

## EDUCATION

---

### **PHD GEOPHYSICS** AUGUST 2017 - DECEMBER 2022 | FAIRBANKS, AK, USA

- Dissertation Title: Acoustic and Seismic Signature of Sustained Volcanic Eruptions.
- Advisor: David Fee

### **BS GEOPHYSICS** | UNIVERSITÄT HAMBURG (UHH)

October 2013 - July 2017 | Hamburg, Germany

- Thesis Title: Comparison of radar and video observations of plumes at Stromboli volcano
- Advisor: Matthias Hort

## RELEVANT EMPLOYMENT

---

### **POSTDOCTORAL RESEARCHER** | LUDWIG MAXIMILIAN UNIVERSITY (LMU)

January 2023 - Now | Munich, Germany

- Comparison of acoustic signals and electric discharge during geyser eruptions including Strokkur geyser, Iceland, and Pohutu geyser, New Zealand and comparing them to volcanic eruptions.

### **RESEARCH AND FIELD ASSISTANT** | UNIVERSITY OF ALASKA FAIRBANKS (UAF) AND ALASKA VOLCANO OBSERVATORY (AVO)

August 2017 - November 2022 | Fairbanks, Alaska, USA

- Researching seismic and acoustic characterization of eruption tremor and its source and acoustic signatures of eruptions. Fieldwork on remote Alaskan volcanoes installing permanent seismic and infrasound sensors.

### **MATH TUTOR** | UNIVERSITÄT HAMBURG (UHH)

October 2014 - January 2017 | Hamburg, Germany

- Teaching "Math for Physicists" including calculus, linear algebra and differential equations in the first two years of undergraduate physics education.

## LANGUAGES

---

### **PROGRAMMING**

Advanced skills (10+ years of experience): Python • Matlab • Latex • Git • Unix

Others: Fortran • GIS

### **SPOKEN & WRITTEN**

German: Native language

English: Fluent

French: Advanced

## JOURNAL PUBLICATIONS

---

- **Gestrich, J. E.** , Fee, D., Cigala, V., Schmid, M. et al. (in prep.). Volcanic Oboe: Resonances at Stromboli Volcano.
- **Gestrich, J. E.** , Cimarelli, C., Fee, D. et al. The acoustics of bulge rise and rupture at Strokkur geyser. *Bull Volcanol* 87, 82 (2025). <https://doi.org/10.1007/s00445-025-01876-3>
- Schmid, M., Kueppers, U., Ricci, T., Civico, R., Cigala, V., Fee, D., **Gestrich, J. E.** et al. (2025). The morphological response to the 13 May 2022 major explosive event at Stromboli volcano, Italy, characterised by high-resolution UAS surveys, *Volcanica*, 8(2), pp. 387–397. doi: 10.30909/vol/crjj4989.
- Iezzi, A. M., Buzard, R. M., Fee, D., Matoza, R. S., **Gestrich, J. E.** , Jolly, A. D., et al. (2023). UAS-based observations of infrasound directionality at Stromboli volcano, Italy. *Geophysical Research Letters*, 50, e2023GL102905. <https://doi.org/10.1029/2023GL102905>
- **Gestrich, J. E.** , Fee, D., Matoza, R. S., Lyons, J. J., Patrick, M. R., Parcheta, C., Kueppers, U., Cigala, V., Dietterich, H. (2022). Lava fountain jet noise during the 2018 eruption of fissure 8 of Kīlauea volcano. *Frontiers in Earth Science*, Volume 10 - 2022. <https://doi.org/10.3389/feart.2022.1027408>
- Lamb, O. D., **Gestrich, J. E.** , Barnie, T. D., Jónsdóttir, K., Ducrocq, C., Shore, M. J., Lees, J. M., Lee, S. J. (2022). Acoustic observations of lava fountain activity during the 2021 Fagradalsfjall eruption, Iceland. *Bull Volcanol* 84, 96 (2022). <https://doi.org/10.1007/s00445-022-01602-3>
- Watson, L. M., Iezzi, A. M., Toney L., Maher, S. P., Fee, D., McKee, K., Ortiz, H. D., Matoza, R. S., **Gestrich, J. E.** , Bishop, J. W., Witsil, A. J. C., Anderson, J. F., Johnson, J. B. (2022). Volcano infrasound: progress and future directions. *Bull Volcanol* 84, 44 (2022). <https://doi.org/10.1007/s00445-022-01544-w>
- **Gestrich, J. E.** , Fee, D., Matoza, R. S., Lyons, J. J., & Ruiz, M. C. (2021). Fitting Jet Noise Similarity Spectra to Volcano Infrasound Data. *Earth and Space Science*, 8(11), 1–16. <https://doi.org/10.1029/2021ea001894>
- **Gestrich, J. E.** , Fee, D., Tsai, V. C., Haney, M., & Van Eaton, A. R. (2020). A Physical Model for Volcanic Eruption Tremor. *Journal of Geophysical Research: Solid Earth*, 1–28. <https://doi.org/10.1029/2019jb018980>

# RESEARCH EXPERIENCE

---

## **COMPARISON OF ELECTRICAL SIGNATURES AND ACOUSTIC WAVES OF VOLCANIC ERUPTIONS AND GEYSERS | LUDWIG MAXIMILIAN UNIVERSITY (LMU)**

January 2023 - Now | Munich, Germany

- Measurement campaigns at Pohutu geyser, New Zealand, and Strokkur geyser, Iceland, deploying arrays of infrasound and audio microphones as well as a electrical discharge detector and various high-speed cameras.
- Quantitative analysis and comparison of the geyser events using machine learning clustering techniques and waveform and spectral processing.
- Comparison of acoustic waves generated during geyser eruptions and volcanic eruption signatures.
- FEM modeling of electric field variations due to fountain movements and derivation of an empirical model to explain measured electric signals.
- Collaborators: Corrado Cimarelli, Caron Vossen, Antonio Capponi, Markus Schmid, Ulrich Kueppers

## **EXPERIMENTAL INVESTIGATION OF THE INFLUENCE OF PARTICLES ON JET NOISE | UNIVERSITY OF ALASKA FAIRBANKS (UAF) & LUDWIG MAXIMILIAN UNIVERSITY (LMU)**

May 2021 - Now | Fairbanks, AK, USA and Munich, Germany

- Conducting outdoor experiments using a shock tube and a network of 15 microphones, high speed and thermal camera with different initial pressures, particle loads, temperatures and vent geometries
- Analyzing acoustic data with a focus on the effect of the experimental parameters on waveform and spectral shapes
- Field experiment on Stromboli volcano deploying multiple infrasound sensors, acoustic microphones, cameras etc. to study the change of jet noise with different ash loads
- Collaborators: Valeria Cigala, Ulrich Kueppers, Alexandra Iezzi, Markus Schmid, Maurizio Ripepe, Giorgio Lacanna, Jörn Sesterhenn, Jacopo Tadeucci, Juan José Peña Fernández, Laura Spina, Robin Matoza, Donald Dingwell

## **ANALYZING ACOUSTIC TREMOR AND GEOPHYSICAL DATA FROM KILAUEA 2018 | UNIVERSITY OF ALASKA FAIRBANKS (UAF)**

October 2019 - Now | Fairbanks, AK, USA

- Processing of acoustic data including array processing techniques and spectral analysis
- Writing acoustic propagation code as well as applying existing code using HPC and GPU clusters
- Finding methods to extract physical parameters from videos and application of machine learning algorithms for feature extraction
- Comparison of acoustic tremor (jet noise) to other geophysical data such as video images, gas measurements, flow velocities etc.
- Modeling eruption parameters using jet noise scaling equations
- Collaborators: David Fee, Robin Matoza, John Lyons, Matthew Patrick, Carolyn Parcheta, Ulrich Kueppers, Valeria Cigala, Hannah Dietterich

## **FORMULATION OF AN ACOUSTIC SPECTRAL FITTING ALGORITHM | UNIVERSITY OF ALASKA FAIRBANKS (UAF)**

October 2019 - June 2021 | Fairbanks, AK, USA

- Development of a spectral fitting algorithm to fit empirical jet noise spectra for large and fine scale turbulence to data using a Gauss-Newton algorithm for non-linear least-squares fitting
- Analysis of the similarity between jet noise spectra and acoustic eruption tremor from the eruption of Mount St Helens in 2005, Tungurahua in August 2006 and Kilauea in 2018
- Publish open access code on GitHub: [https://github.com/jegestrich/simil\\_func](https://github.com/jegestrich/simil_func)
- Collaborators: David Fee, Robin Matoza, John Lyons, Mario Ruiz

## **DEVELOPMENT OF A SEISMIC TREMOR MODEL BY TURBULENCE AND PARTICLE IMPACTS | UNIVERSITY OF ALASKA FAIRBANKS (UAF)**

September 2017 - October 2019 | Fairbanks, AK, USA

- Processing and comparison of various geophysical data such as seismic, infrasonic, and volcanic plume height data associated with the 2016 (sub-)plinian eruption of Pavlof Volcano
- Comparison of volcanic tremor to noise generation in rivers after storms
- Development of a physical model for seismic noise during volcanic eruptions to model the power spectral density; Noise generation by particle impacts and turbulence
- Collaborators: David Fee, Matthew Haney, Victor Tsai, Alexa Van Eaton

## **COMPARISON OF DOPPLER RADAR AND VIDEO DATA | UNIVERSITÄT HAMBURG (UHH)**

June 2016 - July 2017 | Hamburg, Germany

- Data acquisition on Stromboli volcano, Italy
- Analysis of Doppler radar data with respect to total power as an indicator for plume density; Development of algorithm for automated evaluation of plume density
- Collaborators: Matthias Hort

# CONFERENCES / WORKSHOPS

---

## 2025

### INTERNATIONAL ASSOCIATION OF VOLCANOLOGY AND CHEMISTRY OF THE EARTH'S INTERIOR (IAVCEI) SCIENTIFIC ASSEMBLY 2023

July 2025 | Geneva, Switzerland

- Oral Presentation Title: From Geysers to Volcanoes: Connecting Fountain Dynamics with Acoustic and Electrical Signatures

### PHYSICS OF VOLCANOES (POV) WORKSHOP

March 2025 | RWTH Aachen

- Oral Presentation Title: Volcanic Oboe: Investigating Resonant Infrasound at Stromboli Volcano

## 2024

### IASPEI/IAVCEI INTER-ASSOCIATION COMMISSION ON "VOLCANO SEISMOLOGY & ACOUSTICS", ANNUAL WORKSHOP

September 2024 | La Palma, Spain

- Oral Presentation Title: Acoustic Measurements during the 2021 Cumbre Vieja Eruption on La Palma

### PHYSICS OF VOLCANOES (POV) WORKSHOP

March 2024 | DLR Oberpfaffenhofen, Germany

- Oral Presentation Title: Acoustic Signals from Strokkur Geyser

## 2023

### AMERICAN GEOPHYSICAL UNION FALL MEETING 2023 (AGU)

December 2023 | San Francisco, CA, USA

- Oral Presentation (Invited) Title: Different Geysers - Different Signals; Acoustic and electrical observations from Strokkur Geyser, Iceland and Pūhutu Geyser, New Zealand
- Poster Presentation Title: Acoustic Resonance and Jet Noise of Stromboli Volcano
- Session Chair and Converner Session Title: Seismic and Acoustic Signals of Volcanic Unrest and Eruption: from Source Characterization to Monitoring Applications

### INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS (IUGG) GENERAL ASSEMBLY 2023

July 2023 | Berlin, Germany

- Poster Presentation Title: Acoustic Waves and Electrical Signatures from Strokkur Geyser, Iceland and Pūhutu Geyser, New Zealand

### INTERNATIONAL ASSOCIATION OF VOLCANOLOGY AND CHEMISTRY OF THE EARTH'S INTERIOR (IAVCEI) SCIENTIFIC ASSEMBLY 2023

January 2023 | Rotorua, New Zealand

- Poster Presentation Title: The influence of ash particles on volcano acoustics - comparing controlled experiments with real eruption data

## 2022

### AMERICAN GEOPHYSICAL UNION FALL MEETING 2022 (AGU)

December 2022 | Chicago, IL, USA

- Oral Presentation (Invited) Title: Lava Fountain Jet Noise during the 2018 Eruption of Kilauea Volcano

### COMMUNITY NETWORK FOR VOLCANIC ERUPTION RESPONSE (CONVERSE) DISTRIBUTED VOLCANIC FIELDS (DVF) WORKSHOP AND SCENARIO

February 2022 and October 2021

## 2021

### AMERICAN GEOPHYSICAL UNION FALL MEETING 2021 (AGU)

December 2021 | New Orleans, LA, USA

- Poster Presentation (awarded with the Outstanding Student Presentation Award) Title: Experimental Investigation of the Influence of Solid Particles on Volcano Acoustics

## 2020

### AMERICAN GEOPHYSICAL UNION FALL MEETING 2020 (AGU)

December 2020 | virtual

- Oral Presentation Title: Volcanic Jet Noise from the Kilauea Fissure 8 Eruption

### EUROPEAN GEOPHYSICAL UNION GENERAL ASSEMBLY 2020 (EGU)

May 2020 | virtual

- Oral Presentation Title: Volcanic Jet Noise from the Kilauea Fissure 8 Lava Fountain

## 2019

### AMERICAN GEOPHYSICAL UNION FALL MEETING 2019 (AGU)

December 2019 | San Francisco, CA, USA

- Poster Presentation Title: VOLCANIC ERUPTION TREMOR: Analyzing the Plume Height Relationship and Application of a Fluvial Seismology Model

### COMMUNITY NETWORK FOR VOLCANIC ERUPTION RESPONSE (CONVERSE) INFRASOUND WORKSHOP

November 2019 | Fairbanks, AK, USA

- Oral Presentation Title: Volcanic tremor and river tremor

## 2018

### AMERICAN GEOPHYSICAL UNION FALL MEETING 2018 (AGU)

December 2018 | Washington, DC, USA

- Oral Presentation Title: VOLCANIC ERUPTION TREMOR: Analyzing the Plume Height Relationship and Application of a Fluvial Seismology Model

### COMMUNITY VOLCANO EXPERIMENTS (COVE) WORKSHOP

November 2018 | Albuquerque, NM, USA

- Oral Presentation Title: Combining science disciplines

### WORKSHOP ON JAPAN-KAMCHATKA-ALASKA SUBDUCTION PROCESSES (JKASP-2018)

August 2018 | Petropavlovsk-Kamchatsky, Russia

- Poster Presentation Title: VOLCANIC ERUPTION TREMOR: Analyzing the Plume Height Relationship and Application of a Fluvial Seismology Model

# AWARDS / NOMINATIONS

---

## **EARLY CAREER TRAVEL GRANT IUGG GENERAL ASSEMBLY 2023**

July 2023 | Berlin, Germany

## **BEST STUDENT PAPER AWARD GEOPHYSICAL INSTITUTE | UAF**

April 2022 | Fairbanks, Alaska, USA

• Gestrich, J. E. , Fee, D., Matoza, R. S., Lyons, J. J., & Ruiz, M. C. (2021). Fitting Jet Noise Similarity Spectra to Volcano Infrasound Data. *Earth and Space Science*, 8(11), 1–16. <https://doi.org/10.1029/2021ea001894>

## **OUTSTANDING STUDENT PRESENTATION AWARD AGU FALL MEETING 2021**

December 2021 | New Orleans, Louisiana, USA

## **OUTSTANDING STUDENT PERFORMANCE AWARD GEOPHYSICAL INSTITUTE | UAF**

February 2020 | Fairbanks, Alaska, USA

## **PRESIDENT OF GIGSA (GEOPHYSICAL INSTITUTE GRADUATE STUDENT ASSOCIATION) | UAF**

May 2019 – May 2020 | Fairbanks, Alaska, USA

• Representing graduate student voices at the Geophysical Institute. • Fund raising for graduate student travel awards. • Organizing networking and volunteering events

## **DAAD SCHOLARSHIP (GERMAN ACADEMIC EXCHANGE SERVICE)**

September 2017 – August 2018

• Scholarship for German students studying in a foreign country to enhance their educational as well as cultural experiences • Award included tuition fees, health insurance and monthly living fee

# FIELD WORK EXPERIENCE

---

## **LUDWIG-MAXIMILIANS UNIVERSITÄT MÜNCHEN (LMU) AND UNIVERSITY OF EXETER**

November 2024 (2 weeks) | Sakurajima volcano, Japan

• Deploying two arrays with each 4 and 5 infrasound sensors on the flanks of Sakurajima volcano, operating a SO<sub>2</sub> camera to monitor degassing.

## **LMU**

May 2024 (1 week) | Strokkur geyser, Iceland

November 2023 (1 week) | Andernach geyser, Germany

August 2023 (1 week) | Strokkur geyser, Iceland

February 2023 (1 week) | Pōhutu geyser in Te Puia / Rotorua, New Zealand

• Deploying campaign acoustic microphones, infrasound microphones, Biral thunderstorm detector (BTD), highspeed cameras around geysers

## **UAF, LMU ETC. UNIVERSITY OF ALASKA FAIRBANKS IN COLLABORATION WITH PEOPLE FROM MULTIPLE RESEARCH INSTITUTIONS**

May 2022 (3 weeks) Stromboli Volcano, Italy

• Deploying campaign acoustic microphones, infrasound microphones, highspeed cameras to capture jetting events.

May 2021 (1 week) | Fürstfeldbruck, Germany

• Perform outdoor experiments using the shock tube provided by LMU and an array of microphones, high speed camera and thermal camera

## **ALASKA VOLCANO OBSERVATORY (AVO)**

Fall 2020 (1 week) | Kenai, AK, USA

• Installation of permanent, telemetered six element infrasound array KENI

Summer 2019 (2 weeks) | Katmai Region, AK, USA

Summer 2019 (3 weeks) | Adak / Great Sitkin / Kanaga Volcano, AK, USA

Summer 2018 (1 week) | Spurr Volcano, AK, USA

• Installation of permanent telemetered broadband seismic and infrasound stations

## **UNIVERSITÄT HAMBURG (UHH)**

Summer 2016 & Summer 2017 (each 2 weeks) | Stromboli, Italy

• Deployment of various instrumentation including Doppler radar, SO<sub>2</sub> camera, GPS, visual camera and IR cameras to monitor eruption dynamics and ash plume behavior.

• In summer 2016 the deployment was part of the community BAclO project. This data formed the basis for my bachelor thesis project.

Summer 2015 (2 weeks) | Skagerrak, Denmark / Norway

• Training in marine seismic data acquisition on the research vessel ALKOR

• Use of streamer, airgun and, magnetic streamer; monitor and process incoming data; mapping and analysis of degassing pockmarks on the ocean bottom