CURRICULUM VITAE

RICARDO GARZA-GIRÓN, PhD

Postdoctoral Researcher & Geophysical Consultant

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RESEARCH APPOINTMENTS

Postdoctoral researcher

Colorado State University, Department of Geosciences (January 2023 -)

- Collaborating with a multidisciplinary team to study subsurface dynamics.
- Leading the development of new methodologies for detecting and locating seismic signals using a single seismic station.
- Development of machine learning algorithms to classify seismic events.

University of California, Santa Cruz, Earth and Planetary Sciences Department (October 2021 - October 2022)

- Conducted advanced global seismological analysis of the **January 15, 2022 Tonga volcanic eruption**, providing insights into its source.
- Developed and implemented signal processing workflows to analyze long-period seismic waves and their interaction with the atmospheric phenomena, improving understanding of solid Earth-atmosphere coupling.
- Published findings in high-impact journals, including *Science Advances*.

Graduate student researcher

University of California, Santa Cruz, Earth and Planetary Sciences Department (2015 - 2022)

- Dissertation research utilizing **template matching** and **machine learning algorithms** to analyze seismic data, enhancing event detection during large volcanic eruptions, where noise levels are anomalously high..
- Processed the seismic dataset from the **2008 Okmok Volcano eruption in Alaska**, identifying previously undetected seismic events and improving the resolution of the eruption timeline.
- Published multiple peer-reviewed articles in leading journals, including *Geophysical Research Letters* and *Journal of Geophysical Research: Solid Earth*.

CONSULTING EXPERIENCE

Vice-President & CTO, Santa Cruz Geophysics (2021 - Present)

- Lead geophysical consulting services for **geothermal exploration** and fault creep monitoring,
- Apply advanced **signal processing**, **unconventional signals analysis**, and **machine learning** techniques to solve complex geophysical challenges.
- Oversee project planning, client engagement, and technical execution, ensuring deliverables meet high-quality standards.

CURRICULUM VITAE

EDUCATION

PhD: Geophysics
University of California, Santa Cruz, Earth and Planetary Sciences Department (2021)
Thesis dissertation: A geophysical study of active volcanic regions and subduction zones.
Advisor: Emily Brodsky, brodsky@ucsc.edu

Bachelor's Degree: **Geophysics Engineering (Minor: Seismology)** *Honors*
Universidad Nacional Autónoma de México (UNAM), Facultad de Ingeniería (2014)
(National Autonomous University of Mexico, Faculty of Engineering)
Thesis dissertation: Spatial variation of the b value under the Popocatépetl volcano and its relation with the structure of the magma chamber.

Internship
Centro Nacional de Prevención de Desastres (CENAPRED), México (2013)
National Center for Disaster Prevention of Mexico at the "Special Program for Prevention and Risk Mitigation of Disasters"

TEACHING

Lecturer: EART191C-Practical Geophysics, UC Santa Cruz (Winter 2022)

- Designed and delivered a **capstone course in observational seismology**, equipping students with practical skills in seismic data analysis and advanced coding techniques.
- Developed and implemented curriculum modules introducing **neural networks** and **machine learning packages**, enabling students to identify seismic signals using cutting-edge technologies and independently debug complex Python libraries.
- Guided students through hands-on projects, from data acquisition to signal processing and writing a paper, fostering practical expertise in applying computational methods to geophysics.
- Received positive feedback from students, highlighting the course's impact on their technical and analytical capabilities.

GEOPATHS Facilitator: EART110C-The Dynamic Earth (Geophysics), UC Santa Cruz (Spring 2020)
Teaching Assistant: EART191C-Applied Geophysics, UC Santa Cruz (Fall 2019)
Teaching Assistant: EART110C- The Dynamic Earth (Geophysics), UC Santa Cruz (Spring 2019) (*Honorific mention as best TA voted by students*)
Teaching Assistant: EART110C- The Dynamic Earth (Geophysics), UC Santa Cruz (Spring 2018)
Teaching Assistant: EART110C- The Dynamic Earth (Geophysics), UC Santa Cruz (Spring 2017)

FIELD WORK

San Andreas Fault Zone, Santa Cruz Geophysics, Inc. (2023-). SCG, in collaboration with Prof. Roger Bilham from the University of Colorado Boulder, has been developing and deploying creepmeters along the creeping section of the SAFZ.
Aleutian Islands, Alaska Volcano Observatory (2019). Analog-to-digital conversion campaign. Korovin, Cleveland and Okmok volcanoes, Alaska.
Reference: Max Kaufman, amkaufman@alaska.edu
Antarctica (2018). Geophysical surveying using airborne TEM and Nuclear Magnetic Resonance (NMR). Assistance with field work for microbiologists and limnologists drilling through ice and collecting samples.
Reference: Slawek Tulaczyk, stulaczy@ucsc.edu;

Cook Inlet, Alaska Volcano Observatory (2018). Service of existing seismic/GPS stations as well as analog-to-digital conversion of stations. Mount Spurr, Alaska; Mount Redoubt, Alaska.
Reference: Max Kaufman, amkaufman@alaska.edu
Pacific Ocean, R/V Roger Revelle (2017). Surveying the Mendocino Fracture Zone. Deployment of ocean bottom magnetotelluric instruments, CHIRP/multibeam bathymetric data collection.
Reference: Prof. Eli Silver, esilver@ucsc.edu; Prof. David Sandwell, dsandwell@ucsd.edu
IRIS Wavefield Communal Experiment (2016). Deployment of nodal arrays and broadband seismic stations. Enid, Oklahoma, USA.
Geothermal exploration field campaign, Michoacan, Mexico (2015). Field leader for the project "Geoscientific study for the geothermal development of the San Bartolome de los Banos, Guanajuato, Mexico and San Agustin del Maiz, Michoacan, Mexico areas". Activities included the design, deployment and maintenance of a seismic network consisting of 12 broadband instruments as well as executing a regional electromagnetic survey with 85 sites using the TEM (Transient Electro-Magnetic) and MT (Magnetotelluric) methods.
Reference: Prof. Vala Hjorleifsdottir, vala@geofisica.unam.mx
Popocatépetl volcano and the northern Mexican desert (2014). Transient ElectroMagnetics (TEM) and Magnetotellurics (MT). Estado de Mexico, Mexico; Nuevo Leon, Mexico.
Reference: Claudia Arango Galván, claudiar@geofisica.unam.mx
Urban geophysics (2011-2012). Electrical resistivity surveys and GPR with the Geophysics Institute of UNAM to determine the structures under archaeological sites, volcanic lava tubes, city malls and others. Mexico City, Mexico.
Reference: Gerardo Cifuentes Nava, gercifue@geofisica.unam.mx

AWARDS/MENTIONS

Antarctica Service Medal (2019)
GEOPRISMS AGU Student Prize, Honorable Mention (2019)
Zhen and Ren Wu Memorial Award Fund in Geophysics, UC Santa Cruz (2018)
Graduate Students Association (GSA) Research and Travel Grant, UC Santa Cruz (2018)
UC MEXUS-CONACYT Doctoral Fellowship for Mexican Students (2015)
Honorable Mention for bachelor thesis defense, Universidad Nacional Autónoma de México, Facultad de Ingeniería (2014)

PUBLICATIONS

Garza-Giron, R., Aster, R. (Submitted to BSSA). Detection, Location and Magnitude Distributions of Tidally Triggered Icequakes Near the Grounding Line of the Ross Ice Shelf From an Enhanced Seismic Catalog Using a Single Seismic Station.
Villafuerte, C., Cruz-Atienza, V., Tago, J., Solano-Rojas, D., **Garza-Girón, R.**, Franco, S., Dominguez, L. and Kostoglodov, V. (2025). Slow slip events and megathrust coupling changes contribute to the earthquake potential in Oaxaca, Mexico. *Geophysical Journal International*, *241*(1), 17-34.
Garza-Giron, R., Lay, T., Ye, L. (2024). The Repeating Major Earthquakes in the Mexican Subduction Zone Along Oaxaca: Implications for Future Events. *Seismological Research Letters* 2024; doi: https://doi.org/10.1785/0220240267.
Hotovec-Ellis, A. J., **Garza-Girón, R.**, Waite, G. P., Farías, C., Layana, S., & Haney, M. M. (2024). Preface to the Focus Section on Volcano Monitoring in the Americas. *Seismological Research Letters*, *95*(5), 2577-2579.
Garza-Girón, R., & Tulaczyk, S. M. (2024). Brief communication: Significant biases in ERA5 output for the McMurdo Dry Valleys region, Antarctica. *The Cryosphere*, *18*(3), 1207-1213.
Pollitz, F. F., **Garza-Giron, R.**, & Lay, T. (2023). Comment on "Multievent Explosive Seismic Source for the

2022 M w 6.3 Hunga Tonga Submarine Volcanic Eruption" by Julien Thurin, Carl Tape, and Ryan Modrak. *The Seismic Record*, *3*(3), 210-214.

Garza-Girón, R., Lay, T., Pollitz, F., Kanamori, H., & Rivera, L. (2023). Solid Earth–atmosphere interaction forces during the 15 January 2022 Tonga eruption. *Science Advances*, *9*(2), eadd4931.

Garza-Girón, R., Brodsky, E. E., Spica, Z. J., Haney, M. M., & Webley, P. W. (2023). Earthquakes record cycles of opening and closing in the enhanced seismic catalog of the 2008 Okmok Volcano, Alaska, eruption. *Journal of Geophysical Research: Solid Earth*, e2023JB026893.

Garza-Giron, R., Brodsky, E. E., Spica, Z. J., Haney, M. M., & Webley, P. W. (2023). A specific earthquake processing workflow for studying long-lived, explosive volcanic eruptions with application to the 2008 Okmok Volcano, Alaska, eruption. *Journal of Geophysical Research: Solid Earth*, e2022JB025882.

Grombacher, D., Auken, E., Foged, N., Bording, T., Foley, N., Doran, P.T., Mikucki, J., Dugan, H.A., **Garza-Giron, R.**, Myers, K. and Virginia, R.A. (2021). Induced polarization effects in airborne transient electromagnetic data collected in the McMurdo Dry Valleys, Antarctica. *Geophysical Journal International*, *226*(3), pp.1574-1583. https://doi.org/10.1093/gji/ggab148

Cruz-Atienza, V.M., Tago, J., Villafuerte, C., Wei, M., **Garza-Girón, R.**, Dominguez, L.A., Kostoglodov, V., Nishimura, T., Franco, S.I., Real, J. and Santoyo, M.A. (2021). Short-Term Interaction between Silent and Devastating Earthquakes in Mexico. *Nature Communications*. *https://doi.org/10.1038/s41467-021-22326-6*.

Garza-Giron, R., Brodsky, E. E., & Prejean, S. G. (2018). Mainshock-aftershock clustering in volcanic regions. *Geophysical Research Letters*, *45*(3), 1370-1378.

Garza Girón, Ricardo. (2014). "Distribución espacial del valor b debajo del Volcán Popocatépetl y su relación con la estructura de la cámara magmática". (*Tesis de Licenciatura*). Universidad Nacional Autónoma de México, México. https://repositorio.unam.mx/contenidos/428928

Garza-Giron, R., Aster, R., Wiens, D., Nyblade, A., Bromirski, P., Gerstoft, P., Stephen, R. (In prep). Tidally Triggered Cryoseismicity at the Margins of the Ross Ice Shelf, Antarctica.

Garza-Giron, R., Tulaczyk, S., Grombacher, D., Auken, E., Foged, N., Doran, P.T., Mikucki, J., Dugan, H.A. (In prep). Geothermal heat-flux mapping in the McMurdo Sound using air-borne transient electro-magnetics.

ABSTRACTS/MEETINGS/WORKSHOPS

(Invited) Garza-Giron, R., Lay, T., Rivera, L., Pollitz, F., Unraveling New Mysteries of the 2022 Hunga Tonga-Hunga Ha'apai Eruption Using Seismology, AGU Annual Meeting, San Francisco, CA, 2023.

Garza-Giron, R., Aster, R., Wiens, D., Nyblade, A., Bromirski, P., Gerstoft, P., Stephen, R., Tidally Triggered Cryoseismicity at the Margins of the Ross Ice Shelf, Antarctica, AGU Annual Meeting, San Francisco, CA, 2023.

Garza-Giron, R., Lay, T., Pollitz, F., Kanamori, H., Rivera, L., Solid Earth-Atmosphere Interaction Forces During the January 15, 2022 Tonga Eruption, SSA Annual Meeting, San Juan, Puerto Rico, 2023.

Garza-Giron, R., Lay, T., Pollitz, F., Kanamori, H., Rivera, L., Solid Earth-Atmosphere Interaction Forces During the January 15, 2022 Tonga Eruption, SSA Annual Meeting, Bellevue, Washington, 2022.

Garza-Giron, R., Brodsky, E., Spica, Z., and Haney, M.: Hidden earthquakes unveil the dynamic evolution of a large-scale explosive eruption, EGU General Assembly 2020, Online, 4–8 May 2020.

Garza-Giron, R., Brodsky, E.E. , Spica, Z.J. and Haney M.M., Hidden earthquakes as a tool to conduit evolution during an explosive eruption, AGU Fall Meeting, San Francisco, CA, 2019.

Slawek M Tulaczyk, Jill Mikucki, Esben Auken, Denys Grombacher, Hilary A Dugan, Nikolaj Foged, Neil Foley, Ross A Virginia, Peter T Doran, **Ricardo Garza-Giron** and Krista F Myers, Deep subsurface brines in the polar desert of McMurdo Dry Valleys, Antarctica, revealed by a regional AEM (Airborne ElectroMagnetic) survey, AGU Fall Meeting, San Francisco, CA, 2019.

Auken, Esben, Thue Sylvester Bording, Peter T. Doran, Hilary A. Dugan, Nikolaj Foged, Neil Foley,

Ricardo Garza Giron, Denys Grombacher, Jill Mikucki, Lars Jensen, Krista Myers, T.J. Rogers, Slawek Tulaczyk, Ross Virginia, An airborne EM survey of the McMurdo Dry Valleys in Antarctica, AGU-SEG Airborne Geophysics Workshop, Davie, Florida, 2019.

Garza-Giron, R., Brodsky, E.E. and Haney M.M., When does the rock break?: Finding earthquakes during the 2008 Okmok eruption, AGU Fall Meeting, Washington, D.C., 2018.

Garza-Giron, R., Brodsky, E.E. and Prejean, S.G., Mainshock-aftershocks clustering in volcanic regions, Workshop on Japan-Kamchatka-Alaska Subduction Processes (JKASP), Petropavlovsk-Kamchatsky, Russia, 2018.

Garza-Giron, R., Brodsky, E.E. and Prejean, S.G., Mainshock-aftershocks clustering detection in volcanic regions, AGU Fall Meeting, New Orleans, LA, 2017.

Ricardo Garza-Giron, Emily E. Brodsky, Stephanie G. Prejean, Aftershock productivity on volcanoes: What can it tell us about interpreting aftershocks?, 10th International Workshop on Statistical Seismology, Wellington, New Zealand, 2017.

Workshop for the Advanced School on Physics of Volcanoes, ICTP, Trieste, Italy, 2016.

Hjörleifsdóttir, Vala, Shri Krishna Singh, Liliana Martínez-Peláez, **Ricardo Garza-Girón**, Björn Lund, and Chen Ji., Observations of large earthquakes in the Mexican subduction zone over 110 years, EGU General Assembly Conference, Vienna, Austria, 2016.

Garza-Giron, R., Brodsky, E.E. and Prejean, S.G., Aftershock productivity as a potential indicator of the style of stress accumulation on volcanoes of Alaska and the Aleutian Islands, AGU Fall Meeting, San Francisco, CA, 2016.

Garza-Giron, R. and Zuniga, R.R., Spatial distribution of the b-value under Popocatepetl volcano and its relation with the structure of the magma chamber, AGU Fall Meeting, San Francisco, CA, 2014.

ACADEMIC PROFESSIONAL SERVICE

Co-convener: Seismoacoustic, Geodetic and Other Geophysical Investigations of Active Volcanoes, SSA Annual Meeting, 2024

Guest editor: Seismological Research Letters, Focus Section on Volcano Monitoring in the Americas, since 2023.

Reviewer: Journal of Geophysical Research: Solid Earth, since 2023

Reviewer: Nature Geosciences, since 2023

Reviewer: Journal of Volcanology and Geothermal Research, since 2021

INVITED DEPARTMENTAL TALKS

Zhejiang University, China (2023)

San Jose State University, CA (2023)

Columbia University, Volcanology group, NY (2020)

Humboldt State University, Department of Geology, CA (2020)

Stanford University, Seismology group, CA (2020)

Instituto de Geofísica, Universidad Nacional Autónoma de México, Mexico (2019)