

## Shay Gilpin

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### EDUCATION

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*Doctorate in Philosophy* **Aug 2023**  
 University of Colorado Boulder, Applied Mathematics.  
 Advisor: Dr. Tomoko Matsuo  
 Thesis: *A new perspective on covariance propagation for data assimilation applications.*

*Masters of Science* **May 2022**  
 University of Colorado Boulder, Applied Mathematics.

*Bachelor of Arts* **Jun 2017**  
 University of California Santa Cruz, Mathematic major, minor in Chemistry.  
 Summa cum laude with highest honors in the major.

### RESEARCH EXPERIENCE

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*Postdoctoral Research Associate I* **Aug 2023 – Present**  
 Department of Mathematics, University of Arizona. Funded by the National Science Foundation Data Driven Discovery Research Training Grant (RTG).

*National Science Foundation Graduate Research Fellow* **Aug 2019 – Aug 2023**  
 University of Colorado Boulder. Graduate research funded by the National Science Foundation (NSF) Graduate Research Fellowship. Advisor: Dr. Tomoko Matsuo.

*Visiting Scientist* **Oct 2017 – Mar 2019**  
 UCAR COSMIC Program. Research scientist at the University Corporation for Atmospheric Research (UCAR) Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC) Program. Advisor: Dr. Richard Anthes.

*NSF SOARS Protégé* **Jun – Oct 2017; Jun – Aug 2016**  
 UCAR. NSF Significant Opportunities in Atmospheric Research and Science (SOARS) research intern at the UCAR COSMIC Program.

### FELLOWSHIPS, GRANTS, AND HONORS

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*American Mathematical Society (AMS)-Simons Travel Grant* **Jul 2024**  
 Travel grant awarded to postdoctoral researchers which provides two years of support for travel to conferences and collaborative work provided by the Simons Foundation.

*Donald L. Turcotte Award* **Sep 2024**  
 Recognition for outstanding dissertation research in nonlinear geophysics awarded by the American Geophysical Union.

*National Science Foundation Graduate Research Fellowship* **Apr 2019**  
 Five year graduate research fellowship funded through the National Science Foundation that supports outstanding graduate students in the science, technology, engineering, and mathematics disciplines.

## PUBLICATIONS

**Gilpin, S.**, Matsuo, T., and Cohn, S.E., 2025: *Inaccuracy of the variance evolution associated with discrete covariance propagation*, *Q. J. Roy. Meteor. Soc.*, 1 – 26, <https://doi.org/10.1002/qj.5016>.

**Gilpin, S.**, Matsuo, T., and Cohn, S.E., 2023: *A generalized, compactly-supported correlation function for data assimilation applications*, *Q. J. Roy. Meteor. Soc.*, 149, 1953 – 1989, <https://doi.org/10.1002/qj.4490>.

**Gilpin, S.**, Matsuo, T., and Cohn, S.E., 2022: *Continuum covariance propagation for understanding variance loss in advective systems*, *SIAM/ASA J. Uncertainty Quantification*, 10, 886 – 914, <https://doi.org/10.1137/21M1442449>.

**Gilpin, S.**, Anthes, R., and Sokolovskiy, S., 2019: *Sensitivity of forward-modeled bending angles to vertical interpolation of refractivity for radio occultation data assimilation*, *Mon. Wea. Rev.*, 147, 269 – 289, <https://doi.org/10.1175/MWR-D-18-0223.1>

**Gilpin, S.**, Rieckh, T., and Anthes, R., 2018: *Reducing representativeness errors during radio occultation – radiosonde comparisons*, *Atmos. Meas. Tech.*, 11, 2567 – 2582, <https://doi.org/10.5194/amt-11-2567-2018>.

## INVITED TALKS AND SEMINARS

**Gilpin, S.**: *A new perspective on covariance propagation for data assimilation applications*, Turcotte Awardee Lecture, American Geophysical Union Annual Meeting, Washington D.C., December 9 – 13, 2024.

**Gilpin, S.**, Matsuo, T., and Cohn, S.E.: *Inaccuracy of the variance evolution associated with discrete covariance propagation*, Advances in Data Assimilation, Data Fusion, Machine Learning, Predictability and Uncertainty Quantification in the Geosciences, American Geophysical Union Annual Meeting, Washington D.C., December 9 – 13, 2024.

**Gilpin, S.**: *A new parametric correlation function for geophysical data assimilation applications*, IGPP Seminar, Scripps Institution of Oceanography, UCSD, San Diego, CA, April 17, 2024.

**Gilpin, S.**, Matsuo, T., and Cohn, S.E., 2023: *Covariance propagation in data assimilation: a continuum analysis for advective systems*. Mathematical Approaches of Atmospheric Chemical Constituent Data Assimilation and Inverse Modeling Workshop, Banff, Alberta, CAN, March 19 – 24, 2023.

**Gilpin, S.**: *Bringing science to the next generation: the impacts of Richard Anthes on a young scientist's carrer*. Invited Oral Presentation, American Meteorological Society Annual Meeting, Phoenix, AZ, 2019.

## CONFERENCE ACTIVITY

**Gilpin, S.**, Morzfeld, M., and Lin, K.: *Covariance estimation for high-dimensional data assimilation applications*. Oral Presentation. SIAM Conference on Applications of Dynamical Systems, Denver, CO, May 10 – 15, 2025.

**Gilpin, S.**, Matsuo, T., and Cohn, S.E.: *Inaccuracy of the variance evolution associated with discrete covariance propagation*, Poster Presentation, Dynamics Days, Denver, CO, Jan 3 – 5, 2025.

**Gilpin, S.**, Morzfeld, M., and Lin, K.: *Covariance estimation for high-dimensional geophysical applications*. Oral Presentation. SIAM Mathematics of Planet Earth, Portland, OR, June 10 – 12, 2024.

**Gilpin, S.**, Matsuo, T., and Cohn, S.E.: *The inaccurate variance evolution associated with discrete covariance propagation*, Oral Presentation, 12th Workshop on Meteorological Sensitivity Analysis and

Data Assimilation, Lake George, NY, May 19 – 24, 2024.

**Gilpin, S.**, Morzfeld, M., and Lin, K.: *Covariance estimation for high-dimensional geophysical applications*. Oral Presentation. CaCAO Days, Scripps Institution of Oceanography, UCSD, San Diego, CA, April 15 – 16, 2024.

**Gilpin, S.**, Matsuo, T., and Cohn, S.E.: *An alternative approach to standard methods of covariance propagation*. Oral Presentation, SIAM Conference on Uncertainty Quantification, Trieste, Italy, February 27 – March 1, 2024.

**Gilpin, S.**, Matsuo, T., and Cohn, S. E.: *A generalized, compactly-supported correlation function for data assimilation applications*. Oral Presentation, American Meteorological Society Annual Meeting, Denver, CO, January, 2023.

**Gilpin, S.**, Matsuo, T., and Cohn, S. E.: *Continuum covariance propagation for understanding variance loss in advective systems*. Poster Presentation, WCRP-WWRP Joint Symposium on Data Assimilation and Reanalysis (virtual), September 12 – 18, 2021.

**Gilpin, S.**, Matsuo, T., and Cohn, S. E.: *Continuum covariance propagation for understanding variance loss in advective systems*. Contributed Presentation, Society for Industrial and Applied Mathematics (SIAM) Conference on Mathematical & Computational Issues in the Geosciences (virtual), June 21 – 24, 2021.

**Gilpin, S.**, Matsuo, T., and Cohn, S. E.: *Continuum covariance propagation for understanding variance loss in advective systems*. Oral Presentation, International Symposium on Data Assimilation (virtual), March 12, 2021.

**Gilpin, S.**, Rieckh, T., and Anthes, R.: *Reducing representativeness errors during radio occultation – radiosonde comparisons*. Oral Presentation, American Meteorological Society Annual Meeting, Phoenix, AZ, January 2019.

**Gilpin, S.**, Anthes, R., Sokolovskiy, S., and Rieckh, T.: *Calculation of radio occultation bending angles from models: sensitivity to vertical interpolation methods*. Oral presentation, American Meteorological Society Annual Meeting, Austin, TX, January 2018.

**Gilpin, S.**, Anthes, R., Sokolovskiy, S., and Rieckh, T.: *Calculation of radio occultation bending angles from models: sensitivity to vertical interpolation methods*. Poster presentation, COSMIC/IROWG Workshop, Estes Park, CO, September 2017.

**Gilpin, S.**, Rieckh, T., Anthes, R., and Lu, G.: *An elliptical approach to radio occultation and radiosonde comparisons*. Poster presentation, American Meteorological Society Annual Meeting, Seattle, WA, January 2017.

## SOFTWARE DEVELOPMENT

*A Generalized Gaspari-Cohn Correlation Function* **2023**  
<https://doi.org/10.5281/zenodo.7859258>  
 Python software to construct the Generalized Gaspari-Cohn correlation function in Gilpin et al., (2023).

## TEACHING EXPERIENCE

### Instructor

Analysis of Ordinary Differential Equations (Math 355), University of Arizona.  
 Instructor of record for lecture-based, in-person course.

**Spring 2025**

*Instructor*

Introduction to Linear Algebra (Math 313), University of Arizona. **Fall 2024**  
 Instructor of record for lecture-based, in-person course.

*Instructor*

Undergraduate Teaching Assistant (UTA) Seminar (Math 491), University of Arizona. **Fall 2024**  
 Weekly teaching pedagogy and professional development course for the UTA Program.

*Instructor*

Wildcat Proof Workshop (Math 396L), University of Arizona. **Spring 2024**  
 Instructor of record for weekly, collaborative-based supplement to the lecture course.

*Instructor*

Vector Calculus Supplement (Math 196V), University of Arizona. **Spring 2024**  
 Instructor of record for weekly, collaborative-based supplement to the lecture course.

*Instructor*

First Semester Calculus (Math 122B), University of Arizona. **Fall 2023**  
 Instructor of record for lecture-based, in-person course that meets Monday-Friday.

*Teaching Assistant*

Teaching Excellence, University of Colorado Boulder. **Fall 2020**  
 Teaching assistant for the graduate course on teaching pedagogy.

*Teaching Assistant*

Calculus 1 and 2 for Engineers (APPM 1350, 1360), University of Colorado Boulder. **Fall 2020,**  
 Teaching assistant for undergraduate calculus courses. **Spring 2019, Fall 2018**

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**ACADEMIC SERVICE, MENTORING, AND SCIENTIFIC OUTREACH**


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*Undergraduate Research Mentor***Jun – Aug 2025, 2024**

University of Arizona. Research mentor for a undergraduate student in the NSF Data Driven Discovery RTG Summer REU Program.

*RTG Seminar Co-Organizer***Aug 2023 – Present**

University of Arizona. Co-organizer of the department RTG Seminar, focusing on technical topics in data driven discovery and applied mathematics, and professional development for graduate students.

*Undergraduate Teaching Assistant (UTA) Program Co-Coordinator***Nov 2023 – Dec 2024**

University of Arizona. One of two coordinators of the UTA program, which provides undergraduate math majors teaching experience in upper division math courses.

*RTG Showcase Co-Organizer***Jan – Apr 2024**

University of Arizona. Co-organizer for a two-day workshop on Data Driven Discovery hosted by the University of Arizona on April 13 – 14th, 2024.

*Applied Mathematics Graduate Student Mentor***Jul 2019 – Jul 2023**

University of Colorado Boulder. Mentorship program for first year graduate students in the Applied Mathematics Department.

*AWM/SIAM Study Session Coordinator***Jan 2020 – May 2022**

University of Colorado Boulder. One of two coordinators for the Association for Women and Math (AWM)/Society for Industrial and Applied Mathematics (SIAM) study sessions for Calculus 1/2/3 and Differential Equation courses.

*Center for Teaching and Learning Lead***May 2020 – May 2021**

University of Colorado Boulder. One of two lead teaching assistants for the Applied Mathematics Department, serving as a resource for department teaching assistants and liaison between department and the Center for Teaching and Learning.

**Gilpin, S.:** *Mathematics of the atmosphere and how we predict the weather.* Oral Presentation, CU Boulder STEMinar Series, April 6, 2021.

*Graduate School Peer Mentor***Aug – Dec 2019**

Mentor for a first year PhD physics student, providing support and mentorship through the first semester of graduate school.

*NSF SOARS Mentor***May – Aug 2019**

UCAR. Mentor for a NSF SOARS Protégé through the UCAR. Included mentoring in research skills, presenting scientific research, and the graduate school application process.

## PROFESSIONAL DEVELOPMENT AND WORKSHOPS

*Transforming Your Research into Teaching (TYRIT) Workshop***Jun – Jul 2022**

University of Colorado Boulder. The TYRIT workshop series teaches graduate students how to build a course from the ground up using their PhD research as the inspiration for their course.

**Gilpin, S.** and V. Stout: *Establishing Your Ideal Classroom Climate on Day 1.* Center for Teaching and Learning Fall Intensive, August 20, 2020.

*Joint Effort for Data Assimilation Integration (JEDI) Academy***Jun 2019**

UCAR. The JEDI Academy Workshop provides an overview and training in the Joint Center for Satellite Data Assimilation's JEDI system.

## HONORS, AWARDS, AND CERTIFICATES

*Certificate in College Teaching***Aug 2022**

Certificate awarded through the Center for Teaching and Learning (CTL) at the University of Colorado Boulder, for graduate students to develop a firm foundation in college teaching.

*Society for Industrial and Applied Mathematics Travel Award***May 2021**

Travel award for attendance at the Society for Industrial and Applied Mathematics Conference on Mathematical & Computational Issues in the Geosciences, June 21 – 24, 2021.

*American Meteorological Society Conference Best Student Presentation***Feb 2019**

Best student presentation at the 23rd Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface (IOAS-AOLS) Conference at the American Meteorological Society Annual Meeting, Phoenix, AZ, 2019.

## MEMBERSHIPS

*Society for Industrial and Applied Mathematics**Association for Women in Mathematics*