Nair, Arshad Arjunan

Research Scientist
Atmospheric Sciences Research Center (ASRC)
State University of New York at Albany (UAlbany)

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Education/Training

May 25 2024 — State University of New York at Albany, NY, USA
Postdoctoral training (Climate, Air-quality, Health)
Supervisors: Dr. Fangqun Yu (ASRC) and Dr. Shao Lin (School of Public Health)

Aug 14 2021 — State University of New York at Albany, NY, USA
PhD, Atmospheric Sciences ⋆ **Top dissertation** (out of 1,289) across the SUNY system for 2021/22
Dissertation: "The role of ammonia in atmospheric new particle formation and implications for cloud condensation nuclei" • Defense: Jul 16, 2021 • *Supervisor*: Dr. Fangqun Yu

May 27 2015 — Indian Institute of Science Education and Research (IISER) Pune, MH, India
BS–MS, Physics • *Thesis*: Lightning Distribution during Active and Break Monsoon Periods over South Asia • Defense: May 03, 2015 • *Supervisor*: Dr. A. K. Kamra

Positions and Scientific Appointments

May 2024 — Research Scientist, Atmospheric Sciences Research Center (ASRC), State University of New York at Albany (UAlbany), Albany, NY, US
Aug 2021 — Postdoctoral Associate, ASRC, UAlbany, Albany, NY, US
Aug 2017 — Research Project Assistant, ASRC, UAlbany, Albany, NY, US
Aug 2016 — ASRC Graduate Fellow, ASRC, UAlbany, Albany, NY, US
Jun 2015 — Co-Guide, Indian Institute of Tropical Meteorology (IITM), Pune, MH, India
Mar 2015 — Research Assistant, Indian Institute of Tropical Meteorology (IITM), Pune, MH, India
Jun 2011 — INSA-IASc-NASI Summer Research Fellow, Indian Academy of Sciences, Bangalore, KA, India
Aug 2009 — National Fellow in Basic Sciences (KVPY), Dept. of Science and Technology, Govt. of India

Honors, & Awards

Mar 2023 — Narayan R. Gokhale Distinguished Research Scholarship Award 2022/2023
Department of Atmospheric and Environmental Sciences, UAlbany, NY

Dec 2022 — **First Place**, SUNY Chancellor Distinguished PhD Graduate Dissertation Awards
State University of New York System, Albany, NY

May 2022 — Distinguished Doctoral Dissertation Award 2021–2022
State University of New York at Albany, NY

Aug 2017 — 2017 AAAR Annual Conference Travel Grant
The American Association for Aerosol Research (AAAR), Raleigh, NC

Feb 2016 — Atmospheric Sciences Research Center (ASRC) Graduate Fellowship
ASRC, State University of New York at Albany, NY

Sep 2014 — Writing Science workshop: 1 of 14 (and only undergraduate) selected nation-wide
National Council for Science & Technology Communication, Govt. of India

May 2011 — INSA-IASc-NASI Summer Research Fellowship (IAS-SRFP)
The Science Academies, India

Jun 2010 — Bhabha Atomic Research Centre (BARC) Summer Research Internship
Department of Atomic Energy (DAE), Govt. of India

Oct 2009 — *Vigyan Jyoti Shibir* (Selected for National Science Camp)
Department of Science and Technology, Govt. of India

Aug 2009 *Kishore Vaigyanik Protsahan Yojana* (KVPY) Fellowship in Basic Sciences
Top ∼0.004% of nation-wide senior secondary school leaving students
Department of Science and Technology, Govt. of India

Feb 2008 Bank of India Gold Medal (AISSE Topper)
Awarded by R. L. Bhatia, Governor of Kerala State

Aug 2007 Dr. K. M. Munshi Memorial Ever Rolling Trophy
Sameeksha 2007 (All Kerala Science Quiz Competition)

Jun 2007 National Talent Search Scholarship (NTSE)
Top ∼0.01% of nation-wide secondary school leaving students
National Council of Educational Research and Training (NCERT), Govt. of India

May 2007 Rev. Dr. John Britto Educational Endowment
Province of St. Joseph, Thiruvananthapuram

Research Experience

PostDoc
Aug 2021–
May 2024

1. Physics-guided machine learning parameterizations of aerosol microphysics for climate models
2. Hybrid machine learning downscaling of air pollutant exposures to the individual level
3. Socioeconomic disparities in air quality and consequent impacts on morbidity *&* mortality
4. Potential impacts of climate intervention strategies on air-quality and public health

Postdoctoral Associate, Atmospheric Sciences Research Center (ASRC), Albany, NY
• Multiple projects toward developing a deep understanding and reliable quantification of climate *&* health impacts of air-quality and emergent stressors under a changing climate paradigm.

PhD
Aug 2016–
Aug 2021

The role of ammonia in atmospheric new particle formation and implications for cloud condensation nuclei
Research Project Assistant, Atmospheric Sciences Research Center (ASRC), Albany, NY, U.S.A.
Graduate Student, Dept. of Atmospheric and Environmental Sciences, University at Albany
• Developed a physicochemically explainable, robust, and computationally efficient machine learning representation for cloud condensation nuclei in GCMs, validated with DOE ARM data.
• Doctoral work resulted in 11 publications and 15 presentations.
• Led collaborative paper with 27 researchers supported by NSF, NASA, NOAA, and NRF (Korea).

Research Assistantship

Jun 2015–
May 2016

Some observations on lightning over the Bay of Bengal
Co–guide, Indian Institute of Tropical Meteorology (IITM), Pune, India
• Investigated lightning climatology over the Bay of Bengal that receives unusually high monsoon precipitation, as well as displays high convective clouds – peculiar for an oceanic region.
• Guided a Master's student during his summer internship analyzing 18-year satellite data for lightning with sea surface temperature, CAPE, and salinity.

Mar 2015–
May 2016

Lightning Distribution over South Asia during Active and Break Spells of the Monsoon
Research Assistant, IITM Pune, India

Undergraduate (5 year BS–MS)

Aug 2014–
Mar 2015

Lightning Distribution over South Asia during Active and Break Spells of the Monsoon
Masters Thesis Student, IITM Pune, India
• Studied the link between lightning activity and the axis of the monsoon trough using satellite (NASA TRMM LIS/OTD) and observational (in situ surface networks) data sets in context of intensity and duration of the active and break monsoon periods.

Aug 2013–
Dec 2013

Synthesis and Analysis of Mesoporous SnO_2 Nanoparticles
Project Student, Indian Institute of Science Education and Research (IISER), Pune, India
• Optimized synthesis of hollow mesoporous graphene encapsulated SnO_2 nanoparticles aimed at improved lithium ion batteries: charge capacity, number of recharge cycles, and durability.

Jan 2013–Jul 2013 Impacts of the Western Ghats on lightning
Project Student, IITM Pune, India
• Uncovered the strong orographic effect of the Western Ghats on lightning distribution, especially during the onset and withdrawal phases of the monsoon season using satellite data.

May 2012–Jun 2012 Understorey aves diversity and conservation along elevational gradients
Summer Project Student, IISER Pune, India
• Field work (mist-netting, specimen collection, DNA barcoding) to study the elevational distribution of understorey birds at Eaglenest Wildlife Sanctuary, Arunachal Pradesh, India.

May 2011–Jul 2011 Effect of anthropogenic aerosols from Mumbai on cloud electrification
IASc-INSA-NASI Summer Research Fellow, IITM Pune, India
• Studied the effect of aerosols from a metropolitan city on lightning activity.

Jun 2010–Jul 2010 Effect of Low Radiation Dose on *Fenneropenaeus indicus*
Summer Project Student, Bhabha Atomic Research Centre (BARC), Tirunelveli, India
• Optimized radiation doses for preservation of seafood and treatment of hospital wastes.

Research Communication Full list: scholar.google.com/citations?user=MXKOuR8AAAAJ

Journal articles

2024 Qi, Q., Yu, F., **Nair, A. A.**, Lau, S.S., Luo, G., Mithu, I., Zhang, W., Li, S. *&* Lin, S. (2023). Hidden danger: The long-term effect of ultrafine particles on mortality and its sociodemographic disparities in New York State, *Journal of Hazardous Materials, 471*, 134317. doi:10.1016/j.jhazmat.2024.134317

2024 Yu, F., Anderson, B.E., Pierce, J.R., Wong, A., **Nair, A. A.**, Luo, G. *&* Herb, J. (2024). On Nucleation Pathways and Particle Size Distribution Evolutions in Stratospheric Aircraft Exhaust Plumes with H_2SO_4 Enhancement, *ES&T, 58*(16), 6934–6944. doi:10.1021/acs.est.3c08408

2024 Yu, F.†, **Nair, A. A.**†, Lauper, U., Luo, G., Herb, J., Morse, M. J., Savage, B., Zartarian, M., Wang, M., *&* Lin, S. (2023). Mysteriously rapid rise in Legionnaires' disease incidence correlates with declining atmospheric sulfur dioxide, *Proceedings of the National Academy of Sciences Nexus, 3*(3), pgae085. doi:10.1093/pnasnexus/pgae085. †*Equal contribution.*

2023 **Nair, A. A.**, Shao, L., Luo, G., Ryan, I., Qi, Q., Deng, X., *&* Yu, F. (2023) Environmental exposure disparities in ultrafine particles and $PM_{2.5}$ by urbanicity and socio-demographics in New York State, 2013–2020. *Environmental Research, 239*(2), 117246. doi:10.1016/j.envres.2023.117246

2023 **Nair, A. A.**, Yu, F., Luo, G. (2023). The importance of ammonia for springtime atmospheric new particle formation and aerosol number abundance over the United States. *Science of the Total Environment, 160756.* doi:10.1016/j.scitotenv.2022.160756

2023 Yu, F., Luo, G., **Nair, A. A.**, Eastham, S., Williamson, C. J., Kupc, A., and Brock, C. A. (2023). Particle number concentrations and size distributions in the stratosphere: Implications of nucleation mechanisms and particle microphysics. *Atmospheric Chemistry and Physics, 23*(3), 1863–1877. doi:10.5194/acp-2022-487

2022 Yu, F., Luo, G., **Nair, A. A.**, Tsigaridis, K., Bauer, S. (2022). Use of machine learning to reduce uncertainties in particle number concentration and aerosol indirect radiative forcing predicted by climate models. *Geophysical Research Letters*, e2022GL098551. doi:10.1029/2022GL098551

2022 Lin, S., Ryan, I., Paul, S., Deng, X., Zhang, W., Luo, G., Dong, G., **Nair, A. A.**, *&* Yu, F. (2022). Particle surface area, ultrafine particle number concentration, and cardiovascular hospitalizations. *Environmental Pollution, 119795.* doi:10.1016/j.envpol.2022.119795

2022 Deng, X., Friedman, S., Ryan, I., … , **Nair, A. A.**, … *&* Lin, S. (2022). The independent and synergistic impacts of power outages and floods on hospital admissions for multiple diseases. *Science of The Total Environment, 154305.* doi:10.1016/j.scitotenv.2022.154305

2021 **Nair, A. A.**, Yu, F., Campuzano-Jost, P., DeMott, P. J., Levin, E. J. T., … *&* Peng, Q. (2021). Machine learning uncovers aerosol size information from chemistry and meteorology to quantify potential

cloud-forming particles. *Geophysical Research Letters, 48*, e2021GL094133. doi:10.1029/2021GL094133

2021 Mao. J., Zhang, Y., Yu F., **Nair, A. A.**, Yu, Q., … & Chen, L. (2021) On the ship particle number emission index: Size-resolved microphysics and key controlling parameters. *Journal of Geophysical Research: Atmospheres, 126*, e2020JD034427. doi:10.1029/2020JD034427

2020 **Nair, A. A.** & Yu, F. (2020). Using machine learning to derive cloud condensation nuclei number concentrations from commonly available measurements. *Atmospheric Chemistry and Physics, 20*(21), 12853–12869. doi:10.5194/acp-20-12853-2020

2020 **Nair, A. A.** & Yu, F. (2020). Quantification of atmospheric ammonia concentrations: A review of its measurement and modeling. *Atmosphere, 11*(10), 1092. doi:10.3390/atmos11101092

2020 Yu, F., Luo, G., **Nair, A. A.**, Schwab, J. J., Sherman, J. P. & Zhang, Y. (2020). Wintertime new particle formation and its contribution to cloud condensation nuclei in the Northeastern United States. *Atmospheric Chemistry and Physics, 20*(4), 2591–2601. doi:10.5194/acp-20-2591-2020

2019 **Nair, A. A.**, Yu, F. & Luo, G. (2019). Spatioseasonal variations of atmospheric ammonia concentrations over the United States: Comprehensive model-observation comparison. *Journal of Geophysical Research: Atmospheres, 124*(12), 6571-6582. doi:10.1029/2018JD030057

2018 Yu, F., **Nair, A. A.** & Luo, G. (2018). Long-term trend of gaseous ammonia over the United States: Modeling and comparison with observations. *Journal of Geophysical Research: Atmospheres, 123*(15), 8315-8325. doi:10.1029/2018JD028412

2015 Kamra, A. K. & **Nair, A. A.** (2015). The impact of the Western Ghats on lightning activity on the western coast of India. *Atmospheric Research, 160*, 82-90. doi:10.1016/j.atmosres.2015.03.006

Presentations

2024 Qi, Q., Madani, N. A., Xue, Y., …, **Nair, A. A.**, …, Lin, S. (2024, Nov) Panel Paper - Effects of Ultrafine Particles and Extreme Temperature on Hospital Admissions of High Burden Diseases. In *46th Annual Meeting: Assoc. for Public Policy Analysis & Management (APPAM)*. National Harbor, MD.

2024 **Nair, A. A.** (2024, Jun) GEOS-Chem-APM for (1) physics-guided machine learning parameterizations and (2) aerosol pollution exposure and health disparities. In *11th International GEOS-Chem Meeting*. Washington University. St. Louis, MO.

2024 **Invited** Yu, F. & **Nair, A. A.** (2024, May) Mysteriously rapid rise in Legionnaires' disease incidence correlates with declining atmospheric sulfur dioxide. In *NYSDEC BAQAR/NYSERDA Seminar Series*. Albany, NY.

2024 **Invited** Yu, F. & **Nair, A. A.** (2024, Apr) Mysteriously rapid rise in Legionnaires' disease incidence correlates with declining atmospheric sulfur dioxide. In *Council of State and Territorial Epidemiologists (CSTE) Legionnaires' Disease Surveillance Workgroup Call*. Atlanta, GA.

2023 **Invited** Lin, S. & **Nair, A. A.** (2023, Jun) Systematically assessing the associations and disparities between ultra-fine particles and multiple health outcomes, and the modifications by weather factors and greenness coverage. In *NYSDEC BAQAR/NYSERDA Seminar Series*. Albany, NY.

2023 **Invited** **Nair, A. A.** (2023, Feb) The role of ammonia in atmospheric new particle formation and implications for cloud condensation nuclei. In *Academic Affairs Committee of the Board of Trustees of the State University of New York*. Albany, NY.

2023 **Nair, A. A.**, Yu, F., Luo, G., Someya, Y. (2023, Jan) Global Atmospheric Ammonia: Insights from Modeling and Multi-Satellite Measurements. In *103rd AMS Annual Meeting*. American Meteorological Society. Virtual.

2023 Yu, F., Luo, G., & **Nair, A. A.** (2023, Jan) On processes controlling size distributions and optical properties of stratospheric particles: Long-term simulations and comparisons with measurements. In *103rd AMS Annual Meeting*. American Meteorological Society. Virtual.

2022 Yu, F., Luo, G., **Nair, A. A.**, & Wang, J. (2022, Oct) On processes controlling size distributions and optical properties of stratospheric particles: Long-term simulations and comparisons with measurements. In *SAGE III/ISS Science Team Meeting 2022*.

2022 **Nair, A. A.**, Luo, G., Ryan, I., Deng, X., Lin, S., & Yu, F. (2022, Sep) Socioeconomic disparities in aerosol pollutant exposure may be amplified by ultrafine particles despite declining $PM_{2.5}$. In *34th Annual Conference of the International Society of Environmental Epidemiology (ISEE)*. Athens, Greece. doi:10.1289/isee.2022.O-OP-096

2022 Lin, S., Qi, Q., Ryan, I., Deng, X., Luo, G., **Nair, A. A.**, & Yu, F. (2022, Sep) High ambient temperature or ultrafine particles – which one has the largest effect on high burden diseases in New York State (NYS)? In *34th Annual Conference of the ISEE*. Athens, Greece. doi:10.1289/isee.2022.P-0610

2022 **Nair, A. A.**, Luo, G., Ryan, I., Deng, X., Lin, S., & Yu, F. (2022, Sep) Socioeconomic disparities in aerosol pollutant exposure may be amplified by ultrafine particles despite declining $PM_{2.5}$. In *34th Annual Conference of the ISEE*. Athens, Greece. doi:10.1289/isee.2022.P-0685

2022 **Invited** **Nair, A. A.**, Ryan, F., Luo, G., Deng, X., Zhang, W., Yu, F., & Lin, S. (2022, Aug) Race-ethnicity disparities in COVID-19 outcomes may be worsened by shorter- and long-term aerosol pollutants exposure. In *International Conference on Environment and Human Health: Challenges and Opportunities in the 21st Century*. Virtual.

2022 **Nair, A. A.** & Yu, F. (2022, Jun) GEOS-Chem-APM for physics-informed machine learning emulators and parameterizations. In *10th International GEOS-Chem Meeting*. Washington University. St. Louis, MO.

2021 **Nair, A. A.** & Yu, F. (2021, Oct) The Role of Ammonia in Atmospheric New Particle Formation and Aerosol Number Abundance at the Southern Great Plains Site. In *39th AAAR Annual Conference*. American Association for Aerosol Research. Virtual.

2021 **Nair, A. A.** & Yu, F. (2021, Jan) Using Data from NASA Suborbital Campaigns to Validate a Machine Learning Algorithm for Predicting Cloud Condensation Nuclei. In *101st AMS Annual Meeting*. American Meteorological Society. Virtual.

2020 **Nair, A. A.** & Yu, F. (2020, Dec) Using machine learning to derive cloud condensation nuclei number concentrations from commonly available measurements. In *AGU Fall Meeting 2020*. American Geophysical Union. Virtual.

2020 Yu, F., Luo G. & **Nair, A. A.** (2020, Dec) Use of machine learning to reduce uncertainty in anthropogenic radiative forcing associated with aerosol–cloud interactions. In *AGU Fall Meeting 2020*. American Geophysical Union. Virtual.

2020 **Nair, A. A.** (2020, Apr) Predicting atmospheric particle number concentrations using machine learning. In *ASRC Friday Colloquy*. Atmospheric Sciences Research Center. Albany, NY.

2020 **Nair, A. A.**, Yu, F. & Luo, G. (2020, Jan) Particle Number Concentrations and Their Controlling Parameters: Predictive analysis using machine learning. In *NYS DEC DAR BAQAR Scientific Meeting*. Albany, NY.

2020 **Nair, A. A.**, Yu, F. & Luo, G. (2020, Jan) Particle Number Concentrations and Their Controlling Parameters Over the United States. In *100th AMS Annual Meeting*. American Meteorological Society. Boston, MA.

2019 **Nair, A. A.**, Yu, F. & Luo, G. (2019, Oct) Assessment of Model-Simulated Global Atmospheric Ammonia with Satellite Remote Sensing Measurements. In *37th AAAR Annual Conference*. American Association for Aerosol Research. Portland, OR.

2019 Schwab, J., Hassan, H., Ninneman, M., ..., **Nair, A. A.**, ..., Rattigan, O. (2019, Oct) Ammonium and Ammonia: Concentration Trends in the Northeast United States. In *37th AAAR Annual Conference*. American Association for Aerosol Research. Portland, OR.

2019 **Nair, A. A.**, Yu, F. *&* Luo, G. (2019, May) Spatio-seasonal Variations of Atmospheric Ammonia: Comprehensive Model–Observation Comparisons. In *9th International GEOS-Chem Meeting*. Harvard University. Boston, MA.

2018 **Nair, A. A.**, Yu, F. *&* Luo, G. (2018, Dec) Atmospheric Ammonia over the United States: Comprehensive Model-Observation Comparisons. In *AGU Fall Meeting 2018*. American Geophysical Union. Washington, DC.

2018 **Nair, A. A.**, Yu, F. *&* Luo, G. (2018, Dec) Atmospheric Ammonia over United States: Comprehensive Model-Observation Comparisons. In *NYSDEC DAR BAQAR Scientific Meeting*. Albany, NY.

2017 **Nair, A. A.**, Luo, G., *&* Yu, F. (2017, Oct) Comparison of Model Simulated Ammonia with Observations: A Case for Implementation of Improved Gas/Aerosol Partitioning Schemes. In *36th AAAR Annual Conference*. American Association for Aerosol Research. Raleigh, NC.

2017 **Nair, A. A.**, Luo, G., *&* Yu, F. (2017, May) Comparison of GEOS-Chem simulated ammonia concentrations with observations. In *8th IGC Meeting*. Harvard University. Boston, MA.

Theses

2021 **Nair, A. A.** (2021) The Role of Ammonia in Atmospheric New Particle Formation and Implications for Cloud Condensation Nuclei (Doctoral Dissertation), University at Albany, State University of New York, July 16, 2021. Available at Scholars Archive @ University at Albany.

2015 **Nair, A. A.** (2015) Lightning Distribution during Active and Break Monsoon Periods over South Asia (Master's thesis), IISER Pune, March 25, 2015. Available at Digital Repository @ IISER Pune.

Teaching

Spring 2023 *Aerosol exposure and COVID-19*
Module in EHS545: Global Climate Change, Extreme Weather *&* Public Health
Department of Environmental Health Sciences, UAlbany

Fall 2022 *Machine Learning and Aerosol Microphysics*
Module in ATM515: Aerosol Physics
Department of Atmospheric *&* and Environmental Sciences, UAlbany

Service to the profession

University-level:

- University at Albany Senate Council on Research (CoR) Member 2024–26
  –Member of The Committee on Centers, Institutes and Specialized Research Laboratories
  –Member of the Ad Hoc Committee on Faculty Research Award Program - Category A
- 2024 Search Committee for Research Faculty at the Atmospheric Sciences Research Center

Reviewer:

- (*Agencies*) National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), and Belgian Science Policy Office (BELSPO).
- (*Journals*) Science, ACS Earth and Space Chemistry, Atmospheric Chemistry and Physics, Environmental Science *&* Technology, ES*&*T Letters, Environmental Research Letters, Science of the Total Environment, Environment Systems and Decisions, Environment International, Atmosphere, Atmospheric Research, ACS Earth and Space Chemistry, Journal of Environmental Sciences, Remote Sensing of the Environment, Journal of Applied Remote Sensing, Advances in Space Research, Tellus Series B: Chemical and Physical Meteorology, Applied Sciences, Science Bulletin, Sustainability, Toxics, International Journal of Environmental Research and Public Health (IJERPH), Hygiene and Health Advances.
- (*University*) Faculty Research Awards Programs (FRAP) that provide seed funding for faculty members' research, scholarship and creative activities.

- (*Conference*) American Meteorological Society 2023 Atmospheric Chemistry Symposium Student Presentation Competition Judge.

Working Groups: (*subscriber*) DOE Atmospheric System Research Aerosol Processes WG, NCAR Geoengineering Modeling Research Consortium.

Mentor: Science and Technology Entry Program College Overview and Research Experience (STEP/CORE; New York State Education Dept.), Project SHORT, and Wonderland Literacy Center (Indian NGO).

Member: (*non-selective*) American Association for Aerosol Research (AAAR), American Geophysical Union (AGU), American Physical Society (APS), American Meteorological Society (AMS), International Society of Environmental Epidemiology (ISEE), American Public Health Association (APHA), (*previously*:) The New York Academy of Sciences (NYAS), National Postdoctoral Association (NPA), and Capital District Postdoc Association (CDPA).