ESTEBAN J. CHAVES, PHD

(+506) 89597666 ⋄ esteban.j.chaves@una.ac.cr

EDUCATION

University of California Santa Cruz, United States *2013-2018*
Doctor of Philosophy, **Ph.D.** Earth Sciences - Seismology
Universidad Nacional de Costa Rica (2005 - 2009)
B.s. Natural Sciences

RESEARCH INTEREST

- The physics earthquakes and faults.
- Subduction Zones: Mechanics and dynamics.
- The Earth structure using the random seismic wavefield.
- Forensic Seismology.
- The use of Machine learning and AI for identifying, picking and locating earthquakes in Costa Rica.
- Python for data mining, Big data and education.
- Science education and science communication.

ACADEMIC EXPERIENCE

Director at OVSICORI, Universidad Nacional October 2024 - Present
Director, Professor of Earth Sciences (Profesor II+) and Research seismologist *Heredia, Costa Rica*

OVSICORI, Universidad Nacional September 2018 - Present
Professor of Earth Sciences (Profesor II+), Research seismologist *Heredia, Costa Rica*

University of California Santa Cruz September 2013 - August 2018
PhD candidate *Santa Cruz, California*

OVSICORI, Universidad Nacional January 2012 - September 2013
Research assistant *Heredia, Costa Rica*

Universidad Técnica Nacional, UTN January 2011 - December 2011
Assistant professor *Alajuela, Costa Rica*

Costarican Institute of Electricity, ICE 2010-2011
Research assistant in geophysics *San José, Costa Rica*

LANGUAGES

Spanish Mother tongue
English Second language (certified by Universidad Nacional, Costa Rica)

COMPUTATIONAL AND PROGRAMMING STRENGTHS

UNIX OS systems, including Mac OSx and any Linux Platform:

- BASH, FISH, ZSH, CSH, AWK, PERL, VI and VIM.

Data Science and Programming:

- Python (Main programming Language).
- Matlab.
- Seismic Analysis Code (SAC).
- Antelope & Seiscomp 3-5 for seismological data bases.

Documents and production:

- LaTeX
- Office 365

PUBLICATIONS

1.
2. Sonia Hajaji, Esteban J. Chaves; Dynamic Triggering of Earthquakes in Costa Rica. The Seismic Record 2026;; 6 (1): 65–75. doi: https://doi.org/10.1785/0320250050
3. Chaves E.J., Hajaji S., Müller C., Alvarado G.E., Campos N., Avard G., & Quiros D., 2025. Geodynamic characterization and monitoring of the landslide and debris flows in the Aguas Zarcas river (July 2023), San Carlos, Costa Rica. Manuscript submitted for publication.
4. Wetzler, N., & Chaves, E., 2025. Determination of regional attenuation using moderate earthquakes at the Dead Sea fault system. Manuscript submitted for publication.
5. Chaves, E. J., Müller, C., Finnegan, N., Schwartz, S., & Brodsky, E. E., 2025. When does the catastrophic failure of a landslide become predictable? Precursory seismic and geodetic signals before two landslides at Irazú Volcano, Costa Rica. Manuscript submitted for publication to Science.
6. Kristian Svennevig, Stephen P. Hicks, Thomas Forbriger, **Esteban J. Chaves**, et al. (2024). A rockslide-generated tsunami in a Greenland fjord rang Earth for 9 days. *Science*, 385, 1196–1205. 10.1126/science.adm9247
7. Sebastián Gamboa-Chacón, Esteban Meneses, **Esteban J. Chaves**. (2025). Analysis of earthquake detection using deep learning: Evaluating reliability and uncertainty in prediction methods. *Computers & Geosciences*, 197, 105877. 10.1016/j.cageo.2025.105877
8. Steven J. Gibbons, **Esteban J. Chaves**, Mark Fisk. (2022). The 27 February 2022 Lop Nor Earthquake: Detectability, Location, and Discrimination. *The Seismic Record*, 2(2), 137–147. 10.1785/0320220018
9. **Esteban J. Chaves**, Evelyn Nuñez-Alpízar, Nahomy Campos-Salas, Sonia Hajaji-Salgado. (2025). Uso de la sismología como herramienta para el monitoreo de la dinámica oceánica y el cambio climático. In C. Morera Beita & V. Salgado Silva (Eds.), *Gestión de los océanos: algunas lecciones aprendidas en experiencias tropicales* (pp. 141–155). Editorial EUNA. ISBN: Pending.
10. Hajaji, S., and **Chaves, Esteban J**. 2024, Large, distant earthquakes can trigger microseismicity in Costa Rica, Temblor, http://doi.org/10.32858/temblor.343.

11. Minkyung Son, **Esteban J. Chaves** (2024). Investigating Corner frequency Uncertainties: Insights from Six Earthquakes (Mw 3.2 to 3.8) in Ridcrest, California, and the Korean Peninsula. Submitted to the Bulletin of the Seismological Society of America - Special section: Improving measurements of Earthquake Source Parameters.

12. Paola Gonzáles Vargas, **Esteban J. Chaves**. (2024). Sonidos del Interior la Tierra: La expresión artística de los sismogramas y el sonido. Sometido a la Editorial de la Universidad Nacional, EUNA.

13. Minkyung Son, **Esteban J. Chaves** and Chang Soo Cho. (2023). Stress drop estimates of the 2017 Pohang earthquake (MW 5.4) and its largest aftershocks:implications for earthquake rupture and successive triggering. Submitted to Journal of Geophysical Research Solid Earth.

14. **Esteban J. Chaves**, Javier F. Pacheco, Susan Y. Schwartz, Noah Finnegan, Bretwood Higman. 2022. Precursory Seismic Signals before two catastrophic landslides at Irazú Volcano, Costa Rica. (2022). The Latin American and Caribbean Seismological Commission, LACSC, Quito, Ecuador.

15. Afra, M., Hasting, M., Xie, S., **Chaves E.J.**, Müller, C., Protti, M,. Malservisi, R., Calderón, A.A., Dixon, T.H. (2022). Slow Slip Prior to an Earthquake: An Example from Costa Rica, and Forecasting Implications. *Submitted to Journal of Geophysical Research: Solid Earth.*

16. Wetzler, N., Brodsky, E.E., **Chaves, E.J.**, Goebel, T.H., Lay, T. (2022). Regional Characteristics of Observable foreshocks. *Seismological Research letters*, DOI: https://doi.org/10.1785/0220220122.

17. Leonardo van der Laat, Ronald J.L. Baldares, **Esteban J. Chaves**, Esteban Meneses. (2021). OKSP: A novel Deep Learning Automatic Event Detection Pipeline for Seismic Monitoring in Costa Rica. 2021 IEEE 3rd International Conference on BioInspired Processing (BIP)

18. Benjamin A. Brooks, Marino Protti, Todd Ericksenm, Julian Bunn, Floribeth Vega, Elizabeth S. Cochran, Chris Duncan, Jon Avery, Sarah E. Minson, **Esteban J. Chaves**, Juan Carlos Baez, James Foster and Craig L. Glennie. (2021) Robust Earthquake Early Warning at a Fraction of the Cost: ASTUTI Costa Rica. AGU Advances. 2, 10.1029/2021AV000407.

19. **Chaves, J. E.**, Schwartz , S. Y. and Abercrombie, R. E. (2020). Repeating Earthquakes Record Fault Weakening and Healing in Areas of Megathrust Postseismic Slip. **Science Advances**. DOI: https://doi.org/10.1126/sciadv.aaz9317

    Lecocq et al., Global quieting of high-frequency seismic noise due to COVID-19 pandemic lockdown measures. (2020). **Science**. DOI: https://doi.org/10.1126/science.abd2438

20. **E. J. Chaves**, Z. Peng, M. Denolle, W.Frank, T. Taira, H. Zhang. 2020. Waveform Cross-Correlation-Based Methods in Observational Seismology. Seismological Society of America, session proposal, meeting 2021.

21. **Chaves, E. J.**, Protti, M., Norabuena, E., Suarez, G. 2020. Earthquake Early Warning System in the Americas: The on-going efforts and the State of the Art. Seismological Society of America,

session proposal, meeting 2021.

22. Massin, F. et al., 2020. The future strong motion national seismic networks in Central America designed for earthquake early warning. European Geophysical Union. EGU. https://doi.org/10.5194/egusphere-egu2020-19437.

23. Clinton, J. F.; **Esteban J. Chaves**, Costa Rica, Lepolt Linkimer; (2020); Building Earthquake Early Warning across Central America; Abstract SY005-0009; presented at 2020 Fall Meeting, Online Everywhere, 1-17 Dec. https://agu.confex.com/agu/fm20/meetingapp.cgi/Paper/747109.

24. Newman, A. V.; Marino Protti, Susan Y Schwartz, Timothy H Dixon, Tiegan E Hobbs, Nicholas K Voss, Christodoulos Kyriakopoulos, Dongdong Yao, **Esteban J. Chaves**, Yan Jiang, Lujia Feng, Heather DeShon, Jacob I. Walter, Hongfeng Yang, Surui Xie and Victor M González; (2020); Two Decades of Geodetic and Seismological Insight into the Seismogenic Zone: A View from Nicoya, Costa Rica; Abstract T006-03; presented at 2020 Fall Meeting.

25. Brooks, B. A.; Marino Protti, Todd L Ericksen, Floribeth Vega Solano, Julian Bunn, Jonathan Avery, Christopher Duncan, Elizabeth S Cochran, Sarah E Minson, **Esteban J. Chaves**, Maren Böse, Deborah Smith and James H Foster; (2020); ASTUTI-Costa Rica: Fixed Network Smartphone-based Earthquake Early Warning; Abstract S044-03; presented at 2020 Fall Meeting.

26. Voytan, D. P., Lay, T., **Chaves, E. J.** & Ohman, J. T. (2019). Yield Estimates for the Six North Korean Nuclear Tests from Teleseismic P Wave Modeling and Intercorrelation of P and Pn Recordings. Journal of Geophysical Research. https://doi.org/10.1029/2019JB017418.

27. **Chaves, E. J.**, Protti, M., Muller, C. (2019). The Costa Rica-OVSICORI-UNA geodynamic control network: A first world class network in a developing country. IUGG meeting. Montreal, Canada.

28. Protti, M., Cyril Muller and **Esteban J. Chaves**. (2019). Two Quasi-simultaneous Double Couples: an Alternative Model to Explain Moderate and Large Magnitude Earthquakes Under Burica Peninsula in Southern Costa Rica; Abstract G33A-06; presented at 2019 Fall Meeting, AGU, San Francisco, California, 9-13 Dec. https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/511041.

29. **Chaves, E. J.**, Lay, T., & Voytan, D. P. (2018). Yield estimate (230 kt) for a Mueller-Murphy model of the 3 September 2017, North Korean nuclear test (mbNEIC = 6.3) from teleseismic broadband P waves assuming extensive near-source damage. Geophysical Research Letters,45, 10,314 –10,322. Doi: 10.1029/2018GL079343

30. **Chaves, E. J.**, Schwartz, S.Y. and Abercrombie. R.E.(2018).Variability in seismic source spectra and stress drop from repeating earthquake sequences along the Nicoya Peninsula megathrust. SSA-LACSC Meeting. Miami, Florida, US.

31. Mahsa Afra, M., **Esteban J. Chaves**, Cyril Muller, Mitchell Scott Hastings, Surui Xie, Marino Protti, Rocco Malservisi and Timothy H Dixon; (2018). Slow Slip Events in Costa Rica Detected by GPS Observations, 2015-2019; Abstract T13D-0307; presented at 2018 Fall Meeting, AGU,

Washington D.C., 10-14 Dec.https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/525229.

32. **Esteban J. Chaves**, Laure Duboeuf, Susan Y Schwartz, Thorne Lay, Jonas Kintner (2017). Aftershocks of the 2012 7.6 Nicoya, Costa Rica, Earthquake and Mechanics of the Plate Interface. Bulletin of the Seismological Society of America. 107. 3. pp 1227-1239. doi: 10.1785/0120160283

33. **Chaves, E. J.**, Lay, T., & Voytan, D. P. (2017). Source characteristics of the 3 September 2017, North Korean nuclear test (mb = 6.3) inferred from teleseismic forward modeling and regional waveform deconvolution of broadband P and Pn waves. AGU 2017, New Orleans, Louisiana, USA.

34. **Chaves, J. E.**, and S. Y. Schwartz (2016). Monitoring transient changes within overpressured regions of subduction zones using ambient seismic noise, **Science Advances**. 2, no. 1, doi: 10.1126/sciadv.1501289.

35. **Chaves, E. J.**, Lay, T., Schwartz, S.Y. (2016). The 2012 M7.6 Nicoya Peninsula, Costa Rica, earthquake sequence: Source scaling and energy budget. 2016. IASPEI metting, Costa Rica.

36. **Chaves, E. J.**, Schwartz, S.Y. (2015). Imaging High Pore Fluid Pressure in Subduction Zones Using Ambient Seismic Noise. AGU 2015, San Francisco, California, USA.

37. Protti, M., V. González, T. Dixon, S. Schwartz, A. Newman, **E. J. Chaves**, H. Porras, P. LaFemina, Two earthquake cycle geodynamic control networks in Costa Rica: Nicoya and Osa-Burica peninsulas, Asamblea Regional de la Comisión Latinoamericana y del Caribe de Sismología LACSC-IASPEI, Bogotá, Colombia, 23-25 de Julio del 2014.

38. Protti, M., S Schwartz, A Newman, V González, T Dixon, L Feng, **E. J. Chaves**, H Porras, Mapping patchiness of the subduction interface in the near field: the case of the southern terminus of the Middle American Trench, Costa Rica; Asamblea Regional de la Comisión Latinoamericana y del Caribe de Sismología LACSC-IASPEI,Bogotá, Colombia, 23-25 de Julio del 2014.

39. González Salas, V. M., M Protti, **E. J. Chaves**, F Vega, W Jimenez, (2013) Static and Dynamic Rupture-History of the Nicoya (Mw=7.6) Earthquake, Costa Rica: An approach using high frequency rate GPS and seismological recordings in the near field, Abstract S43D-03 presented at 2013 Meeting of the Americas, AGU, Cancun, Mexico, 14-17 May.

40. **E. J. Chaves**, J F Pacheco, M Protti, V Gonzales, F Vega, W Jimenez (2013) Determination of Earthquake Source Parameters Using Local and Regional Data:Seismic Moment and Rupture Directivity of the Mw=7.6 Nicoya Earthquake, Costa Rica, Abstract S43D-05 presented at 2013 Meeting of the Americas, AGU, Cancun, Mexico, 14-17 May.

41. Protti, M., V González, **E. J. Chaves**, (2013) Movimiento de la península de Nicoya asociado al terremoto de Nicoya del 15 de septiembre del 2012, XV Congreso Nacional y 1er Congreso Centroamericano de Ciencia, Tecnología y Sociedad (CIENTEC), Universidad Nacional, Liberia, Guanacaste, 22-24 de agosto del 2013.

Other publications for Science Communication and Dissemination 2013-present
National and International

1. Estaciones de Ovsicori registraron aislamiento social (2020). Periódico Campus, Universidad Nacional. (Link)

2. Cuarentena por coronavirus redujo el "ruido sísmico". (2020). Semanario Universidad, Universidad de Costa Rica.(Link)

3. Aislamiento Social por nuevo coronavirus. La Nación, 2020.(Link)

4. COVID-19: Equipos de OVSICORI revelan impacto de aislamiento social en calles ticas. CRHoy, 2020.(Link)

5. Experto determinó que aislamiento social reduce la deformación de la tierra en Heredia. Telenoticias, 2020.(Link)

6. Chasing the next big earthquake in Costa Rica. (2018). Revista Temblor. (2018). (Link)

7. ¿Es el sismo de Golfito, M=6.2 del 17 de Agosto del 2018, un premonitor de la próxima ruptura a lo largo de la Península de Osa en Costa Rica?. (2018). Revista Temblor.(Link)

8. Magnitude 6.5, Esterillos, Costa Rica Earthquake killed through heart attacks. (2017). Revista Temblor. (Link)

9. El Terremoto de Esterillos, Costa Rica Mw=6.50, Un sismo con consecuencias destructivas. (2017). Revista Temblor. (Link)

10. Study results suggest slower seismic waves due to quakes may signal weak spots in crust. (2016). Phys.org. (Link)

11. Seismic waves harnessed to map weakened crustal areas. (2016). Revista Civil Enginnering.(Link)

12. Ground shakes expose faraway earthquake hot spots. Science News. (2016).(Link)

TEACHING EXPERIENCE

At Universidad Nacional, Costa Rica 2020-present

- Introduction to Seismology (CGO006O). 2023-2024. Level: Undergraduate.

- Physics of the Earth's interior (CGO004O). 2020-2022. Level: Undergraduate. Universidad Nacional, Costa Rica.

- Bio-seismology: The coupling between the biosphere, the hydrosphere, the anthroposphere and the solid Earth (CGO005O). 2020-2022. Level: Undergraduate. Universidad Nacional, Costa Rica.

- **Data Analysis and data visualization using Python programming language for educators**. Sponsored by Vicerrectoría de Investigación, Universidad Nacional, Costa Rica. II semester 2021.

- **Data Analysis and data visualization using Python programming language for graduate students**. Sponsored by Vicerrectoría de Investigación, Universidad Nacional, Costa Rica. I semester 2022.

At University of California, Santa Cruz, USA 2013-2018

- Geology of National Parks. TA assistant with Susan Y. Schwartz

- Seismotectonics. TA assistant with Thorne Lay.

- **Introduction to Python for Earth Sciences** TA assistant with Susan Y. Schwartz.

- Mathematical methods for Earth Sciences. TA assistant with Francis Nimmo.

SEMINARS AND INVITED TALKS

- Seismological Signatures of Landslides from slow to fast slip. **TECTONIC FEAR SEMINAR**. (Link)
- Actividad sísmica en Cinchona-Vara Blanca. Hotel Las Hortencias, Vara Blanca. Marzo de 2023.
- Señales premonitoras antes de la ocurrencia de dos deslizamientos catastroficos en el volcán irazú. Comité Costarricense de Ingeniería Geológica, COCIGA. (Link).
- Evolución Geodinámica del deslizamiento en el flanco Suroeste del Volcán Irazú. Congreso Geológico de América Central. 2022. Hotel Raddisson, San José, Costa Rica.
- Using near repeating earthquakes for monitoring aseismic processes along the Central Costa Rica Subduction Zone. Fall 2021: Geophysics Seminar. **Georgia Institute of Technology.** (Link)
- Dia de la Tierra 2020: El registo sísmico del distanciamiento social en Costa RIca debido a la pandemia por el COVID-19. Charla virtual, LANAMME. Abril, 2020.
- El registro sísmico del distanciamiento social en Costa Rica debido al COVID-19. Charla Virtual, Facebook live del OVSICORI-UNA. Abril, 2020.
- Repeating Earthquakes record frictional weakening and Healing following a Megathrust earthquake. **Baylor University**, Waco Texas, USA. Diciembre, 2019.
- Estimaciones del rendimiento y potencial de armamento nuclear de Corea del Norte a partir del Análisis de ondas P telesísmicas. Académia Nacional de Ciencias. Setiembre, 2019.(Link)
- Debilitamiento y curación de una falla posterior a la ocurrencia de una mega ruptura. Academia Nacional de Ciencias. Febrero, 2019.(Link)

AWARDS

- CONICIT, Costa Rica (2013): Scholarship for pursuing PhD studies.
- Universidad Nacional (2013): Scholarship for pursuing PhD studies.
- UNAVCO, COCONET (2013, 2014, 2015): COCONET Award
- Universidad de California Santa Cruz (2015): Zhen and Ren Wu Memorial Award in Geophysics
- IASPEI-LACSC (2018): Early Career award

- The National Science Foundation (NSF): Antartica Service Medal of the United States of America. 2014-2015; 2015-2016.

CONTINUING PROFESSIONAL DEVELOPMENT

- Escuela de Computación de Alto Rendimiento 2024. Colaboratorio Nacional de Computación avanzada, CNCA. Centro Nacional de Alta Tecnología, CENAT. Enero 2024.

- Introducción a la programación con Python. Marzo 2024. Colaboratorio Nacional de Computación avanzada, CNCA. Centro Nacional de Alta Tecnología, CENAT. Marzo 2024.

- Workshop on Mechanics of the Earthquake Cycle. International Centre for Theoretical Physics. Trieste Italy, October 2023.

- Capacitación Docente en Metodologías de Aprendizaje Activo (mediante herramientas como: Zoom, MS Teams, Kahoot, Canvas, etc.), 2021. LASPAU-Hardvard. Cambridge, Massachusetts.

- Sort course on GPS Data Processing and Analysis with GAMIT/GLOBK/TRACK. UNAVCO, Builder, Colorado, United States. July 2013.

- Teoría Infrarroja, funcionamiento de equipo FLIR SC660 y Manejo de Software FLIR R&D. TERMOGRAM. Heredia, Costa Rica, December 2012.

- Progamación en Java, nivel básico. Universidad Nacional, Escuela de Informática. 2012.

- Advance School on Understanding and Prediction of Earthquakes and Other Extreme events in Complex Systems. International Centre for Theoretical Physics. Trieste Italy, October 2011.

- Join ICTP-TWAS Workshop on Seismic Sources in Central America: What is the largest Earthquake each can produce? International Centre for Theoretical Physics. Heredia, Costa Rica. October 2011.

- Pan American Advance Studies Institute on New Frontiers in Seismological Research. Incorporated Research Intitutions for Seismology, IRIS. Quito, Ecuador, July, 2011.

SEISMOLOGICAL AND EDUCATIONAL COMMISSIONS

- 2026: Member of the Board of Directors of the Seismological Society of America,SSA, United States.
- 2023-present: Comisión UNA por los Océanos, Universidad Nacional, Costa Rica.
- 2022- June 2024: **President of the Latin American and Caribbean Seismological Comission, LACSC**.
- 2021-present: SSA Awards Encouragement Committee. Seismological Society of America.

- 2021-present: Meetings Committee. Seismological Society of America.