviewed papers and improved representation of key equatorial processes in models.

**TECHNICAL SKILLS**

**Programming & Analysis:** Python (pipelines, data processing/visualization), R, FORTRAN, Bash, SQL; Machine Learning (PyTorch, Keras, CNNs, PCA, SOM); Error Budgeting, Time Series Analysis

**Remote Sensing & Environmental Modeling:**

- **Observational Systems:** Satellite Platforms (MISR Stereo, MODIS Infrared, Lidar); Surface-based Weather Stations (e.g., ARM-ENA site) & Radars
- **Atmospheric Models:** HRRR, RAP, PBL dynamics, Sub-cloud processes; Radiative Transfer, Non-Hydrostatic Convection-Resolving
- **GIS:** QGIS, geoJSON, Shapefiles, KML/KMZ, cartopy, netCDF etc.

**Scientific Computing & Workflows:** CI/CD pipelines, High-Performance Computing (HPC), Large-Scale Data Processing (>TB-scale), Scientific Visualization, Cloud Platforms for Environmental Datasets

**EDUCATION**

***Ph.D in Atmospheric Sciences***

Aug 2017 - Feb 2023

University of Illinois, Urbana-Champaign | USA | Advisor: Dr. Larry Di Girolamo

***M.Sc. in Physics***

Aug 2015 - May 2017

Presidency University, Kolkata | India | Thesis Project: Indian Institute of Geomagnetism, Mumbai

***B.Sc. in Physics***

Aug 2012 - May 2015

Presidency University, Kolkata | India | Minor: Mathematics

**HIGHLIGHTED PUBLICATIONS**

- Mitra, A.; Ghate, V. P. (2025). *Towards Retrieving Cloud Top Entrainment Velocities from MISR Cloud Motion Vectors*. Atmospheric Measurement Techniques. [DOI: [10.5194/egusphere-2025-4564](https://doi.org/10.5194/egusphere-2025-4564)]
- Mitra, A. (2025). *Regime Characterization of Offshore Wind Resource Using Unsupervised Learning*. US DOE OSTI. [DOI: [10.2172/2589309](https://doi.org/10.2172/2589309)]
- Mitra, A.; Ghate, V. P.; Rutan, D. (2025). *Comparison of CERES SYN1deg Radiative Fluxes with Those Derived from Observations at The ARM ENA Site*. Journal of Climate. [DOI: [10.1175/jcli-d-24-0633.1](https://doi.org/10.1175/jcli-d-24-0633.1)]
- Di Girolamo, L., Zhao, G., Zhan, G., Wang, Z., Loveridge, J., **Mitra, A.** (2025). *Cloud-motion data identify changes in atmospheric circulation*. Nature. [DOI: [10.1038/s41586-025-09242-1](https://doi.org/10.1038/s41586-025-09242-1)]
- Mitra, A. et al. (2025). *Wind and Weather Variability within the Californian Offshore Wind Energy Areas*. DOE OSTI. [DOI: [10.2172/2568064](https://doi.org/10.2172/2568064)]
- Mitra, A. et al. (2025). *Locating the Optimal Wind Resource within two Californian Offshore Wind Energy Areas*. Wind Energy Science. [DOI: [10.5194/wes-2025-55](https://doi.org/10.5194/wes-2025-55)]
- Mitra, A. (2025). *Validation, trend analysis & bias reduction through satellite fusion of the cloud-top height record from Terra MODIS & MISR*. University of Illinois (Thesis). [<https://hdl.handle.net/2142/12049>]
- Mitra, A.; Loveridge, J., et al. (2023). *Fusion of MISR Stereo Cloud Heights and MODIS IR Radiances*. JGR Atmospheres, 128, e2022JD038135. [DOI: [10.1029/2022JD038135](https://doi.org/10.1029/2022JD038135)]
- Mitra, A.; Di Girolamo, L., et al. (2021). *Assessment of Terra MODIS and MISR Cloud-Top Heights via ISS-CATS*. JGR Atmospheres. [DOI: [10.1029/2020JD034281](https://doi.org/10.1029/2020JD034281)]
- Ram, S.; Gowtham, V; **Mitra, A.**; et al. (2018). *The improved two-dimensional artificial neural network-based ionospheric model (ANNIM)*. JGR Space Physics. [DOI: [10.1029/2018ja025559](https://doi.org/10.1029/2018ja025559)]

**HIGHLIGHTED CONFERENCE PRESENTATIONS**

- Mitra, A., Ghate, V. (2024). *An Analytical Model for Size Dependent Drizzle Evaporation Below Stratocumulus Clouds*. International Commission on Clouds & Precipitation Conference, Jeju Islands, Republic of Korea (Oral).

- Mitra, A., Ghate, V., Krishnamurthy, R. (2024). *Characterizing Multi-Scale Variability of Wind Resource within Californian Offshore Wind Energy Areas*. AGU Fall Meeting, Washington, D.C. (Poster).
- Mitra, A., Di Girolamo, L., et al. (2021). Quantification and Reduction of Bias in Multi-layered Cloud-Top Heights from Terra MISR and MODIS. AGU Fall Meeting, New Orleans, USA (Oral).  
**+12 more**

### **LEADERSHIP & GRANTS**

- PI, DOE LDRD Seed Grant (\$25k) – Global Benchmark Winds for Energy & Climate (Mar-Sep '25)
- Co-I, NASA MEASURES Grant (\$400k/year x 3y) - Fusion Satellite Algorithm Development (Present)
- Lead Analyst, DOE ORACLE Project, Observational Theme (2023–Sept 2025)
- Convener & OSPA Judge, AGU Fall Meeting (2024)
- Community Science Expert, AGU Thriving Earth Exchange (2021)
- Journal Reviewer for JGR Atmospheres, Nature Communications, Atmospheric Measurement Techniques, JQSRT, MDPI Remote Sensing, etc. (2021-present; 12 reviews)

### **SELECTED INDEPENDENT PROJECTS (Self-Initiated)**

- **AQI-Cast** ([GitHub](#)) Real-time AQI forecasting platform (Prophet, LSTM, XGBoost) with gridded visualization, ensemble modeling, and EPA/WHO-based thresholds. Deployed via Streamlit + Fly.io; includes dynamic forecast benchmarking and model interpretability tool.
- **CropGuard** ([GitHub](#)) Lightweight deep-learning web app for crop disease detection from leaf images using CNNs. Built with Gradio, tested on public imagery datasets, and deployed free-tier online. Includes GradCAM explainability and class-wise performance reports