

Elizabeth C. Asher, PhD

Cooperative Institute for Research in
Environmental Sciences (CIRES); 216 UCB,
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NOAA ESRL Global Monitoring Laboratory
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Research Interests

- Changes in atmospheric composition
- Combining in situ measurements, satellite retrievals and numerical models to advance understanding of chemistry and climate dynamics
- Assessing climate and chemical impacts of volcanic eruptions and large wildfires, with implications for climate intervention activities

Professional Strengths

- Oral and written communication
- Project management
- Data cleaning/ processing and analysis
- Proposal development/ grant management
- Supervising scientific and engineering personnel
- Python, R, MATLAB, LabVIEW; familiarity with C, FORTRAN, IGOR
- Instrument development

Professional Experience

Research Scientist III, Research and Innovation Office, Cooperative Institute for Research in Environmental Sciences (CIRES); Leader of the Upper Atmospheric Water Vapor Group, NOAA Global Monitoring Laboratory	2023 – Present
Research Scientist II, Research and Innovation Office, CIRES; NOAA Chemical Sciences Laboratory	2019 – 2023
Advanced Study Program Postdoctoral Research Fellow National Center for Atmospheric Research	2017 – 2019
Postdoctoral Research Associate University of California, Davis, CA	2015 – 2017

Education

Ph.D.	University of British Columbia, Vancouver, Canada Oceanography	July 2015
B.A.	Dartmouth College, Hanover, NH Earth Sciences Magna Cum Laude Philosophy Minor	June 2009

Academic Awards and Distinctions

CIRES Bronze Medal Award for Scientific/Engineering Achievement SABRE	2026
CIRES Silver Medal Award for Scientific/Engineering Achievement Tunga Rapid Response Experiment	2023
United States Patent No. US 011598697 B2 Air Sample Collection Apparatus and Methods for Use	2023
CIRES Outstanding Performance Award, \$2,000	2023
NASA Group Achievement Award — Atmospheric Tomography Mission	2019
Atmospheric Chemistry Observation and Modeling Special Recognition Award, NCAR, \$1,000	2018
Captain Thomas S. Byrne Prize for Outstanding Doctoral Thesis in Oceanography, UBC, \$250	2015
Captain Thomas S. Byrne Scholarship for Outstanding Research Paper in Oceanography, UBC, \$500	2012 2011
Doug Bangs Research Award for Overall Best Student in Earth Science Field Program, Dartmouth college	2008

Project Management

Principal Investigator; Monitoring Stratospheric Water Vapor in the Absence of Aura MLS: Ensuring Continuity of Three Long-Term NOAA Frost Point Hygrometer Records of Upper Tropospheric and Stratospheric Water Vapor Program: NASA Upper Atmospheric Composition Observations Program Value: (\$565,000)	2025– 2029
Principal Investigator; Extension of Multidecadal Records from the Premier Tropical Balloon-Borne Ozone and Water Vapor Sounding Network for Trends and Climate Studies (\$990,824)	2025– 2029
Co-Investigator; Ice-Nucleating Particles in the Upper Troposphere: Advancing Cirrus Control and Experiment Science Strength Program: Advanced Research Invention Agency (ARIA) Exploring Climate Cooling Value (\$1,200,000)	2025– 2027
Principal Investigator; B ² SAP — manage Baseline Balloon Stratospheric Aerosol Profiles network for regular measurements from latitudinally distributed sites through NOAA sites and international collaborators; lead Intensive Operation Periods (IOP) Program: NOAA annual Earth Radiation Budget Intra-Agency Funding Transfer \$330K-350K	2023 – Present
Principal Investigator: POPS measurements onboard World View Stratollite — led modification of a small aerosol instrument for continuous measurements onboard a commercial long-endurance, navigable stratospheric platform and managed collaboration with World View Inc. for three successful deployments (5 – 25 days each in duration)	2021– 2023

Program: NOAA annual Earth Radiation Budget Intra-Agency Funding Transfer
\$54K-68K

Principal Investigator: Whole Air Sampling Pilotless Platform (WASPP) — 2018 –
developed drone-based system for whole air sample collection and meteorological 2019
measurements and led deployments in Boulder, Colorado and Broomfield, Colorado
to study boundary layer pollution
Program(s): NCAR Advanced Study Program; City of Broomfield (\$2000)

Service and Leadership

<u>Science co-mentor</u> , Hollings Scholar Program	2026
<u>Lead Author</u> , SPARC Hunga Tonga-Hunga Ha'apai Report; Ch.2 Plume eruption and early dispersion phase	2025
<u>Science Mentor</u> , Hollings Scholar Program	2025
<u>Steering Committee Sonde Working Group Representative</u> , Network for the Detection of Atmospheric Composition Change (NDACC)	2023 – Present
<u>Supervisor</u> , NOAA GML CIRES engineers Alex Fritz, Nicholas Mastromonaco, CIRES scientists Peter Effertz, Glen McConville NOAA CSL CIRES scientists Alexandre Baron, Georgia Michailoudi, Collin Garganus, and Eleanor Waxman	2023 – Present 2021 – 2023
<u>Organizer</u> , First Friday Forum Chemical Sciences Division, NOAA Earth Systems Research Laboratory	2019 – 2022
<u>Writing Mentor</u> , Significant opportunities in Atmospheric Research and Science (SOARS)	2017

Peer-Reviewed Publications:

- Ghysels, M., Durry, G., Carbone, S., Amarouche, N., Riviere, E., Khaykin, S., Kalnajs, L. E.,
Deshler, T., Hall, E., Asher, E., Atlas, E. L., Campos, T., Smith, K., Frérot, F., &
Samake, J.-C. (2026). Long-Duration in situ Monitoring of H₂O and CH₄ in the
Equatorial Tropopause with the Pico-STRAT Bi Gaz Balloon-Borne Laser Diode
Spectrometer during the Strateole 2 Campaign. *Journal of Atmospheric and Oceanic
Technology*, 43(1), 45–60. <https://doi.org/10.1175/JTECH-D-25-0024.1>
- Asher, E., Hornbrook, R. S., Roozitalab, B., Zhang, X., Ortega, J., Tyndall, G. S., Hills, A. J.,
Orlando, J. J., & Apel, E. C. (2025). Analysis of Volatile Organic Compound Product
Distributions under Reduced NO_x Conditions in the NSF NCAR Atmospheric Simulation
Chamber: Implications for *In Situ* VOC Measurements. *ACS Earth and Space Chemistry*,
9(7), 1737–1751. <https://doi.org/10.1021/acsearthspacechem.4c00407>
- Zhu, Y., Akiyoshi, H., Aquila, V., Asher, E., Bednarz, E. M., Bekki, S., Brühl, C., Butler, A.
H., Case, P., Chabrillat, S., Chiodo, G., Clyne, M., Colarco, P. R., Dhomse, S., Falletti,
L., Fleming, E., Johnson, B., Jörmann, A., Kovilakam, M., ... Zhuo, Z. (2025). Hunga
Tonga–Hunga Ha'apai Volcano Impact Model Observation Comparison (HTHH-MOC)
project: Experiment protocol and model descriptions. *Geoscientific Model Development*,
18(17), 5487–5512. <https://doi.org/10.5194/gmd-18-5487-2025>

- Zhu, Y., Mann, G., Newman, P. A., & Randel, W. (2025). The Hunga Volcanic Eruption Atmospheric Impacts Report. In Y. Zhu, G. Mann, P. A. Newman, & W. Randel (Eds.), *Jülich: APARC IPO: APARC report 11* (p. pages 346). Forschungszentrum Jülich. <https://doi.org/10.34734/FZJ-2025-05237>
- Asher, E., Baron, A., Yu, P., Todt, M., Smale, P., Liley, B., Querel, R., Sakai, T., Morino, I., Jin, Y., Nagai, T., Uchino, O., Hall, E., Cullis, P., Johnson, B., & Thornberry, T. D. (2024). Balloon Baseline Stratospheric Aerosol Profiles (B²SAP)—Perturbations in the Southern Hemisphere, 2019–2022. *Journal of Geophysical Research: Atmospheres*, 129(22). <https://doi.org/10.1029/2024jd041581>
- Dunn, R. J. H., Blannin, J., Gobron, N., Miller, J. B., Willett, K. M., Ades, M., Adler, R., Alexe, M., Allan, R. P., Anderson, J., Anneville, O., Aono, Y., Arguez, A., Armenteras Pascual, D., Arosio, C., Asher, E., Augustine, J. A., Azorin-Molina, C., Baez-Villanueva, O. M., ... Zou, C.-Z. (2024). Global Climate. *Bulletin of the American Meteorological Society*, 105(8), S12–S155. <https://doi.org/10.1175/BAMS-D-24-0116.1>
- Li, C., Peng, Y., Asher, E., Baron, A. A., Todt, M., Thornberry, T. D., Evan, S., Brioude, J., Smale, P., Querel, R., Rosenlof, K. H., Zhou, L., Xu, J., Qie, K., Bian, J., Toon, O. B., Zhu, Y., & Yu, P. (2024). Microphysical Simulation of the 2022 Hunga Volcano Eruption Using a Sectional Aerosol Model. *Geophysical Research Letters*, 51(11), e2024GL108522. <https://doi.org/10.1029/2024GL108522>
- Lappin, F., De Boer, G., Klein, P., Hamilton, J., Spencer, M., Calmer, R., Segales, A. R., Rhodes, M., Bell, T. M., Buchli, J., Britt, K., Asher, E., Medina, I., Butterworth, B., Otterstatter, L., Ritsch, M., Puxley, B., Miller, A., Jordan, A., ... Pillar-Little, E. (2024). Data collected using small uncrewed aircraft systems during the TRacking Aerosol Convection interactions ExpeRiment (TRACER). *Earth System Science Data*, 16(5), 2525–2541. <https://doi.org/10.5194/essd-16-2525-2024>
- Asher, E. C., Todt, M. A., Rosenlof, K., Thornberry, T., Gao, Ru-Shan, Taha, Ghassan, Walter, Paul, Alvarez, Sergio, James Flynn, Sean Davis M., Evan, Stephanie, Brioude, Jerome, Metzger, Jean-Marc, Hurst, Dale F., Hall, Emrys, & Xiong, Kensy. (2023). Unexpectedly rapid aerosol formation in the Hunga Tonga plume. *Proceedings of the National Academy of Sciences*, 120(44). <https://doi.org/10.1073/pnas.2219547120>
- Evan, S., Brioude, J., Rosenlof, K. H., Gao, R.-S., Portmann, R. W., Zhu, Y., Volkamer, R., Lee, C. F., Metzger, J.-M., Lamy, K., Walter, P., Alvarez, S. L., Flynn, J. H., Asher, E., Todt, M., Davis, S. M., Thornberry, T., Vömel, H., Wienhold, F. G., ... Read, W. G. (2023). Rapid ozone depletion after humidification of the stratosphere by the Hunga Tonga Eruption. *Science*, 382(6668), eadg2551. <https://doi.org/10.1126/science.adg2551>
- Li, Y., Pedersen, C., Dykema, J., Vernier, J.-P., Vattioni, S., Pandit, A. K., Stenke, A., Asher, E., Thornberry, T., Todt, M. A., Bui, T. P., Dean-Day, J., & Keutsch, F. N. (2023). In situ measurements of perturbations to stratospheric aerosol and modeled ozone and radiative impacts following the 2021 La Soufrière eruption. *Atmospheric Chemistry and Physics*, 23(24), 15351–15364. <https://doi.org/10.5194/acp-23-15351-2023>
- Todt, M. A., Asher, E., Hall, E., Cullis, P., Jordan, A., Xiong, K., Hurst, D. F., & Thornberry, T. (2023). Baseline Balloon Stratospheric Aerosol Profiles (B²SAP)—Systematic Measurements of Aerosol Number Density and Size. *Journal of Geophysical Research: Atmospheres*, 128(12), e2022JD038041. <https://doi.org/10.1029/2022JD038041>
- Yu, P., Portmann, R. W., Peng, Y., Liu, C., Zhu, Y., Asher, E., Bai, Z., Lu, Y., Bian, J., Mills, M., Schmidt, A., Rosenlof, K. H., & Toon, O. B. (2023). Radiative Forcing From the

- 2014–2022 Volcanic and Wildfire Injections. *Geophysical Research Letters*, 50(13), e2023GL103791. <https://doi.org/10.1029/2023GL103791>
- Zhou, X., Dhomse, S. S., Feng, W., Mann, G., Heddell, S., Pumphrey, H., Kerridge, B. J., Latter, B., Siddans, R., Ventress, L., Querel, R., Smale, P., Asher, E., Hall, E. G., Bekki, S., & Chipperfield, M. P. (2024). Antarctic Vortex Dehydration in 2023 as a Substantial Removal Pathway for Hunga Tonga-Hunga Ha’apai Water Vapor. *Geophysical Research Letters*, 51(8), e2023GL107630. <https://doi.org/10.1029/2023GL107630>
- Asher, E., Thornberry, T., Fahey, D. W., McComiskey, A., Carslaw, K., Grunau, S., Chang, K., Telg, H., Chen, P., & Gao, R. (2022). A Novel Network-Based Approach to Determining Measurement Representation Error for Model Evaluation of Aerosol Microphysical Properties. *Journal of Geophysical Research: Atmospheres*, 127(3). <https://doi.org/10.1029/2021JD035485>
- Thompson, C. R., Wofsy, S. C., Prather, M. J., Newman, P. A., Hanisco, T. F., Ryerson, T. B., Fahey, D. W., Apel, E. C., Brock, C. A., Brune, W. H., Froyd, K., Katich, J. M., Nicely, J. M., Peischl, J., Ray, E., Veres, P. R., Wang, S., Allen, H. M., Asher, E., ... Zeng, L. (2022). The NASA Atmospheric Tomography (ATom) Mission: Imaging the Chemistry of the Global Atmosphere. *Bulletin of the American Meteorological Society*, 103(3), E761–E790. <https://doi.org/10.1175/BAMS-D-20-0315.1>
- Asher, E., Hills, A. J., Hornbrook, R. S., Shertz, S., Gabbard, S., Stephens, B. B., Helmig, D., & Apel, E. C. (2021). Unpiloted Aircraft System Instrument for the Rapid Collection of Whole Air Samples and Measurements for Environmental Monitoring and Air Quality Studies. *Environmental Science & Technology*, 55(9), 5657–5667. <https://doi.org/10.1021/acs.est.0c07213>
- Asher, E., Hornbrook, R. S., Stephens, B. B., Kinnison, D., Morgan, E. J., Keeling, R. F., Atlas, E. L., Schauffler, S. M., Tilmes, S., Kort, E. A., Hoecker-Martínez, M. S., Long, M. C., Lamarque, J.-F., Saiz-Lopez, A., McKain, K., Sweeney, C., Hills, A. J., & Apel, E. C. (2019). Novel approaches to improve estimates of short-lived halocarbon emissions during summer from the Southern Ocean using airborne observations. *Atmospheric Chemistry and Physics*, 19(22), 14071–14090. <https://doi.org/10.5194/acp-19-14071-2019>
- Asher, E. C., Christensen, J. N., Post, A., Perry, K., Cliff, S. S., Zhao, Y., Trousdell, J., & Faloon, I. (2018). The Transport of Asian Dust and Combustion Aerosols and Associated Ozone to North America as Observed From a Mountaintop Monitoring Site in the California Coast Range. *Journal of Geophysical Research: Atmospheres*, 123(10), 5667–5680. <https://doi.org/10.1029/2017JD028075>
- Asher, E. C., Dacey, J. W. H., Stukel, M., Long, M. C., & Tortell, P. D. (2017). Processes driving seasonal variability in DMS, DMSP, and DMSO concentrations and turnover in coastal Antarctic waters. *Limnology and Oceanography*, 62(1), 104–124. <https://doi.org/10.1002/lno.10379>
- Asher, E., Dacey, J. W., Ianson, D., Peña, A., & Tortell, P. D. (2017). Concentrations and cycling of DMS, DMSP, and DMSO in coastal and offshore waters of the Subarctic Pacific during summer, 2010–2011. *Journal of Geophysical Research: Oceans*, 122(4), 3269–3286. <https://doi.org/10.1002/2016JC012465>
- Asher, E. C., Dacey, J. W. H., Jarníková, T., & Tortell, P. D. (2015). Measurement of DMS, DMSO, and DMSP in natural waters by automated sequential chemical analysis.

Limnology and Oceanography: Methods, 13(9), 451–462.

<https://doi.org/10.1002/lom3.10039>

Stukel, M. R., Asher, E., Couto, N., Schofield, O., Strebel, S., Tortell, P., & Ducklow, H. W. (2015). The imbalance of new and export production in the western Antarctic Peninsula, a potentially “leaky” ecosystem. *Global Biogeochemical Cycles*, 29(9), 1400–1420.

<https://doi.org/10.1002/2015GB005211>

Tortell, P. D., Asher, E. C., Ducklow, H. W., Goldman, J. A. L., Dacey, J. W. H., Grzyski, J. J., Young, J. N., Kranz, S. A., Bernard, K. S., & Morel, F. M. M. (2014). Metabolic balance of coastal Antarctic waters revealed by autonomous $p\text{CO}_2$ and $\Delta\text{O}_2/\text{Ar}$ measurements. *Geophysical Research Letters*, 41(19), 6803–6810.

<https://doi.org/10.1002/2014GL061266>

Asher, E. C., Dacey, J. W. H., Mills, M. M., Arrigo, K. R., & Tortell, P. D. (2011). High concentrations and turnover rates of DMS, DMSP and DMSO in Antarctic sea ice: DMS DYNAMICS IN ANTARCTIC SEA ICE. *Geophysical Research Letters*, 38(23), n/a-n/a.

<https://doi.org/10.1029/2011GL049712>

Asher, E. C., Merzouk, A., & Tortell, P. D. (2011). Fine-scale spatial and temporal variability of surface water dimethylsulfide (DMS) concentrations and sea–air fluxes in the NE Subarctic Pacific. *Marine Chemistry*, 126(1–4), 63–75.

<https://doi.org/10.1016/j.marchem.2011.03.009>

Select First Author Conference Presentations

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- American Geophysical Union (AGU) — Dec 18, 2025, “Insights from balloon-borne measurements of stratospheric aerosol and water vapor following volcanic and pyrocumulonimbus injections (2019-2024)”, [Invited Platform].
 - American Geophysical Union (AGU) — Dec 18, 2025, “Addressing UTLS water vapor data gaps with water vapor sondes and radiosondes”, [Geoburst Platform and Poster].
 - American Geophysical Union (AGU) — Dec 14, 2023, “Springtime polar stratospheric measurements of water vapor, ozone, and aerosol in 2022 and 2023 following the Hunga Tonga Hunga Ha’apai eruption”, [Platform].
 - American Meteorological Society (AMS) — Jan 9, 2023, “The unprecedented rapid aerosol formation from the Hunga Tonga-Hunga Ha’apai eruption”, [Platform].
 - American Geophysical Union (AGU) — Dec 15, 2022, “The unprecedented rapid aerosol formation from the Hunga Tonga-Hunga Ha’apai eruption”, [Invited Platform].
 - American Geophysical Union (AGU) — Dec 15, 2021, “Pyrogenic perturbations to the stratospheric aerosol layer and subsequent climate impacts”, [eLightning Platform].
 - American Geophysical Union (AGU) — Dec 16, 2020, “A spatially dense aerosol instrument network in the southern great plains: POPSnet-SGP”, [Platform].
 - American Geophysical Union— Dec 13, 2018, Washington, D.C, “Quality Assessment and airborne measurements in the Colorado Front Range using the Unmanned Whole Air Sampler” [Platform].
 - Biogenic Hydrocarbons and the Atmosphere: Connecting Volatiles and Climate System from Leaf to Planet, Gordon Research Conference— June 10-15, 2018, Les Diablerets, Switzerland, “Constraining Southern Ocean emissions of halogenated VOCs,” [Invited Young Scientist Platform].
 - 6th DMSP Symposium— May 26-30, 2014, Barcelona, Spain, “The effect of sea-ice extent on DMS oxidation at high latitudes in the Southern Hemisphere: DMS chemistry, climate implications and MSA records,” [Platform].

Professional Affiliation

Member, American Geophysical Union (AGU)
Member, American Meteorological Society (AMS)
Network for Detection of Atmospheric Composition Change (NDACC)
Elizabeth C. Asher CV

Global Climate Observing System (GCOS) Reference Upper-Air Network (GRUAN)