Taekyu Joo, Ph.D.

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145 Anam-ro, Mediheal EES hall Rm708
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PROFESSIONAL POSITIONS

2024.03 – Current **Assistant Professor, Dept. of Earth and Environmental Sciences, Korea University**
Research focus: *Aerosol & Atmospheric chemistry & Climate Change*

2022.03 – 2024.02 **Postdoctoral Associate, Yale University**
Research: *Investigation in urban air quality as a part of Investigating atmospheric emissions and chemical reactions that affect air quality and climate (AEROMMA) field campaign and The Atmospheric Science and Chemistry mEasurement NeTwork (ASCENT) project*

EDUCATION

2016.08 – 2021.12 **Georgia Institute of Technology**
Ph.D. in Earth and Atmospheric Sciences
Thesis: *Secondary organic aerosol formation from the oxidation of furans emitted from biomass burning and their possible impacts on radiative forcing*

2014.03 – 2016.08 **Korea University, Seoul, South Korea**
M.Sc. in Atmospheric Environment
Thesis: *Variation of OC and EC during haze events at Gosan Climate Observatory and source apportionment applying isotope analysis*

2007.03 – 2014.02 **Korea University, Seoul, South Korea**
B.Sc. in Earth and Environmental Sciences
B. Climate Change (interdisciplinary program)

HONORS AND AWARDS

- Outstanding Presentation Award, Korean Society for Atmospheric Environment Annual Meeting, Oct. 2024
- Invitee of Atmospheric Chemistry Colloquium for Emerging Senior Scientists (ACCESS) XVII, Jul. 2023
- Outstanding Contribution Award, Yale Postdoctoral Association, Jun. 2023
- Outstanding Oral Presentation Award, Yale Postdoctoral Association Annual Symposium, May. 2022
- Air and Waste Management Association's (A&WMA) scholarship – Georgia Chapter, Dec. 2021
- Student Registration Waiver Grant, American Association for Aerosol Research, Sep. 2020
- Korea University Alumni fellowship, International Foundation for Korea University, Aug. 2019
- Doug Davis Fellowship Award, School of Earth and Atmospheric Sciences, Georgia Tech, Apr. 2019
- NASA Group Achievement Award to KORUS-AQ Mission, Jun. 2016
- Best Poster Presentation Award, Korean Meteorology Society Annual Meeting, Oct. 2015
- Best Poster Presentation Award, Korean Society for Atmospheric Environment Annual Meeting, Oct. 2014
- Graduated with Honor, Feb. 2014
- National Science Scholarship, Korea Student Aid Foundation, Sep. 2013

- Seokrim Fellowship for Outstanding Students, Faculty Council of Korea University, Sep. 2013
- Scholarship for Academic Excellence, Department of Earth and Environmental Sciences, Korea University, 2012-2013

PUBLICATIONS (Google Scholar Citations = 429, h-index = 12)

Joo, T., Machesky, J., Hass-Mitchell, T., Gentner, D., Alvarado, M. J., Ng, N.L.: Humidity Effect on Secondary Organic Aerosol Formation from Furans Oxidation by Hydroxyl Radical., 2024 (In preparation)

20. Jung, S., Gil, J., Lee, M., Betancourt, C., Schultz, M., Choi, Y., **Joo, T.**, Kim, D., Interpolation of Missing Ozone Data Using Graph Machine Learning and Parameter Analysis Through eXplainable Artificial Intelligence Comparison. Environmental Modelling & Software, doi.org: 10.1016/j.envsoft.2025.106466, 2025

19. Shin, N., Bin, B., **Joo, T.**, Wang, Y., N.L., Liu. P., Photolytic Mass Loss of Secondary Organic Aerosol Derived from Photooxidation of Biomass Burning Furan Precursors. *ACS ES&T Air*, doi.org: 10.1021/acsestair.4c00230, 2025

18. Rogers, M.J., **Joo, T.**, Hass-Mitchell, T., Canagaratna, M.R., Campuzano-Jost, P., Sueper, D., Tran, M.N., Machesky, J.E., Roscioli, J.R., Jimenez, J.L., Krechmer, J.E., Lambe, A.T., Nault, B.A., Gentner, D.R., Humid Summers Promote Urban Aqueous-Phase Production of Oxygenated Organic Aerosol in the Northeastern United States. *Geophysical Research Letter*, doi.org: 10.1029/2024GL112005, 2025.

17. Joo, T., Rogers, M., Soong, C., Hass-Mitchell, T., Heo, S., Bell, M., Ng, N.L., Gentner, D.R., Aged and obscured wildfire smoke delivers far downwind health risks. *Environmental Science & Technology Letters*, doi: 10.1021/acs.estlett.4c00785, 2024

16. Hass-Mitchell, T., **Joo, T.**, Rogers, M., Nault, B.A., Soong, C., Tran, M., Seo, M., Machesky, J.E., Canagaratna, M., Roscioli, J., Ng, N.L., Dillner, A.M., Bahreini, R., Russel, A., Krechmer, J., Lambe, A., Gentner, D.R.: Increasing Contributions of Temperature-Dependent Oxygenated Organic Aerosol to Summertime Particulate Matter in New York City. *ACS Environmental Science & Technology: Air*, doi: 10.1021/acsestair.3c00037, 2024

15. Joo, T., Machesky, J.E., Zeng, L., Hass-Mitchell, T., Weber, R.J., Gentner, D.R., Ng, N.L.: Secondary Brown Carbon Formation from Photooxidation of Furans from Biomass Burning. *Geophysical Research Letter.* doi: 10.1029/2023GL104900, 2024

14. Liu, F., **Joo, T.**, Ditto, J.C., Saavedra, M.G., Takeuchi, T., Boris, A.J., Yang, Y., Weber, R.J., Dillner, A.M., Gentner, D.R., Ng, N.L.: Oxidized and unsaturated: key organic aerosol traits associated with cellular reactive oxygen species production in the southeastern US. *Environmental Science & Technology.* doi: 10.1021/acs.est.3c03641, 2023

13. Nguyen, T.B., Bates, K.H., Buenconsejo, R., Charan, S., Cavanna, E.E., Cocker, D., Day, D., DeVault, M., Donahue, N.H., Finewax, Z., Habib, L., Handschy, A., Hildebrandt Ruiz, L., Hou, C.Y., Jimenez, J.L., **Joo, T.**, Klodt, A., Kong, W., Le, C., Masoud, C.G., Mayernik, M., Ng, N.L., et al.: Overview of ICARUS – a curated, open access, online repository for atmospheric simulation chamber data. *ACS Earth and Space Chemistry*. doi: 10.1021/acsearthspacechem.3c00043, 2023

12. Joo, T., Chen, Y., Xu, W., Croteau, P., Canagaratna, M.R., Gao, D., Guo, H., Saavedra, G., Kim, S.S., Sun, Y., Weber, R.J., Jayne, J., Ng, N.L.: Evaluation of new Aerosol Chemical Speciation Monitor (ACSM) system at an urban site in Atlanta, GA: the use of capture vaporizer and $PM_{2.5}$ inlet. *ACS Earth and Space Chemistry*. doi: 10.1021/acsearthspacechem.1c00173, 2021

11. Joo, T., Rivera-Rios, J.C., Alvarado-Velez, D., Westgate, S., Ng., N.L.: Formation of oxidized gases and secondary organic aerosol from a commercial oxidant-generating electronic air cleaner. *Environmental Science &*

Technology Letters. doi: 10.1021/acs.estlett.1c00416, 2021 (7 news outlets and Altmetric score 235 as of Oct 2023)

10. Boris, A.J., Takahama, S., Weakley, A.T., Debus, B.M., Shaw, S.L., Edgerton, E.S., **Joo, T.**, Ng, N.L., Dillner, A.M., Quantifying organic matter and functional groups in particulate matter filter samples from the southeastern united states – part 2: Spatiotemporal trends. *Atmos. Meas. Tech*. 14: 4355-74. doi:10.5194/amt-14-4355-2021, 2021

9. Joo, T., Takeuchi, M., Liu, F., Rivera, M.P., Barr, J., Blum, E.S., Parker, E., Tipton, J.H., Varnedoe, J., Dutta, B., Lively, R.P., Ng, N.L.: Evaluation of Particle Filtration Efficiency of Commercially Available Materials for Homemade Face Mask Usage. *Aerosol Science and Technology*, pp.1-15. doi: 10.1080/02786826.2021.1905149, 2021 (44 news outlets and Altmetric score 342 as of Oct 2023)

8. Rivera-Rios, J.C., **Joo, T.**, Takeuchi, M., Orlando, T.M., Bevington, T., Mathis, J.W., Pert, C.D., Tyson, B.A., Anderson-Lennert, T.M., Smith, J.A., Ng, N.L.: In-flight particulate matter concentrations in commercial flights are likely lower than other indoor environments. *Indoor air*. doi: 10.1111/ina.12812, 2021 (12 news outlets and Altmetric score 88 as of Feb 2022)

7. Blanchard, E.L., Lawrence, J.D., Noble, J.A., Xu, M., **Joo, T.**, Ng, N.L., Schmidt, B.E., Santangelo, P.J., Finn, M.G.: Enveloped virus inactivation on personal protective equipment by exposure to ozone. *medRxiv*, 020.05.23.20111435; doi: 10.1101/2020.05.23.20111435, 2020 (not peer-reviewed)

6. Ditto, J.C., **Joo, T.**, Slade, J.H., Shepson, P.B., Ng, N.L., Gentner, D.R.: Nontargeted tandem mass spectrometry analysis reveals diversity and variability in aerosol functional groups across multiple sites, seasons, and times of day. *Environmental Science & Technology Letters*. doi: 10.1021/acs.estlett.9b00702, 2020

5. Castañeda, A.D., Li, Z., **Joo, T**., Benham, K., Burcar, B.T., Krishnamurthy, R., Liotta, C.L., Ng, N.L., Orlando, T.M.: Prebiotic Phosphorylation of Uridine using Diamidophosphate in Aerosols. *Scientific Report* 9, 13527. doi:10.1038/s41598-019-49947-8, 2019

4. Ditto, J. C., **Joo, T.**, Khare, P., Sheu, R., Takeuchi, M., Chen, Y., Xu, W., Bui, A. A. T., Sun, Y., Ng, N. L., Gentner, D. R.: Effects of Molecular-Level Compositional Variability in Organic Aerosol on Phase State and Thermodynamic Mixing Behavior. *Environmental Science & Technology* 53 (22), 13009-13018. doi: 10.1021/acs.est.9b02664, 2019

3. Joo, T., Rivera-Rios, J., Takeuchi, M., Alvarado, M. J., Ng, N. L.: Secondary organic aerosol formation from reaction of 3-methylfuran with nitrate radicals, *ACS Earth and Space Chemistry*, 2019, 3, 6, 922-934. doi: 10.1021/acsearthspacechem.9b00068, 2019

2. Lim, S., Lee, M., Czimczik, C. I., **Joo, T.**, Holden, S. R., Mouteva, G. O., Santos, G. M., Xu, X., Walker, B., Kim, S., et al.: Source signatures from combined isotopic analyses of PM2.5 carbonaceous and nitrogen aerosols at the peri-urban Taehwa Research Forest, South Korea in summer and fall, *Science of the Total Environment*, 655, 1505-1514. doi: 10.1016/j.scitotenv.2018.11.157, 2019

1. Ditto, J. C., Barnes, E. B., Khare, P., Takeuchi, M., **Joo, T.**, Bui, A. A., Lee-Taylor, J., Eris, G., Chen, Y., Aumont, B., Jimenez, J. L., Ng, N. L., Griffin, R. J., and Gentner, D. R.: An omnipresent diversity and variability in the chemical composition of atmospheric functionalized organic aerosol, *Communications Chemistry*, 1(1), 75. doi: 10.1038/s42004-018-0074-3, 2018

INVITED PRESENTATIONS

"Investigating the impact of wildfires on climate change and public health: from laboratory experiments to field campaigns", Environment-2024 Mongolian Society of Environmental Engineering & Professionals, Oct. 2024

"Aged and obscured wildfire smoke associated with downwind health risks during 2023 Canadian Wildfires in New York City", New York State Department of Environmental Conservation Bureau of Air Quality Analysis &

Research/New York State Energy Research & Development Authority (NYSDEC BAQAR/NYSERDA) Seminar series, Jul. 2024

"Aged and obscured wildfire smoke associated with downwind health risks during 2023 Canadian Wildfires in New York City", New Frontiers in AQ Research: Observation Improvements from both the Surface and Outer Space, American Geophysical Union, Mar. 2024

"Understanding the Interconnections between Climate Change and Air Quality: Using Dual-Track Approach to Tackle the Emerging Issue", Korea University Faculty Candidate Seminar, Nov. 2023

"Secondary Brown Carbon Formation via Photooxidation of Furanoids from Biomass Burning", Atmospheric Chemistry Colloquium for Emerging Senior Scientists (ACCESS) XVII, Jul. 2023

"Exploring Secondary Organic Aerosol and Brown Carbon Formation using a Smog Chamber: Focusing on the Oxidation of a Biomass Burning Precursor", Jeon Buk National University, Apr. 2023

"Secondary Organic Aerosol and Brown Carbon Formation from Photooxidation of Furanoid", Emerging Young Scientist Session, Korean Society for Atmospheric Environment Annual Meeting, Oct. 2022

"Humidity and NH_3/NH_4^+ Effect on Secondary Organic Aerosol Formation during Smog Chamber Experiments", Korea Institute of Science and Technology, Oct. 2022

"Exploring Secondary Organic Aerosol and Brown Carbon Formation from Furans Oxidation via Smog Chamber Experiments: Important Precursor from Biomass Burning", Korea University, Oct. 2022

"Exploring Secondary Organic Aerosol and Brown Carbon Formation from Furans Oxidation via Smog Chamber Experiments", Korea Institute of Science and Technology, Apr. 2022

PLATFORM PRESENTATIONS

"Wintertime Chemical and Optical Properties of Aerosols over Asia Megacities", American Geophysical Union Fall Meeting, Dec. 2024

"Using a Smog Chamber to Investigate Secondary Brown Carbon Formation during Photooxidation of Furanoids from Biomass Burning", Korean Meteorological Society Annual Meeting, Oct. 2024

"Applying Monte Carlo and Epidemiological Analysis to Evaluate Composition-dependent PM2.5 Health Risk: Case Study on 2023 Canadian Wildfire Smoke Plume Impact on New York City", Korean Society for Atmospheric Environment Annual Meeting, Oct. 2024

"Investigating the impact of wildfires on climate change and public health: from laboratory experiments to field campaigns", Biannual International Conference on Geology and Mining (GEOMINE) at Mongolian University of Science and Technology, Oct. 2024

"Dramatic Aerosol Enhancements from the 2023 Canadian Wildfires in New York City and its Implications for Public Health", American Geophysical Union Fall Meeting, Dec. 2023

"Ion mobility spectrometry with ammonium-adduct chemical ionization for instantaneous isomer-resolved ambient measurements: A New York City case study", American Geophysical Union Fall Meeting, Dec. 2022

"Effects of Humidity on Secondary Organic Aerosol Formation from Furanoid Oxidation with Hydroxyl Radicals", American Association for Aerosol Research Annual Conference, Oct. 2022

"Is it safe to use an oxidant-generating electronic air cleaner indoors? Evaluation based on the measurement of gas- and particle-phase byproducts", Yale Postdoctoral Association Annual Symposium, May 2022

"Secondary Organic Aerosol and Brown Carbon Formation from Furanoid Oxidation via OH Radicals: Important Precursors from Biomass Burning", American Association for Aerosol Research Annual Conference, Oct. 2021

"Evaluation of Particle Filtration Efficiency of Commercially Available Materials for Homemade Face Mask Usage", American Association for Aerosol Research Annual Conference, Oct. 2020

"OC and EC Observed at Gosan Climate Observatory (GCO) and Their Seasonal Characteristics During Haze Events", Georgia Tech School of Earth and Atmospheric Sciences Graduate Student Symposium, Nov. 2016

POSTER PRESENTATIONS

"The Effect of Humidity on Secondary Organic Aerosol and Brown Carbon Formation During the Photooxidation of Furanoids in Biomass Burning Emissions", Gordon Research Conference, Aug. 2023

"Secondary Organic Aerosol Formation from Methylfurans by Nitrate Radical Oxidation", International Aerosol Conference, Sep. 2018

"Secondary Organic Aerosol Formation from 3-Methylfuran Oxidation", American Association of Aerosol Research Annual Conference, Oct. 2017

"Carbon and nitrogen isotopic composition of $PM_{2.5}$ at periurban Taehwa Research Forest and over the Yellow Sea", 17th International Union of Air Pollution Prevention and Environmental Protection Associations World Clean Air Congress and 9th Clean Air Asia Better Air Quality Conference, Aug. 2016

"OC and EC Observed at Gosan Climate Observatory (GCO) and Their Seasonal Characteristics During Haze Events", American Geophysical Union Fall meeting, Dec. 2015

"Carbon and Nitrogen Isotopic Composition of $PM_{2.5}$ at a Periurban Mt. Taehwa Near Seoul and Over the Yellow Sea", American Geophysical Union Fall Meeting, Dec. 2015

"Carbon and Nitrogen Isotopic Composition of $PM_{2.5}$ Over the Yellow Sea", Korean Meteorological Society Annual Meeting, Oct. 2015

"Seasonal Signature of Carbonaceous Aerosols in $PM_{2.5}$ During Haze Episode at Gosan Climate Observatory", Korean Society for Atmospheric Environment Annual Meeting, Oct. 2014

TEACHING EXPERIENCE

Korea University, 2024 – Current

- Undergraduate course: *Atmospheric Science, Climate Variation*
- Graduate course: *Aerosol Chemistry and Physics, Air Pollution, Atmospheric Chemistry*

Chungnam National University, Daejeon, South Korea, 2022

- Guest lecture in the class *Environmental Processing/Treatment*: "Smog Chamber: A Powerful Tool to Explore Science Beneath Secondary Organic Aerosol Formation"

Yonsei University, Seoul, South Korea, 2022

- Guest Lecture in the class *Atmospheric Thermodynamics*: "Exploring the Formation Mechanism and Chemical Composition of Secondary Organic Aerosol using a Smog Chamber and Advanced On-line Instrumentation"

Korea University, Seoul, South Korea, 2014 – 2015

Teaching assistant

- *Earth and Environmental Science* for freshman
- *Experiments in Earth and Environmental Science* for freshman

Korea University, Seoul, South Korea, 2012

Senior undergraduate tutor

- *Oceanography*

MENTORING EXPERIENCE

Korea University, 2024 – Current

Graduate students

- Hee Sun Park

Undergraduate students

- Jihoon Kim, Lauren Hyunseo Lee, Heeseong Min, Nayeon Kim

Yale University, 2022 – 2024

Graduate students

- Tori Hass-Mitchell, Mitchell Rogers: ASCENT Queens College site operation, maintenance, and data analysis on ToF-ACSM, SMPS, AE33
- Tori Hass-Mitchell: PMF analysis on ACSM dataset
- Mitchell Rogers: HYSPLIT air trajectory model
- Jo Machesky, Mia Tran: TofWare data analysis

Georgia Institute of Technology, Atlanta, GA, 2020 – 2022

Graduate students

- Sabrina Westgate, Daniel Alvarado-Velez: indoor air quality projects
- Nara Shin: operation and maintenance of HR-ToF-AMS, chamber experiments on biomass burning precursors
- Athena Xu: operation of FIGAERO-HR-ToF-CIMS, chamber experiments

SERVICES

- Lab data manager of Georgia Tech Environmental Chamber as a part of ICARUS (Integrated Chamber Atmospheric data Repository for Unified Science) project
- Instrument mentor at Queens College site as a part of ASCENT (The Atmospheric Science and Chemistry mEasurement NeTwork) project
- Reviewer for journals: *Atmospheric Chemistry and Physics, Green Energy and Environment, Environmental Science: Processes & Impacts, Chemosphere*
- Reviewer for proposals: National Science Foundation, Georgia Tech President's Undergraduate Research Awards
- Session chair: American Association for Aerosol Research Annual Conference, Korean Society for Atmospheric Environment Annual Meeting
- Judge: Outstanding Student Presentation Award in American Geophysical Union Annual Meeting, Future Researcher Presentation Award in Korean Society for Atmospheric Environment Annual Meeting, Fine Particle Research Contest hosted by National Institute of Environmental Research
- Representative of School of Earth and Atmospheric Sciences for Georgia Tech Korea Student Association
- Sub-committee leader of Yale Postdoc Association Annual Symposium Committee
- President of Korea University Alumni Society in Georgia, US
- President of Science Article/Book Writing Club

OUTREACH

- Participated “Particulate Matter and Air Pollution” outreach program for middle school students and teachers, Atlanta, GA
- High school students mentoring program, Seoul, South Korea

PROFESSIONAL MEMBERSHIPS

- American Association for Aerosol Research (AAAR)
- American Geophysical Union (AGU)
- Korean Society for Atmospheric Environment (KOSAE)
- Korean Meteorological Society (KOMES)
- Korean-American Scientists and Engineers Association (KSEA)
- Asia Oceania Geosciences Society (AOGS)