

Chayan Roychoudhury

CONTACT INFORMATION

Modeling and Analysis of Atmospheric Composition Laboratory



EDUCATION

Doctoral Studies - PhD Jan 2021 - Aug 2025
The University of Arizona, Department of Hydrology and Atmospheric Sciences
Supervisor : Dr. Avelino F. Arellano Jr.
Post-Graduation - MSc Aug 2017 - Jul 2019
University of Calcutta, Department of Atmospheric Science
Thesis: *Simulation of Hygroscopic Factors on Polar Aerosols over East Antarctica*
Supervisor : Dr. Sanat Kumar Das, Bose Institute
Graduation - BSc Aug 2014 - Jun 2017
University of Calcutta, Department of Physics
First Class Honours

WORK EXPERIENCE

Graduate Research Assistant Jan 2021 - Present
Graduate Teaching Assistant Jan 2023 - May 2024
ATMO 430 - Computational Methods in Atmospheric Sciences (Spring 2023)
ATMO 569 - Air Pollution I : Gases (Fall Spring 2023)
ATMO 545 - Introduction to Data Assimilation (Spring 2024)
Department of Hydrology and Atmospheric Sciences, The University of Arizona
Supervisor : Dr. Avelino F. Arellano Jr.
Guest Research Worker Aug 2019 - Jul 2020
Bose Institute, Environmental Sciences Section
Supervisor : Dr. Sanat Kumar Das

RESEARCH EXPERIENCE

Publications

1. C Roychoudhury, C He, R Kumar, AF Arellano Jr. 2025. **Diagnosing Aerosol-Meteorological Interactions on Snow within the Earth System: A Proof-of-Concept Study over High Mountain Asia.** *Earth System Dynamics*.
2. C Roychoudhury, C He, R Kumar, JM McKinnon, and AF Arellano. **On the relevance of aerosols to snow cover variability over High Mountain Asia.** 2022. *Geophysical Research Letters*, 49.
3. R Kumar, C He, C Roychoudhury, W Cheng, N Mizukami, and AF Arellano. **High Mountain Asia 12 km Modeled Estimates of Aerosol Transport, Chemistry, and Deposition Reanalysis, 2003-2019. (HMA2_MATCHA, Version 1).** 2024. [Data Set]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. <https://doi.org/10.5067/CG40T8DJX2Z7>.
4. K Mottungan, C Roychoudhury, V Brocchi, B Gaubert, W Tang, MA Mirrezaei, JM McKinnon, Y Guo, DWT Griffith, DG Feist, I Morino, MK Sha, MK Dubey, M De Mazière, NM Deutscher, PO Wennberg, R Sussmann, R Kivi, TY Goo, VA Velazco, W Wang, and AF Arellano Jr. **Local and regional enhancements of CH₄, CO, and CO₂ inferred from TCCON column measurements.** 2024. *Atmospheric Measurement Techniques*, 17, 5861–5885.
5. M Greenslade, Y Guo, G Betito, MA Mirrezaei, C Roychoudhury, AF Arellano, A Sorooshian. **On ozone's weekly cycle for different seasons in Arizona.** 2024. *Atmospheric Measurement Techniques*, 17, 5861–5885.
6. MA Mirrezaei, AF Arellano, Y Guo, C Roychoudhury, A Sorooshian. **Ozone Production over Arid Regions: Insights into Meteorological and Chemical Drivers.** 2024. *Environmental Research Communications*, 6, 051009.
7. Y Guo, C Roychoudhury, MA Mirrezaei, R Kumar, A Sorooshian, and AF Arellano: **Investigating Ground-Level Ozone Pollution in Semi-Arid and Arid Regions of Arizona Using WRF-Chem v4.4 Modeling.** 2024. *Geoscientific Model Development*, 17, 4331–4353.
8. A Sorooshian, AF Arellano Jr, M Fraser, P Herckes, G Betito, E Betterton, R Braun, Y Guo, MA Mirrezaei, C Roychoudhury. **Ozone in the Desert Southwest of the United States: A Synthesis of Past Work and Steps Ahead.** 2024. *ACS ES&T Air*, 1(2), 62-79.
9. D Das, S Chiao, C Roychoudhury, F Khan, S Chaudhuri, S Mukherjee. **Tropical Cyclone Energy Variability in North Indian Ocean: Insights from ENSO.** 2023. *Climate*, 11, 232.

In progress

1. JM McKinnon, C Roychoudhury, MA Mirrezaei, B Gaubert, AF Arellano. **Use of Power Spectral Analysis and Dominant Time Scales to Investigate Seasonal and Long-Term Variability of Atmospheric Composition.** In prep.
2. JM McKinnon, C Roychoudhury, AF Arellano. **Spatio-temporal pattern analysis of MOPITT total column CO using varimax rotation and singular spectrum analysis.** [Atmospheric Measurement Techniques](#). In review.
3. J Richter, E Joseph, M Arcodia, J Berner, J Demuth, P Falloon, G Romine, J Cohen, J Gonzalez-Cruz, M El Gharamti, B Hoppe, S Kumar, A Mariotti, D Mishra, K Pegion, Z Pu, K A Quagraine, K T Quagraine, C Roychoudhury, J Ryan, Z Stone, D Das, B Gaubert, S Kapnick, C Zarzycki. **Earth System Predictability Across Time Scales for a Resilient Society: A Research Community Perspective** (Submitted to the *Bulletin of the American Meteorological Society*.)
4. C Roychoudhury, C He, R Kumar, AF Arellano Jr. **Diagnosing Aerosol-Meteorological Interactions on Snow within the Earth System: A Proof-of-Concept Study over High Mountain Asia.** [Earth System Dynamics](#). In review.
5. C Roychoudhury, W Cheng, N Mizukami, C He, AF Arellano and R Kumar. **MATCHA, Model for Atmospheric Transport and Chemistry in Asia, a novel regional climate-chemical reanalysis. Part 1: System description and initial evaluation.** (In preparation for *Earth System Science Data*).
6. C Roychoudhury, C He, R Kumar, and AF Arellano. **Revisiting Black Carbon Emission Estimates in the Third Pole: A Bayesian Synthesis Inversion Perspective.** (In preparation for *Atmospheric Measurement Techniques*).
7. H Bai, C Roychoudhury, C Strong. **Variability of summertime North American Dipole from large ensemble climate simulations.** (In preparation).
8. SK Das, C Roychoudhury, and A Taori. **Virga observed over East Antarctica: An alarming indication of global warming.** (In preparation).

Conference Presentations

1. C Roychoudhury, AF Arellano. **Diagnosing Interactions at the Earth System Interface: Case Studies from Snowmelt and Chemical Feedbacks.** Poster NG43A-2301 presented at AGU Fall Meeting 2024, Washington DC.
2. C Roychoudhury, JM McKinnon, MA Mirrezaei, Y Guo, AF Arellano. **Source attribution of wildfires in Arizona: An exploration of the June 2021 wildfire season.** Poster GC23F-0335 presented at AGU Fall Meeting 2024, Washington DC.
3. C Roychoudhury, MA Mirrezaei, Y Guo, AF Arellano, G Betito, A Sorooshian, AF Arellano. **Leveraging atmospheric chemistry observations in Arizona: Insights into the regional transport of ozone and aerosols.** Poster presented at AERONET Science and Application Exchange, College Park, MD, September 17-19, 2024.
4. C Roychoudhury, AF Arellano, W Cheng, N Mizukami, J McKinnon, C He, R Kumar. **Is traditional Bayesian inversion sufficient to constrain black carbon abundance in High Mountain Asia?** Poster C84 presented at the iCACGP-IGAC 2024 Conference in Kuala Lumpur, Malaysia, 9th-13th September, 2024.
5. C Roychoudhury, W Cheng, C He, R Kumar, JM McKinnon, AF Arellano. **How uncertain are BC emissions in High Mountain Asia? An inverse modeling approach.** Poster GC21K-1070 at AGU Fall Meeting 2023, San Francisco, CA.
6. C Roychoudhury, W Cheng, C He, R Kumar, AF Arellano. **MATCHA, Model for Atmospheric Transport and Chemistry in Asia: A novel regional climate-chemical reanalysis.** Poster C51C-0957 at AGU Fall Meeting 2023, San Francisco, CA.
7. Y Guo, AF Arellano, C Roychoudhury, A Sorooshian, R Kumar, G Pfister (2023). **Harnessing our Air Quality Modeling & Observational Capabilities to Establish Key Factors Influencing Ozone Levels in Arizona.** Poster at 2023 MAC-MAQ Conference, UC Davis, CA.
8. MA Mirrezaei, Y Guo, C Roychoudhury, AF Arellano, A Sorooshian, W Tang, L Emmons (2023). **Investigating surface ozone sensitivity to HCHO/NO₂ ratios over Arizona using the Multi-Scale Infrastructure for Chemistry and Aerosols (MUSICA) model.** Poster at 2023 MAC-MAQ Conference, UC Davis, CA.
9. D Das, S Chiao, ET Swenson, GG Persad, C Roychoudhury (2023). **Past, Present and Future Humid Heat Extremes over the East Coast of the United States** (2023). Poster at 2023 103rd AMS Annual Meeting, Denver, CO.
10. C Roychoudhury, C He, R Kumar, JM McKinnon and AF Arellano (2022). **Tracing the sources of black carbon deposition over the glaciers in High Mountain Asia: A tagged-tracer approach using**

WRF-Chem. Poster at 2022 AGU Fall Meeting, Chicago, IL.

11. JM McKinnon, AF Arellano, *C Roychoudhury* (2022). **Spatio-temporal Pattern Analysis of Trace Gases and Aerosol Abundance Using Varimax Rotation and Locally Linear Embeddings.** Poster at 2022 AGU Fall Meeting, Chicago, IL.
12. *C Roychoudhury*, C He, R Kumar, JM McKinnon and AF Arellano (2022). **Source attribution of aerosol impacts to snow cover over High Mountain Asia.** Poster at 2022 International Global Atmospheric Chemistry (IGAC) Project Science Conference, Manchester, UK.
13. *C Roychoudhury*, C He, R Kumar, MK Shrivastava, JM McKinnon , AF Arellano (2022). **Do aerosols really matter over High Mountain Asia?.** Oral Presentation at University of Arizona's annual El Día Del Agua Y La Atmósfera, Tucson, AZ.
14. *C Roychoudhury*, C He, R Kumar, and AF Arellano (2021). **Investigating the relationship of meteorology and atmospheric composition to snow cover: A comparative study over High-Mountain Asia and Andes.** Lightning Talk and Poster at 2021 International Global Atmospheric Chemistry (IGAC) Project Science Conference, (virtual).
15. *C Roychoudhury*, C He, R Kumar and AF Arellano (2021). **Exploring the association of meteorology and atmospheric composition to snow cover changes: A case study over High-Mountain Asia and Central Andes.** Lightning Talk at 2021 MAC-MAQ Conference, (virtual).
16. *C Roychoudhury*, C He, R Kumar, MK Shrivastava, JM McKinnon , AF Arellano (2021). **Model simulations and satellite data analysis of aerosol impacts to snow cover over High Mountain Asia.** Oral Talk at 2021 Fall Meeting, AGU, New Orleans, LA.
17. JM McKinnon, *C Roychoudhury*, B Gaubert, RR Buchholz, AF Arellano (2021). **Spatio-temporal Pattern Analysis of Trace Gases and Aerosol Abundance Using PCA, SOMs, and Convolution Auto-encoders.** Oral Talk at 2021 AGU Fall Meeting, and 2022 AMS Annual Meeting.
18. C He, R Kumar, MK Shrivastava, *C Roychoudhury*, AF Arellano (2021). **Brown carbon climatic impacts over High Mountain Asia: WRF-Chem model implementation and application.** Presented at 2021 AGU Fall Meeting (virtual).
19. D Das, D Strauss, *C Roychoudhury*, E Swenson, S Paul, G Fang, P Sinha, A Roy Chowdhury (2020). **Oceanic and Atmospheric factors contributing towards the rapid intensification of tropical cyclones in a warming climate: A diagnostic study of Super Cyclone AMPHAN over the Bay of Bengal.** Poster at 2020 AGU Fall Meeting (virtual).
20. D Das, *C Roychoudhury*, S Paul, F Khan, S Chaudhuri (2020). **Impact of ENSO on Tropical Cyclone Season over North Indian Ocean.** Oral Presentation at the International Virtual Conference on Earth's Changing Climate: Past, Present & Future, Society of Earth Scientists (virtual).
21. F Khan, D Das, *C Roychoudhury*, S Chaudhuri (2018). **Role of geo-potential height in estimating the variability in Indian Summer Monsoon Rainfall: A comparative study with NCEP-NCAR Reanalysis and CFSR.** Poster Presentation at 2018 TROPMET National Symposium, Indian Meteorological Society.
22. *C Roychoudhury*, R Ray (2018). **Impact of climate change on butterfly population over a metropolis of India.** Oral Presentation at 2018 TROPMET National Symposium, Indian Meteorological Society and BIOSPECTRUM-2018, India.

TECHNICAL SKILLS

Programming Python, GrADS, IDL, MATLAB, QGIS/ArcGIS, PostgreSQL, L^AT_EX, Linux, HPC.
Modeling WRF-Chem, CESM/CESM-SCAM

HONOURS & AWARDS

- i) Recipient of John & Margaret Harshbarger Scholarship, University of Arizona (2024).
- ii) Recipient of Sol Resnick Scholarship, University of Arizona (2023).
- iii) Recipient of Galileo Circle Scholarship, University of Arizona (2022).
- iv) NSF NCAR Graduate Visitor Program (GVP) (2022).
- v) Rank 1 in MSc in Atmospheric Science (2019) and eligible for INSPIRE-Fellowship under DST, Government of India.

JOURNAL REVIEWER

- i) Geophysical Research Letters (Wiley).
- ii) Theoretical and Applied Climatology (Springer).
- iii) Environmental Monitoring and Assessment (Springer).
- iv) Journal of Applied Meteorology and Climatology (AMS).