

Full Name: Caio Henrique Ciardelli

Professional Address: 2145 Sheridan Road – Evanston IL, 60208

Academic Formation

- Postdoc at Northwestern University (2022 – Present)
- Ph.D. in Geophysics - University of São Paulo (2016 – 2021)
- Bachelor of Science in Geophysics - University of São Paulo (2011 – 2016)

Research Internships

- Northwestern University (2019)
- Colorado School of Mines (2018 – 2019)
- University of Liverpool (2014)

Professional Experience

- Consulting for Colorado School of Mines (2021)

Awards

- Outstanding Doctoral Award for the thesis “Adjoint Tomography of South America based on 3D Simulations of Seismic Waves by Spectral Elements”, defended in 2021 in the Postgraduate Program in Geophysics at IAG-USP

Publications

1. **Ciardelli, C.** (2022). Sensitivity kernels in seismic wave propagation: a simplified explanation for the banana-doughnut paradox. *European Journal of Physics*, vol. 43, n° 4, 045802. <https://doi.org/10.1088/1361-6404/ac6a8e>
2. **Ciardelli, C.**, Assumpção, M., Bozdağ, E., & van der Lee, S. (2022). Adjoint waveform tomography of South America. *Journal of Geophysical Research: Solid Earth*, vol. 127, n° 2, e2021JB022575. <https://doi.org/10.1029/2021JB022575>
3. **Ciardelli, C.**, Bozdağ, E., Peter, D., & van der Lee, S. (2022). SphGLLTools: A toolbox for visualization of large seismic model files based on 3D spectral-element meshes. *Computers & Geosciences*, vol. 159, 105007. <https://doi.org/10.1016/j.cageo.2021.105007>
4. Yuan, Y. O., Bozdağ, E., **Ciardelli, C.**, Gao, F., & Simons, F. J. (2020). The exponentiated phase measurement, and objective-function hybridization for adjoint waveform tomography. *Geophysical Journal International*, vol. 221, n° 2, p. 1145-1164. <https://doi.org/10.1093/gji/ggaa063>
5. **Ciardelli, C.**, & Assumpção, M. (2019). Rupture lengths of intraplate earthquakes in Brazil determined by relative location of aftershocks: evidence for depth dependence of stress drops. *Journal of South American Earth Sciences*, vol. 89, p. 246-258. <https://doi.org/10.1016/j.jsames.2018.11.017>
6. Agurto-Detzel, H., Bianchi, M., Assumpção, M., Schimmel, M., Collaço, B., **Ciardelli, C.**, Albuquerque, D. F., Barros, L. V., & Calhau, J. (2016). The tailings dam failure of 5 November 2015 in SE Brazil and its preceding seismic sequence. *Geophysical Research Letters*, vol. 43, n° 10, p. 4929-4936. <https://doi.org/10.1002/2016GL069257>
7. Agurto-Detzel, H., Assumpção, M., **Ciardelli, C.**, Albuquerque, D. F., Barros, L. V., & França, G. S. (2015). The 2012–2013 Montes Claros earthquake series in the São Francisco Craton, Brazil: new evidence for non-uniform intraplate stresses in mid-plate South America. *Geophysical Journal International*, vol. 200 n° 1, p. 216-226. <https://doi.org/10.1093/gji/ggu333>

Co-Mentoring

- Yoweri Nseko (Ph. D.) - **Crustal Structure of South America Through Ambient Noise Tomography** (Northwestern University, 2024 – Present)
- Victor Agaba (Undergrad) - **An Asymmetry-Aware Error-Estimation Model for Single Seismometer Focal Mechanism Inversion** (Northwestern University, 2023)
- Felipe Proença Corral - **Development of computational routines for processing travel-time data for finite-frequency tomography in Brazil** (University of São Paulo, 2018 – 2021)

Teaching Assistant

- AGG0232 – Seismic I (University of São Paulo. **Years:** 2014, 2015, 2017, 2018, 2020)
- Summer Course – Introduction to Seismology (University of São Paulo. **Years:** 2014, 2015, 2016, 2017)
- Summer Course – Surface Waves and Crustal Structure (University of São Paulo. **Years:** 2015, 2017)
- Winter Course – ObsPy: Python for Seismology (University of São Paulo. **Years:** 2014)

Extension Courses

- Introduction to GNU/Linux (Caio Ciardelli & Israel Dragone, University of São Paulo, 2017)
- Introduction to GNU/Linux (Caio Ciardelli & Israel Dragone, University of São Paulo, 2016)
- Short course on Relative Epicentral Location with Cross-Correlation (Caio Ciardelli, University of Brasília, 2015)

Regular Courses (Classes Lectured as Substitute Professor)

- **EARTH 353-0 Mathematical Inverse Methods in Earth and Environmental Sciences** (Official Lecturer – Suzan van der Lee, 2023). **Topics:** Least squares solution; minimum-norm solution; damped least squares; generalized inverse; data resolution matrix; model resolution matrix; introduction to waveform tomography; resolution tests; tectonic interpretation;
- **EARTH 353-0 Mathematical Inverse Methods in Earth and Environmental Sciences** (Official Lecturer – Suzan van der Lee, Northwestern University 2023). **Topics:** Matrices and linear transformations; identity matrix; orthogonal matrices; symmetric matrices; non-square matrices; spectral decomposition; singular value decomposition;
- **EARTH 323-0 Seismology and Earth Structure** (Official Lecturer – Suzan van der Lee, Northwestern University 2022). **Topics:** Earth's free oscillations; Spheroidal and Toroidal modes; Spherical harmonics; How normal modes convey information about the gross seismic-velocity and density distribution inside the Earth; First normal-mode observation (historical background); Normal modes derivation for a homogeneous liquid Earth; Normal modes for a more realistic Earth (Spherical, Non-rotating, Elastic, Isotropic – SNREI Earth); Normal mode splitting and coupling; Demonstration with the Colab notebook of modes in a string;
- **EARTH 323-0 Seismology and Earth Structure** (Official Lecturer – Suzan van der Lee, Northwestern University 2022). **Topics:** Seismic refraction field experiment;
- **EARTH 323-0 Seismology and Earth Structure** (Official Lecturer – Suzan van der Lee, Northwestern University 2022). **Topics:** Earth's bulk geodynamic and geochemical structure; Structure and composition of the continental crust, oceanic crust, mantle, and core; Mineral phase changes in the Earth's mantle for olivine, pyroxene, and granade (majority, ringwoodite, bridgmanite, post-perovskite, etc); Types of magma; Seismic waves in the Earth's interior; Core-mantle boundary and the D" layer; Discovery of the Moho, Outer core and Inner core (physics and historical background); Shadow zones; Seismic refraction and reflection methods; Crustal thickness;
- **GPGN455/555 Earthquake Seismology** (Official Lecturer – Ebru Bozdağ, Colorado School of Mines 2018). **Topics:** Ray theory; travel-time tomography; amplitude and travel-time sensitivity kernels; Fermat's principle; Huygens principle; diffraction; path integral; Fresnel zones.