

EDUCATION

- McGill University**, Department of Earth and Planetary Sciences Montréal, QC, Canada
• **Ph.D.** Earth and Planetary Sciences October 2020
Relevant Coursework: Earthquake Physics and Geology, and Advanced Volcanology
- Ruhr-University Bochum**, Faculty of Geoscience Bochum, Germany
• **Exchange Research** at Institute of Geology, Mineralogy and May 2017 - August 2018
Geophysics
- University of Los Andes**, Department of Physics Bogotá, Colombia
• **Bachelor of Sciences (Physics)** September 2014
Relevant Coursework: Introduction to Seismology

RESEARCH EXPERIENCE

- University of New Mexico (Albuquerque, NM, USA) February 2022 - Present
Postdoctoral Researcher (Advisor: Dr. Brandon Schmandt)
• Detection, location, and characterization of low magnitude intraplate seismicity
- University of Strasbourg - EOST (Strasbourg, France) November 2020 - November 2021
Postdoctoral Researcher (Advisors: Dr. Sophie Lambotte and Dr. Marc Grunberg)
• Quantification of earthquake location uncertainties in Metropolitan France
- McGill University (Montreal, Canada) 2014 - 2020
Graduate Student with Professors Dr. Rebecca Harrington and Dr. Yajing Liu
• Analyze earthquake processes and interactions in human-induced seismicity environments
- University of Los Andes (Bogotá, Colombia) January 2014 - July 2014
Research Assistant with Professors Alejandro Garcia and Beatriz Sabogal
• Data retrieved from galaxies Sextans A, B and NGC-253 from different astronomical observatories.
- University of Los Andes (Bogotá, Colombia) January 2013 - December 2013
Member of Geophysics group with Professor German Prieto
• Focal mechanisms of intermediate depth-earthquakes in the Bucaramanga's nest.

SKILLS AND TECHNIQUES

- Proficient in programming languages and softwares (Python, Matlab, Fortran, Unix, Latex and GMT).
- Experience with earthquake location, relocation, moment tensor inversion programs and statistical analysis applied to earthquake catalogs.
- Familiar with different types of standard seismological software and code (Obspy, SAC and pyrocko).
- Fluent English and Spanish (mothertongue), and basic French.

FIELD EXPERIENCE

- Mapping fault project in Maine, U.S.A for Crustal Rheology Class at McGill University.
- Deployment and maintenance of seismic stations on the Charlevoix Seismic Zone (Quebec, Canada).
- Installation of a temporary seismic array: LARge-n Seismic Survey in Oklahoma (LASSO).

TEACHING EXPERIENCE

- Lecturer (w. Bei Wang) at Ruhr-University Bochum of Crustal Transitional Zone Class.
- Teaching Assistant at Ruhr-University Bochum: Hydrogeomechanics and Mapping Active Faults.
- Teaching Assistant at McGill University: Geodynamics, General Geology (2 times), Terrestrial Planets (2 times), Elementary Earth Physics and Tectonics.
- Lecturer at University of Los Andes: Physics II Tutorials (Thermodynamics and Electromagnetism) for Biologists and Physicians, and Experimental Physics I.
- Teaching Assistant at University of Los Andes: Physics learning center (3 times), Far-away world (2 times), Thermodynamics (2 times), Physics II, Physics of Star Trek and Stellar Astrophysics.

PUBLICATIONS

- Kemna K. B., **Peña Castro A.F.**, Harrington R. M. and Cochran E.S. "Using a Large-n Seismic Array to Explore the Robustness of Spectral Estimations". *Geophysical Research Letters* (2020) <https://doi.org/10.1029/2020GL089342>
- **Peña Castro A.F.**, Roth M.P., Verdecchia A., Onwuemeka J., Liu Y., Harrington R. M., Zhang Y., and Kao H. "Stress Chatter Via Fluid Flow and Fault Slip in a Hydraulic Fracturing Induced Earthquake Sequence in the Montney Formation, British Columbia". *Geophysical Research Letters* (2020). <https://doi.org/10.1029/2020GL087254>
- Cochran E. S., Wickham-Piotrowski A., Kemna K.B., Harrington R. M., Dougherty S. L., and **Peña Castro A.F.** "Minimal Clustering of Injection-Induced Earthquakes Observed with a Large-N Seismic Array". *Bulletin of the Seismological Society of America* (2020). <https://doi.org/10.1785/0120200101>
- **Peña Castro A.F.**, Dougherty S.L., Harrington R.M. and Cochran E.S. "Delayed Dynamic Triggering of Disposal-induced Earthquakes Observed by a Dense Array in Northern Oklahoma" *Journal of Geophysical Research: Solid Earth* (2019). <https://doi.org/10.1029/2018JB017150>
- Rowe C.D., Ross C., Swanson M.T., Pollock S., Backeberg N. R., Barshi N. A., Bate C.E., Carruthers S., Coulson S., Dascher-Cousineau K., Harrichhausen N., **Peña Castro A.F.**, Nisbet H., Rakoczy P., Scibek J., Smith H., Tarling M.S., Timofeev A., and Young E. "Geometric Complexity of Earthquake Rupture Surfaces Preserved in Pseudotachylyte Networks" *Journal of Geophysical Research: Solid Earth* (2018). <https://doi.org/10.1029/2018JB016192>

CURRENT (AND OTHER) PROJECTS

- Seismic hazard and focal mechanism estimations in Montreal (Quebec, Canada) using recent earthquakes.
- Earthquake catalog enhancement and comparison between different detection methods in Canada.
- Induced seismicity by hydraulic fracturing in the Western Canadian Sedimentary Basin.

PROFESSIONAL SOCIETIES AND SERVICE

- Member of American Geophysical Union (2014-), Canadian Geophysical Union(2014-), and European Geoscience Union (2018-).
- Manuscript peer reviewer for international academic journals: *Seismological Research Letters*, *Geophysical Research Letters*, and *Nature Scientific Reports*.
- Completed courses: "Focus on Peer Review" by Nature masterclasses.

CONFERENCE ABSTRACTS

- Zhu L. X., Liu Y., and **Peña-Castro A. F.**, “Quantifying the Change in Seismic Background Noise during COVID-19 Pandemic in Quebec, Canada” American Geophysical Union Meeting, 2021 (*Submitted*).
- Chien J., **Peña-Castro A. F.**, Onwuemeka J., Liu Y., Pollet J., Rosset P., and Chouinard L., “Earthquake source parameter inversion and seismic hazard model in the western Quebec Seismic Zone” American Geophysical Union Meeting, 2021 (*Submitted*).
- Roth M. P., Kemna K. B., Verdecchia A., Wache R. M., Harrington R. M., Liu Y. and **Peña-Castro A. F.**, “The correlation of induced earthquake productivity, injection parameters, and geological properties: A case study at three wells in the Kiskatinaw area, British Columbia, Canada.” American Geophysical Union Meeting, 2021 (*Submitted*).
- **Peña-Castro, A. F.**, Lambotte S., Grunberg M., Arroucau P., Mayor J., Daniel G., and Letort J. “A comprehensive quantification of error location uncertainties for the French earthquake catalog” European Geosciences Union General Assembly, 2021.
- Kemna K. B., Wickham-Piotrowski A., **Peña-Castro, A. F.**, Cochran E. S., and Harrington R. M. “Exploring the evolution and Source Properties of Injection-Induced Seismicity in Northern Oklahoma using a Large-N Seismic Array” European Geosciences Union General Assembly, 2020, Vienna, Austria.
- Verdecchia A., Wang B., Liu Y., Harrington R. M., Roth M. P., **Peña-Castro A. F.** and Onwuemeka J. “Exploring possible causative mechanisms for earthquake triggered by hydraulic fracturing: examples from the Montney Basin, BC, Canada” European Geosciences Union General Assembly, 2020, Vienna, Austria.
- Cochran E. S., Kemna K. B., Harrington R. M., **Peña-Castro, A. F.** and Wickham-Piotrowski A. “Using a Large-N Seismic array to explore source properties of injection-induced earthquakes in Northern Oklahoma” American Geophysical Union Meeting, 2019, San Francisco, California, USA.
- **Peña-Castro, A. F.**, Kemna K. B., Harrington R.M., Liu Y., and Roth M.P., “A concise comparison between three automated earthquake detection methods for seismic zones in Canada” American Geophysical Union Meeting, 2019, San Francisco, California, USA.
- Verdecchia A., Wang B., Liu Y., Harrington R. M., Roth M. P., **Peña Castro A.F.**, and Onwuemeka J., “Earthquake triggering in the crystalline basement from hydraulic fracturing: two examples from the Montney Basin, BC, Canada” American Geophysical Union Meeting, 2019, San Francisco, California, USA.
- Liu Y., Roth M. P., **Peña Castro A.F.**, Verdecchia A., Onwuemeka J., Harrington R. M. and Honn Kao. “Stress chatter on a fault/fracture network reactivated by hydraulic fracturing” American Geophysical Union Meeting, 2019, San Francisco, California, USA.
- Cochran E. S., Harrington, R. M., Dougherty S. L., **Peña-Castro, A.F.**, Kemna K., Wikham-Piotrowski A., and Ross Z. “Using a large-N seismic array to explore injection-induced earthquakes in northern Oklahoma” Geological Society of America Meeting, Phoenix, Arizona, USA.
- Roth M. P., Harrington R. M., Liu Y., **Peña Castro A.F.**, and Onwuemeka J. “Local Array Monitoring of Hydraulic Fracturing Induced Earthquakes in the Dawson-Septimus Area, Northeast British Columbia, Canada” International Union of Geodesy and Geophysics General Assembly, Montreal, Canada.
- Onwuemeka J., Liu Y., Harrington R. M., M. Roth M., and **Peña-Castro A.F.** “Focal Mechanism Solutions and Stress Drop Estimates of the 2018/11/30 M_L 4.5, Injection-induced Earthquake Sequence near Dawson Creek, British Columbia, Canada” International Union of Geodesy and Geophysics General Assembly, 2019, Montreal, Canada.

- Kemna K. B., **Peña-Castro A.F.**, Harrington R. M., Liu Y., and Roth M. P. "Source parameter scaling of mining induced earthquakes near Bottrop, Germany" International Union of Geodesy and Geophysics General Assembly, 2019, Montreal, Canada.
- **Peña Castro A.F.**, Liu Y., Harrington R.M., Roth M. P., and Onwuemeka J. "Evolution of the seismicity surrounding the 30 November 2018 ML Dawson Creek, British Columbia induced earthquake" International Union of Geodesy and Geophysics General Assembly, 2019, Montreal, Canada.
- **Peña Castro A.F.**, Kemna K.B., Harrington R.M., Liu Y. and Roth M.P. Analysis of the seismicity induced by the last underground coal mine in Germany (2019). Seismology Student Workshop at Lamont-Doherty Earth Observatory.
- **Peña-Castro A. F.**, Kemna, K. B., Harrington, R. M., Roth M. P., and Liu Y. "Source Mechanism of Seismicity Generated by one of the Last Active Coal Mines in Germany before its Closure". American Geophysical Union Meeting 2018, Washington, DC, USA.
- Cochran, E. S., Dougherty, S. L., Harrington, R. M., **Peña-Castro, A. F.**, and Ross, Z., "Trials and triumphs of a large-N seismic array to survey injection-induced earthquakes in northern Oklahoma" (Invited). International Induced Seismicity Workshop 2018, Banff, Alberta, Canada.
- Kemna, K. B., **Peña-Castro, A. F.**, Harrington, R. M., Roth, M. P. and Liu Y "Source mechanism of the seismicity generated by the Prosper-Haniel coal mine in Bottrop". AG Seismologie, 2018, Pirna, Free State of Saxony, Germany.
- **Castro, A.**, Dougherty, S., Harrington, R. and Cochran, E. "Constraining potential triggering stress amplitudes on receiver faults using the Large-n Seismic Survey in Oklahoma". European Geosciences Union General Assembly, 2018, Vienna, Austria.
- **Peña-Castro A. F.**, Dougherty S. L., Harrington R. M. and Cochran E. S. "Using a large-n nodal array to search for remote dynamic triggering in a region of induced seismicity in northern Oklahoma" American Geophysical Union Meeting, 2017, New Orleans, Louisiana, USA.
- Onwuemeka J., Liu Y., Harrington R. M., **Peña-Castro A. F.**, Rodriguez Padilla A. M. and Darbyshire F. A. "Earthquake Source Parameter Estimates for the Charlevoix and Western Quebec Seismic Zones in Eastern Canada". American Geophysical Union Meeting, 2017, New Orleans, Louisiana USA.
- Onwuemeka J., Liu Y., Harrington R., **Peña Castro A. F.**, Martell A. and Darbyshire F. A. "Events Relocation and Stress Inversion for Charlevoix Seismic Zone using Recent Earthquake and Newly Recorded Waveform Data " Canadian Geophysical Union meeting, 2017, Vancouver, Canada.
- **Pena-Castro A. F.**, Onwuemeka J., Liu Y., Harrington R., Martell A. and Darbyshire F. A. "Earthquake Focal Mechanism solutions in the Charlevoix Seismic zone suggest stress heterogeneity in the impact structure" Canadian Geophysical Union meeting, 2017, Vancouver, Canada.
- **Peña Castro A. F.**, Harrington R. M. and Cochran E. S. "Very-low frequency earthquakes on the San Andreas Fault that occur independently of low-frequency earthquakes" American Geophysical Union Chapman Conference on the Slow Slip Phenomena, 2016, Ixtapa, Guerrero, Mexico.
- Liu Y., Deng K, Clerc F., and **Peña Castro A. F.** "Aseismic and seismic slip induced by fluid injection from poroelastic and rate-state friction modeling with application to the Fox Creek, Alberta, 2013-2015 earthquake sequences" European Geosciences Union meeting, 2016, Vienna, Austria.
- **Peña-Castro A. F.**, Harrington R. M., Cochran E. S. "Near-field observations of very-low frequency earthquakes on the San Andreas Fault". American Geophysical Union Meeting 2015, San Francisco, California, USA.
- **Peña-Castro A. F.**, Harrington R. M., Cochran E. S., Zeng X., Thurber C. H. and Shelly D. R. "Detecting Very-Low-Frequency Earthquakes in Parkfield, California: Evidence for Slow-Slip Events", Joint Assembly AGU-GAC-MAC-CGU, 2015, Montreal, Canada.

SCHOLARSHIPS, GRANTS AND AWARDS

- Robert Wares Fellowship, 2018-2019: McGill University, Earth and Planetary Sciences.
- J. B. Lynch Fellowship, 2017-2018: McGill University, Earth and Planetary Sciences.
- Eric Mountjoy Fellowship, 2016-2018: McGill University, Earth and Planetary Sciences.
- Geraldine Elizabeth Davidson Fellowship, 2015-2016: McGill University, Earth and Planetary Sciences.
- Graduate Excellence Award, 2014-2017: McGill University, Earth and Planetary Sciences
- Lorne Trotter Science Accelerator Fellowship, 2015-2016: McGill University.
- Reinhardt C Fellowship, 2014-2019: McGill University, Earth and Planetary Sciences.

OTHER EXPERIENCES

- Captain of ice hockey team of the Earth and Planetary Sciences department (September 2018- April 2019) and member of the team (since September 2014) at the Intramural Hockey League organized by McGill Athletics and Recreation. Captain of the soccer team of the Earth and Planetary Sciences department (Fall 2016) and part of other soccer teams at the Intramural Soccer League organized by McGill Athletics and Recreation.
- Soccer Referee at the Intramural Soccer League organized by McGill University, 2019-2020
- Amateur guitar, ukulele and bass player.

REFEREES

1. **Dr. Sophie Lambotte**, Professor at University of Strasbourg, **Address:** EOST-IPGS UMR 7516 CNRS - Université de Strasbourg, 5 rue Rene Descartes, 67084 Strasbourg Cedex, FRANCE, **Tel:** +33 (0) 3 68 85 00 86 **Email:** sophie.lambotte@unistra.fr
2. **Dr. Yajing Liu**, Professor at McGill University, **Address:** 339 F.D. Adams Building, 3450 University Street, Montreal, Quebec H3A 0E8, Canada, **Tel:** +1-514-398-4085, **Email:** yajing.liu@mcgill.ca
3. **Dr. Rebecca M. Harrington**, Professor at Ruhr-University Bochum, **Address:** Universitätsstr. 150, 44780 Bochum, Germany, **Tel:** +49 234 32 23297, **Email:** rebecca.harrington@rub.de