Joseph Bail (Joey)

Mechanical & Air Quality Engineer | Manufacturing, Air Quality, Field Science, Modeling

Salt Lake City, UT joey.bail@utah.edu josephbail.com josephbail2018 joeybail96

About Me

Hands-on mechanical and atmospheric engineer with experience spanning field instrumentation, air quality research, and industrial-scale engineering projects.

Strong background in designing, building, and deploying real-world systems—from remote alpine research laboratories to automated manufacturing processes.

Motivated by environmental and air-quality challenges, with a practical, implementation-focused approach to engineering and research.

Education

University of Utah, MS in Atmospheric Sciences – Salt Lake City, UT — Aug 2023 – Dec 2025

- GPA: 4.00/4.00
- Thesis: Implementing Playa Dust as Sources for Particulate Chloride in GEOS-Chem
- Hallar Aerosol Research Team (HART) & Haskins Lab

University of Utah, MS in Mechanical Engineering – Salt Lake City, UT — Aug 2021 – May 2023

- GPA: 4.00/4.00
- Thesis: Analyzing the Softening Behavior of Brain Vessels
- Head Injury and Vessel Biomechanics Lab

Pennsylvania State University, BS in Mechanical Engineering – State College, PA — Aug 2014 – Dec 2018

- GPA: 3.61/4.00
- Environmental & Biological Fluid Mechanics Lab
- Second Language Acquisition Laboratory
- Formula SAE — Chassis Team
- Technical Writing Mentor Program

Experience

Graduate Researcher — Hallar Aerosol Research Team (HART) — Aug 2023 – Dec 2025
University of Utah – Salt Lake City, UT

- Designed and led construction of a remote mountaintop aerosol research laboratory at Powder Mountain, Utah
- Engineered and installed a 30-ft aerosol inlet system supplying ambient air to multiple instruments
- Maintained and monitored aerosol measurements using GRIMM and Quant optical particle counters
- Developed climatologies of dust events across the western U.S. using surface, satellite, and field observations
- Participated in Utah Summer Ozone Study and S2noCliME field campaigns

Graduate Researcher — Haskins Lab Aug 2023 – Aug 2025
University of Utah – Salt Lake City, UT

- Converted soil conductivity measurements into chloride concentrations for a new GEOS-Chem particulate chloride inventory
- Implemented playa dust emissions and halogen chemistry pathways in GEOS-Chem
- Evaluated $ClNO_2$ predictions against NACHTT 2011 field campaign observations
- Supported development of new modeling capabilities for inland chloride chemistry

Graduate Researcher — Brain Injury & Vessel Biomechanics Lab Aug 2021 – Dec 2023
University of Utah – Salt Lake City, UT

- Designed and executed mechanical testing of cerebral arteries from adolescent sheep
- Developed MATLAB scripts and interactive applications to process LabVIEW mechanical test data
- Co-managed undergraduate capstone project using digital image correlation for vessel deformation
- Designed custom fixtures for microscopy-based wall thickness measurements

Mechanical Project Engineer Jan 2019 – June 2021
Carlisle Construction Materials – Carlisle, PA

- Authored and managed capital engineering projects with approved budgets ranging from $66k to $4.7M
- Led a $1.4M automation project eliminating a hazardous, labor-intensive rubber mat handling process
- Co-managed a $1.2M equipment upgrade to increase throughput and reduce scrap
- Supported manufacturing operations across facilities in OH, OR, UT, PA, and the Netherlands

Quality Services Intern May 2018 – Aug 2018
Carlisle Construction Materials – Carlisle, PA

- Built a proof-of-concept roof leak detection system using time-domain reflectometry
- Designed and programmed a moisture monitoring system with a custom MATLAB interface

Teaching Experience

Teaching Assistant, Engineering Dynamics — University of Utah (2021–2023)

Engineering Writing Mentor — Penn State University (2018)

Projects

Design & Deployment of a Remote Aerosol Research Facility Sept 2024 – Jan 2025
Powder Mountain, UT

- Project overview: https://www.josephbail.com/projects/project-1
- Delivered a 30-ft aerosol inlet system on a four-month timeline
- Designed inlet manifold, anchoring hardware, and roof penetration support/seal assembly
- Engineered structural support for >100 mph winds and harsh winter conditions
- Led on-site installation, alignment, sealing, and commissioning

(M.S. Thesis) Implementing Playa Dust as Sources for Particulate Chloride in GEOS-Chem Jan 2024 – Dec 2025

University of Utah - Salt Lake City, UT

- Project overview: https://www.josephbail.com/projects/project-2
- Created playa source masks from SSURGO soil data
- Built playa dust emission inventories using FENGSHA
- Integrated emissions and chemistry via HEMCO and Fortran
- Evaluated impacts on N_2O_5 and $ClNO_2$ over CONUS

(M.S. Thesis) Analyzing the Softening Behavior of Brain Vessels Aug 2021 – May 2023

University of Utah - Salt Lake City, UT

- Project overview: https://www.josephbail.com/projects/project-3
- Designed custom vessel testing systems and protocols
- Quantified softening under overstretch and collagen digestion
- Developed MATLAB/LabVIEW data processing workflows

Publications

Comparative Analysis of the Softening Effects of Collagen Digestion and Overstretch in Middle Cerebral Arteries 2023

Committee: Dr. Ken Monson; Dr. Brittany Coats; Dr. Jeffrey Weiss
Authors: Bail, J. D.
(Proquest, University of Utah)

Frequency at the Syntax–Discourse Interface: A Bidirectional Study on Fronting Options in L1/L2 German and L1/L2 English 2020

Authors: Hopp, H., Bail, J., Jackson, C. N.
(Second Language Research 36 (1), 65-96)

Implementing Playa Dust as Sources for Particulate Chloride in GEOS-Chem 2025

Committee: Dr. Gannet Hallar; Dr. Jessica Haskins; Dr. Jim Steenburgh
Authors: Bail, J. D.
(Proquest, University of Utah)

Strong Springtime Increase of Ice-Nucleating Particle Concentration in the Rocky Mountains 2025

Authors: Lacher, L., Hallar, A. G., McCubbin, I. B., Bail, J., Froyd, K. D., Jacquot, J., Shen, X.
(EGUsphere 2025, 1-30)

Long-Term Monitoring of Ice-Nucleating Particles (INPs) Coupled with Cloud Microphysics 2026

Authors: Hallar, A. G., Lacher, L., Benson, S., Mace, G. G., Pettersen, C., McCubbin, I. B.
(106th AMS Annual Meeting)

Conference Presentations

- Poster: Implementing Playas as Sources for Particulate Chloride in GEOS-Chem — 11th International GEOS-Chem Meeting (2024)
- Poster: Climatology of Dust Events for the Salt Lake Valley — Global Change & Sustainability Symposium (2024)

Research Field Campaigns

- Utah Summer Ozone Study (Summer 2024)
- S2noCliME (Fall 2024 – Fall 2025)
- Snowscape (Aug 2025 – Dec 2025)

Grants & Awards

- Research Grant — Global Change & Sustainability Center, University of Utah (2023)
- Research Grant — PIRE Program, Penn State University (2015)

Skills

Programming Languages: Python, MATLAB, R, Fortran, Bash, JavaScript, HTML, Arduino (C++), G-Code, C

CAD Tools: SolidWorks, Inventor, Fusion 360

Data Analysis & Visualization: Pandas, NumPy, Xarray, Rasterio, Matplotlib, Cartopy

Development Tools: VS Code, Jupyter Notebook, Anaconda, RStudio, Git/GitHub, Linux

Atmospheric Modeling: GEOS-Chem, STILT, HYSPLIT, FENGSHA

Machining: Woodworking, manual lathe, manual mill, power tools

Functional Expertise: Technical writing, experimental design, scientific communication, cross-functional collaboration, project management, R&D

Languages: English, German