M. OMAR NAWAZ

George Washington University, Milken Institute School of Public Health, Department of Environmental and Occupational Health, Air, Climate, and Health Lab

Email: nawaz.muhammad@email.gwu.edu, **Nationality**: American / British

RESEARCH EXPERIENCE

Postdoctoral Research Associate
National Resources Defense Council Health Science Policy Fellow
George Washington University, Milken Institute School of Public Health, Department of Environmental and Occupational Health, Air, Climate, and Health Lab
2023 – Current

- Research fellow for one year, led team of researchers to incorporate health and equity analyses into National Resources Defense Council climate policy modelling.
- Led writing of under review NASA grant proposal ($1,000,000) for project to characterize compounding climate and air pollution hazards and project climate policy impacts.
- Used satellite remote-sensing of nitrogen dioxide (ESA TROPOMI) to build land-use regression and machine learning models for health and equity assessments.
- Investigated nitrogen dioxide in Houston, TX by comparing models, aircraft and satellite remote sensing, and ground-level monitors to understand emission underestimates.
- Invited to speak at UNEP / EDF workshop in Bogotá on clean air strategies for improving public health and advancing climate goals in Latin American countries.
- Wrote and contributed to scientific papers for peer-reviewed journals and attended multiple conferences and workshops to promote work.

Ph.D. Research Assistant
University of Colorado Boulder, Department of Mechanical Engineering
2018 – 2023

- Developed novel adjoint model approach that integrates remote-sensing data and health methods to consider climate and transportation policy impacts.
    - This method supported reduced-form tools including the NASA AQACF (NPO-52578-1), the ICCT FATE tool, and the SEI LEAP-IBC tool and it was used in subsequent studies by other researchers (Choi et al 2024; Gu et al. 2023a,b).
    - ICCT collaboration led to multiple additional co-designed consulting projects.
- Investigated how increased wildfires in Amazon from deforestation impacted air quality and health in Brazil, led to peer-reviewed paper and media coverage.
- Explored G20 net-zero health benefits, led to peer-reviewed paper and media coverage.
- Characterized the benefits of Chile's NDCs from the Paris Climate Agreement compared to business as usual, led to peer-reviewed paper.

M.S. Research Assistant
University of North Carolina at Chapel Hill, Department of Environmental Engineering
2016-2018

- Developed GIS approach to integrate county-level disease rates from the US CDC, with remote-sensing derived pollution, and population data to estimate health impacts in US.

GRANTS, AWARDS, AND FELLOWSHIPS

Accepted

2024 Application of satellite observations in estimating NO_2 concentrations, mortality burdens, and inequities. NASA ROSES FINESST F.5 (**Collaborator**) ($150,000)
2024 Study of Global Maritime Shipping-Attributable Health Impacts by the International Council on Clean Transportation (ICCT) (**Consultant**) ($5,000)
2023 Study of Global Transportation-Attributable Health Impacts by the International Council on Clean Transportation (ICCT) (**Consultant**) ($12,000)
2023 National Resources Defense Council Health Science Policy Fellowship
2018 Outstanding Mechanical Engineering Research Potential Fellowship ($1000)
2018 1st place student poster Award, UNC 5th Climate Change Symposium ($100)

Under Review

2023 HEAD-IN: Assessing disaster risk and resilience action benefits associated with compound heat and air quality hazards, exposures, and vulnerabilities. NASA ROSES A42. (**Primary Investigator**) ($1,016,525)

Competitive Grants Not Selected for Funding

2020 Development of a source attribution and data assimilation framework for MAIA primary and secondary target areas in North America and South America. NASA ROSES FINESST F.5 (**Future Investigator**) ($150,000)

EDUCATION

Ph.D. in Mechanical Engineering, Air Quality Focus

2023 Department of Mechanical Engineering, University of Colorado Boulder
Dissertation: *An adjoint sensitivity framework for public health: the sources of air pollution and their current and future impacts at both the urban and national scale.*
Committee: Dr. Daven K. Henze (Advisor), Dr. Susan C. Anenberg, Dr. Michael P. Hannigan, Dr. Colleen E. Reid, Dr. Christine Wiedinmyer

M.S. in Environmental Engineering

2018 Department of Environmental Engineering, Gillings School of Global Public Health, University of North Carolina at Chapel Hill
Dissertation: *Benefits of reduced premature mortality from decreases in $PM_{2.5}$ and ozone in the United States from 1999 to 2015.*
Committee: Dr. J. Jason West (Advisor), Dr. Marc Serre, Dr. William Vizuete

B.S. in Physics, Minor in Astronomy

2017 Department of Physics and Astronomy, University of North Carolina at Chapel Hill

B.S. in Applied Mathematics

2017 Department of Mathematics, University of North Carolina at Chapel Hill

POSTGRADUATE TEACHING

Professorial Lecturer

George Washington University

Fall 2024 (Beginning October 1st, 2024)

- Responsible for teaching *Global Climate Change and Air Pollution* (PuBH 6140) to graduate and undergraduate students.
- Responsible for developing and delivering lectures, seminars, and tutorials.
- Responsible for marking exams, homework, and essays.

UNDERGRADUATE TEACHING

Lead Teaching Assistant
University of Colorado Boulder, Supervised by Professor Daven Henze
Spring 2019

- Led tutorials and practicals for *Computational Methods* (MCEN 3030)
- Marked exams and homework
- Managed a group of graders and teaching assistants to support class of around 100 undergraduate students.

Teaching Assistant
University of Colorado Boulder, Supervised by Professor Jeffery Knutsen
Fall 2018

- Led tutorials and practicals for *Computational Methods* (MCEN 3030) for a class of around 100 undergraduate students.
- Marked exams and homework

MENTORSHIP

Mentor
George Washington University
2023-

- Trained and supported junior lab members in research methods, grant writing, integrating health and equity in climate policy modeling, and working with stakeholders.

Mentor
University of Colorado
2020-2023

- Trained and supported junior lab members in research methods, chemical transport modeling, air pollution health impact assessments, and Ph.D. examinations.

Research Mentees
Olivia Paquette (B.S. Student, Current)
Erin Campbell (M.P.H Student, Current)
Katie O'Donnell (M.P.H, Current)
Mohammed Alwakeel (B.S., 2021, next a mechanical engineer)

PUBLICATIONS (20)

Refereed Journal Articles (14)

2024 Choi, J., Henze, D.K., **Nawaz, M.O.,** Malley, C. Source attribution of health burdens from ambient $PM_{2.5}$, O_3, and NO_2 exposure for assessment of South Korean national emission control scenarios by 2050. Accepted. *GeoHealth*.

2024 Georgia M.C. Dyer, Sasha Khomenko, Deepti Adlakha, Susan Anenberg, Martin Behnisch, Geoff Boeing, Manuel Esperon-Rodriguez, Antonio Gasparrini, Haneen Khreis, Michelle C. Kondo, Pierre Masselot, Robert I. McDonald, Federica Montana, Rich Mitchell, Natalie Mueller, **Nawaz, M.O.**, Enrico Pisoni, Rafael Prieto-Curiel, Nazanin Rezaei, Hannes Taubenböck, Cathryn Tonne, Daniel Velázquez-Cortés, Mark Nieuwenhuijsen. Exploring the nexus of urban form, transport, environment and health in large-scale urban studies: A state-of-the-art scoping review, Environmental Research, Volume 257, 2024, https://doi.org/10.1016/j.envres.2024.119324.

2024 **Nawaz, M. O.,** Johnson, J., Yarwood, G., de Foy, B., Judd, L., and Goldberg, D. L.: An intercomparison of satellite, airborne, and ground-level observations with WRF–CAMx simulations of NO_2 columns over Houston, Texas, during the September 2021 TRACER-AQ campaign, Atmos. Chem. Phys., 2024, 6719–6741, https://doi.org/10.5194/acp-24-6719-2024.

2023 Gu, Y., Henze, D.K., **Nawaz, M.O**., Wagner, U.J. Response of the ozone-related health burden in Europe to changes in local anthropogenic emissions of ozone precursors. *Environmental Research Letters*. 18(11). https://doi.org/10.1088/1748-9326/ad0167

2023 Jo, D., Nault, B.A., Tilmes, S., Gettelman, A., McCluskey, C., Hodzic, A., Henze, D.K., **Nawaz, M.O.**, Fung, K., Jimenez, J. Global Health and Climate Effects of Organic Aerosols from Different Sources. *Environmental Science and Technology*. 2023, 57, 37, 13793–13807. https://doi.org/10.1021/acs.est.3c02823

2023 **Nawaz, M.O.**, Henze, D.K., Huneeus, N.J., Osses, M., Álamos, N., Opazo, M., Gallardo, L., Sources of air pollution health impacts and co-benefits of carbon neutrality in Santiago, Chile. *Journal of Geophysical Research: Atmospheres* 128(19) https://doi.org/10.1029/2023JD038808

2023 **Nawaz, M. O.**, Henze, D. K., Anenberg, S. C., Ahn, D. Y., Goldberg, D. L., Tessum, C. W., & Chafe, Z. A. Sources of air pollution-related health impacts and benefits of radially applied transportation policies in 14 US cities. *Frontiers in Sustainable Cities*, *5*. https://doi.org/10.3389/frsc.2023.1102493

2023 Gu, Y., Henze, D.K., **Nawaz, M.O.**, Cao, H. Wagner, U.J., Sources of PM2.5-associated health risks in Europe and corresponding emission-induced changes during 2005-2015. *GeoHealth* 2023. https://doi.org/10.1029/2022GH000767

2023 **Nawaz, M. O.**, Henze, D. K., Anenberg, S. C., Braun, C., Miller, J., & Pronk, E. A Source Apportionment and Emission Scenario Assessment of PM2.5- and O3-Related Health Impacts in G20 Countries. *GeoHealth*, *7*(1), e2022GH000713. https://doi.org/10.1029/2022GH000713

2022 Cao, H., Henze, D. K., Cady-Pereira, K., McDonald, B. C., Harkins, C., Sun, K., Bowman, K. W., Fu, T.-M., & **Nawaz, M. O.** COVID-19 Lockdowns Afford the First Satellite-Based Confirmation That Vehicles Are an Under-recognized Source of Urban

NH3 Pollution in Los Angeles. *Environmental Science & Technology Letters*, *9*(1), 3–9. https://doi.org/10.1021/acs.estlett.1c00730

2021 **Nawaz, M. O.**, Henze, D. K., Harkins, C., Cao, H., Nault, B., Jo, D., Jimenez, J., Anenberg, S. C., Goldberg, D. L., & Qu, Z. (2021). Impacts of sectoral, regional, species, and day-specific emissions on air pollution and public health in Washington, DC. *Elementa: Science of the Anthropocene*, *9*(1), 00043. https://doi.org/10.1525/elementa.2021.00043

2021 Malley, C. S., Hicks, W. K., Kulyenstierna, J. C. I., Michalopoulou, E., Molotoks, A., Slater, J., Heaps, C. G., Ulloa, S., Veysey, J., Shindell, D. T., Henze, D. K., **Nawaz, M. O.**, Anenberg, S. C., Mantlana, B., & Robinson, T. P. Integrated assessment of global climate, air pollution, and dietary, malnutrition and obesity health impacts of food production and consumption between 2014 and 2018. *Environmental Research Communications*, *3*(7), 075001. https://doi.org/10.1088/2515-7620/ac0af9

2021 Nault, B. A., Jo, D. S., McDonald, B. C., Campuzano-Jost, P., Day, D. A., Hu, W., Schroder, J. C., Allan, J., Blake, D. R., Canagaratna, M. R., Coe, H., Coggon, M. M., DeCarlo, P. F., Diskin, G. S., Dunmore, R., Flocke, F., Fried, A., Gilman, J. B., Gkatzelis, G., … **Nawaz, M. O.**, … Jimenez, J. L. Anthropogenic Secondary Organic Aerosols Contribute Substantially to Air Pollution Mortality. *Atmospheric Chemistry and Physics Discussions*, 1–53. https://doi.org/10.5194/acp-21-11201-2021

2020 **Nawaz, M. O.**, & Henze, D. K. Premature Deaths in Brazil Associated With Long-Term Exposure to PM2.5 From Amazon Fires Between 2016 and 2019. *GeoHealth*, *4*(8), e2020GH000268. https://doi.org/10.1029/2020GH000268

Manuscripts Under Review (4)

Submitted **Nawaz, M.O.**, Goldberg, D.G., Kerr, G.H., Anenberg, S.C. TROPOMI satellite data reshape NO2 air pollution land-use regression modeling capabilities in the United States. *Under Review*.

Submitted Goldberg, D.G., de Foy, B., **Nawaz, M.O**; Johnson, J., Yarwood, G., Judd, L., Identifying Sources of Urban NO_x Emissions in Houston, Texas using Remote Sensing Aircraft Measurements and Source Apportionment Regression Models. *Under Review*.

Submitted Jin, L. Benoit, J. Ferrini Rodrigues, P. Miller, J. Alvarez, G., Osipova, L., Anenberg, S.C., **Nawaz, M.O.**, Henze, D.K., Wiecko, P. Current and future burden of mortality and paediatric asthma from transport-related policy measures. *Under Review*.

Submitted Dyer, G., …, **Nawaz, M.O.**, … Nieuwenhuijsen, M., Commentary: A road map for future urban health research. *Under Review*.

Manuscripts in Preparation (2)

In prep. **Nawaz, M.O.**, Henze, D.K., Climate action has the potential to ameliorate, perpetuate, or exacerbate geopolitical air pollution inequities.

In prep. **Nawaz, M.O.**, O'Donnell, K., Campbell, E., Anenberg, S.C., Commentary: Integrating health risk and equity into analyses of climate, energy, and environmental policies.

PROFESSIONAL ASSOCIATIONS

2024- Global Burden of Disease Study Collaborator
2023- American Meteorological Society
2023- European Geophysical Union
2018- American Geophysical Union

MEDIA COVERAGE

2023 The Global Health Benefits of Going Net Zero
2020 Queimadas na Amazônia aumentam internações

AD-HOC PEER-REVIEW FOR JOURNALS (16)

Discover Cities: 2024 (1)
Elementa: Science of the Anthropocene: 2021 (1)
Environmental Research Letters: 2024 (1)
Environmental Science & Technology: 2023 (1), 2022 (1), 2019 (1)
GeoHealth: 2024 (1), 2023 (1)
International Geoscience and Remote Sensing Symposium: 2024 (6)
Lancet Planet Health: 2021 (1)
Journal of the Air and Waste Management Association: 2019 (1)
Scientific Reports: 2024 (1)

REFERENCES

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PRESENTATIONS (23)

Invited Talks

2023 Using satellite data to characterize air pollution and health in cities and countries. Environmental Defense Fund / Climate and Clean Air Coalition / United Nations Environmental Programme Workshop for Clean Air Solutions in Latin America and the Caribbean. Bogotá, Columbia. April 27th.

Conference Presentations

2024 **Nawaz, M.O.**, Anenberg, S.C., Goldberg, D.L., Kerr, G.H., Kondragunta, S. Development of a Land-Use Regression of Hourly Surface NO2 in preparation for GeoXO Atmospheric Composition Data. April 17th. EGU 2024. Oral

2024 **Nawaz, M.O.**, O'Dell, K., Anenberg, S.C., Goldberg, D.L., Kerr, G.H., He, J., McDonald, B., Kondragunta, S. Value of GeoXO Atmospheric Composition Data for Estimating Air Pollution-Related Health Impacts. January 30th. AMS 2024. Oral

2023 **Nawaz, M.O.,** Henze, D.K., Anenberg, S.C., Goldberg, D.L., Investigating climate co-benefits using GEOS-Chem adjoint sensitivities. August 15th. Second GEOS-Chem Europe Meeting. Oral

2023 **Nawaz, M.O.,** Henze, D.K., Anenberg, S.C., Tessum, C. Regional vs local sources of municipal air pollution-related health impacts. American Meteorological Society. January 10. Oral (Presented by Henze).

2022 **Nawaz, M.O.**, Henze, D.K., Anenberg, S.C., Harkins, C., Gallardo, L., Barazza Basoa, K. Leveraging satellite-derived data and air quality modeling to characterize source profiles of climate co-benefits at the urban- and country- scale. American Geophysical Union. December 12. Poster.

2022 **Nawaz, M.O.**, Henze, D.K., Anenberg, S.C., Huang, T. Developing an interactive tool for characterizing the air pollution-related health impacts in Los Angeles, CA associated with different proposed emission scenarios. Earth Science Information Partners Meeting, July 19. Oral.

2022 **Nawaz, M.O.**, Henze, D.K., Anenberg, S.C., Harkins, C., Gallardo, L., Barazza Basoa, K. Leveraging satellite-derived data in GEOS-Chem adjoint simulations to characterize the sources of PM2.5-, O3-, and NO2-related health impacts at multiple spatial scales. 10th International GEOS-Chem Meeting, June 9. Oral.

2022 **Nawaz, M.O.**, Henze, D.K., Braun, C., Miller, J., Pronk, E., Anenberg, S.C. Characterizing the sources of air pollution at the urban- and country-scale: case studies in Santiago, Chile and G20 countries. Graduate Engineering Annual Research and Recruitment Symposium, February 17. Oral.

2021 **Nawaz, M.O.**, D. Henze, S.C. Anenberg, C. Braun, J. Miller. Comparing domestic and extra-regional contributions to pollutant exposures and health impacts in G20 countries through a novel adjoint modeling approach. American Geophysical Union Fall Meeting, December 15, New Orleans. Oral.

2020 **Nawaz, M.O**., D. Henze, D. Goldberg, S. Anenberg, D. Jo, B. Nault, J.L. Jimenez, H. Cao, C. Harkins, Z. Qu. Characterizing the regional, sectoral and species-specific sources of pollution exposure and its associated health impacts in urban environments: case studies in Washington, D.C. and Santiago, Chile. American Geophysical Union Fall Meeting, Dec. 14. Oral.

2020 **Nawaz, M.O.**, Y. Zhang, D. Q. Tong, A. Van Donkelaar, R. Martin, M. L. Serre, J. J. West. Health benefits of decreases in PM2.5 and ozone in the United States, 1990-2016. NASA Health and Air Quality Applied Sciences Team Final Showcase, July 21. Poster.

2020 **Nawaz, M.O.**, Henze, D.K., Anenberg, S.C., Goldberg, D. Premature deaths in Brazil associated with long-term exposure to PM2.5 from Amazon fires and development of a nested South American domain for the GEOS-Chem Adjoint. 19th GEIA Conference, June 23. Oral.

2019 **Nawaz, M.O.**, D.K. Henze, S.C. Anenberg, D. Goldberg, Z. Qu (2019). Source attribution of PM2.5 and O3 concentrations and health outcomes from 2010 and 2011 in Washington D.C. using sensitivity analyses in the GEOS-Chem adjoint model. American Geophysical Union, San Francisco, CA, Dec. 19. Poster.

2019 **Nawaz, M.O.**, Henze, D.K. Source attribution of PM2.5 from sensitivity analyses in the GEOS-Chem adjoint model. Young Scientists Symposium on Atmospheric Research, October 25. Oral.

2019 **Nawaz, M.O.**, D.K. Henze, C.S. Malley, J.C.I. Kuylenstierna, H.W. Vallack, Y. Davila, S.C. Anenberg, S. Terry, A. Curry-Brown, N. Fann, E. Lefevre, C. Heaps, S. Penn, H. Roman, J. Neumann. Source attribution of climate and health impacts from aerosols. 9th International GEOS-Chem Meeting, Cambridge, MA, May 6. Poster.

2019 **Nawaz, M.O.**, Henze, D.K., The use of adjoint modeling to assess the sources of air pollution and its associated health impacts. Graduate Engineering Annual Research and Recruitment Symposium. February 21. Poster.

2018 **Nawaz**, **M.O.**, D. K. Henze, C. Malley, GH41C-1446: Source Attribution of Climate and Health Impacts from Aerosols, AGU Fall Meeting, Washington D.C., Dec. 10 – 14. Poster.

2018 **Nawaz, M.O.**, Y. Zhang, D. Q. Tong, A. van Donkelaar, R. V. Martin, J. J. West (2018). Health benefits of decreases in PM2.5 and ozone in the United States, 1990-2015. NASA Health and Air Quality Applied Sciences Team meeting, July 16. Poster.

2018 **Nawaz, M.O.,** Y. Zhang, D. Q. Tong, A. van Donkelaar, R. V. Martin, J. J. West (2018). Health benefits of decreases in PM2.5 and ozone in the United States, 1990-2015. Climate Change and Resilience Symposium, April 20. Poster.

2017 **Nawaz, M.O.,** Y. Zhang, D. Q. Tong, J. J. West. Health benefits of decreases in PM2.5 and ozone in the United States from 1990 to 2015. AGU Fall Meeting, December 11, New Orleans, LA. Poster.

2017 **Nawaz, M.O.**, Y. Zhang, D. Q. Tong, J. J. West. Health benefits of decreases in PM2.5 and ozone in the United States from 1990 to 2015. CMAS Conference, October 23. Poster.

2017 **Nawaz M.O.**, Y. Zhang, West, J.J. Impact of regional ozone precursor emissions on global ozone burden. Celebration of Undergraduate Research, April 12. Poster.