Caio Ciardelli

Northwestern University, USA

Curricular Summary
July 9, 2025

Education/Training

2022 – now **Postdoctoral Researcher**, Northwestern University, USA. Supervisor: Suzan van der Lee. Project: Joint inversion for seismic tomography.

2016 – 2021 **PhD in Geophysics**, University of São Paulo, Brazil. Supervisor: Marcelo Assumpção. Thesis: "Adjoint Tomography of South America based on 3D Spectral-Element Wave Simulations."

2011 – 2016 **BSc in Geophysics**, University of São Paulo, Brazil. Supervisor: Marcelo Assumpção. Thesis: "Seismic Wave Modeling using Finite Differences and Spectral Elements."

Professional Experience

2022 – now **Postdoctoral Researcher**, Northwestern University, USA. Joint seismic-geophysical tomography.

2021 – 2021 **Consultant**, Colorado School of Mines, USA. Supervisor: Ebru Bozdağ. Project on waveform inversions and seismic moment tensors.

Selected Publications

2022 Ciardelli, C. Sensitivity kernels in seismic wave propagation: a simplified explanation for the banana-doughnut paradox. *European Journal of Physics*, 43, 045802. doi:10.1088/1361-6404/ac6a8e. **Google Scholar citations: 1**

2022 Ciardelli, C., Assumpção, M., Bozdağ, E., van der Lee, S. Adjoint waveform tomography of South America. *JGR: Solid Earth*, 127, e2021JB022575. doi:10.1029/2021JB022575. **Google Scholar citations: 38**

2022 Ciardelli, C., Bozdağ, E., Peter, D., van der Lee, S. SphGLLTools: A toolbox for visualization of large seismic model files based on 3D spectral-element meshes. *Computers & Geosciences*, 159, 105007. doi:10.1016/j.cageo.2021.105007. **Google Scholar citations: 9**

2020 Yuan, Y.O., Bozdağ, E., Ciardelli, C., Gao, F., Simons, F.J. The exponentiated phase measurement, and objective-function hybridization for adjoint waveform tomography. *Geophysical Journal International*, 221, 1145–1164. doi:10.1093/gji/ggaa063. **Google Scholar citations: 29**

2019 Ciardelli, C., Assumpção, M. 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*, 89, 246–258. doi:10.1016/j.jsames.2018.11.017. **Google Scholar citations: 11**

Papers Under Review and In Preparation

2025 Ciardelli, C., Nseko, Y., Kabanda, A., van der Lee, S. Optimized workflows for efficient and stable Empirical Green's Function computation in Ambient-Noise Tomography. *Submitted to Seismica*.

2025 Ciardelli, C., van der Lee, S. Cross-compatibility of 3D Models of the South American Mantle. *In preparation*.

Scholarships

Research Scholarships (Brazil)

2016 – 2021 PhD Scholarship, University of São Paulo (FAPESP Grant 2016/03120-5). Project: Adjoint waveform tomography of South America. Supervisor: Marcelo Assumpção.

2016 – 2016 PhD Scholarship, University of São Paulo (CAPES). Project: Adjoint waveform tomography of South America. Supervisor: Marcelo Assumpção.

2014 – 2015 Undergraduate Research, University of São Paulo (FAPESP Grant 2013/24001-6). Project: Fault orientation in Montes Claros earthquakes using P and S phases correlation. Supervisor: Marcelo Assumpção.

2013 – 2014 Undergraduate Research, University of São Paulo (CNPq–PIBIC). Project: Fault orientation in Montes Claros earthquakes using P and S phases correlation. Supervisor: Marcelo Assumpção.

2013 – 2013 Undergraduate Research, University of São Paulo (CNPq–PIBIC). Project: Epicenters in Andes from BRASIS network: Precision analysis and velocity model improvement. Supervisor: Marcelo Assumpção.

Research Scholarships (Abroad)

2022 – now Postdoctoral Research, Northwestern University (NU). Project: Joint inversion of waveforms, travel times, dispersion curves, normal modes, and geoid. Supervisor: Suzan van der Lee. Funding: Northwestern University.

2019 – 2019 PhD Visiting Scholar, Northwestern University (FAPESP/BEPE 2018/04917-0). Project: Adjoint waveform tomography of South America. Supervisor: Suzan van der Lee.

2018 – 2019 PhD Visiting Scholar, Colorado School of Mines (FAPESP/BEPE 2018/04918-6). Project: Adjoint waveform tomography of South America. Supervisor: Ebru Bozdağ.

2014 – 2014 Undergraduate Visiting Scholar, University of Liverpool (FAPESP/BEPE 2014/09915-4). Project: Precise epicenter determination for fault geometry studies. Supervisor: Andreas Rietbrock.

Software Development

1. SAAM23: https://github.com/caiociardelli/saam23 (doi:10.1016/j.cageo.2021.105007)
2. PyWinEPAdjoint: https://github.com/caiociardelli/pywinadjoint (doi:10.1029/2021JB022575)
3. GLAD-M25: https://github.com/caiociardelli/gladm25 (doi:10.1016/j.cageo.2021.105007)
4. GLAD-M15: https://github.com/caiociardelli/gladm15 (doi:10.1016/j.cageo.2021.105007)
5. SphGLLTools: https://github.com/caiociardelli/sphglltools (doi:10.1016/j.cageo.2021.105007)
6. MasterLoc: https://seiscode.iag.usp.br/caio/masterloc (doi:10.1016/j.jsames.2018.11.017)
7. Correlate: https://seiscode.iag.usp.br/caio/correlate (doi:10.1016/j.jsames.2018.11.017)

Student Mentoring

1. Yoweri Nseko (PhD, 2023-now), Northwestern University.
2. Victor Agaba (Undergraduate, 2023), Northwestern University.
3. Felipe Proença Corral (Undergraduate, 2018-2021), University of São Paulo.

Awards

1. PhD Thesis Award for Outstanding Performance, awarded for the thesis entitled “Adjoint Tomography of South America based on 3D Spectral-Element Seismic Wave Simulations”, defended in 2021 in the Graduate Program in Geophysics at the Institute of Astronomy, Geophysics, and Atmospheric Sciences, University of São Paulo (IAG-USP).

Peer Reviewer of Scientific Journals

1. Seismica: 2023 – Current
2. Journal of Geophysical Research: Solid Earth: 2021 – Current
3. Geophysical Journal International: 2022 – Current

Teaching Experience

Lead Instructor

2025 – 2025	EARTH 350-0 Physics of the Earth, Northwestern University. Topics: Plate Tectonics, Geodynamics, Gravity, Seismology, etc. Duration: 11 weeks (2 lectures/week). Enrollment: 15 students.

Guest Lecturer

2023 – 2023	EARTH 353-0 Mathematical Inverse Methods, Northwestern University. 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.
2023 – 2023	EARTH 353-0 Mathematical Inverse Methods, Northwestern University. Topics: Matrices and linear transformations, identity matrix, orthogonal matrices, symmetric matrices, non-square matrices, spectral decomposition, singular value decomposition.
2022 – 2022	EARTH 323-0 Seismology and Earth Structure, Northwestern University. Topics: Seismic wave propagation and Earth structure.
2018 – 2018	GPGN455/555 Earthquake Seismology, Colorado School of Mines. Topics: Ray theory, travel-time tomography, amplitude and travel-time sensitivity kernels, Fermat’s principle, Huygens’ principle, diffraction, path integrals, and Fresnel zones.

Extension Courses

2024 – 2024	Minicourse on Relative Event Location, Northwestern University. Offered as part of the Nemmers Workshop. Duration: 3h20min. Instructor: Caio Ciardelli. Assistant: Albert Kabanda.
2017 – 2017	Introduction to GNU/Linux, Institute of Astronomy, Geophysics and Atmospheric Sciences (IAG/USP), Brazil. Duration: 40 hours (two groups of 20 hours each). Voluntary teaching. Instructors: Caio Ciardelli and Israel Dragone. Offered as an IAG Extension Course under the supervision of Prof. Marcelo Belantani de Bianchi.
2016 – 2016	Introduction to GNU/Linux, Institute of Astronomy, Geophysics and Atmospheric Sciences (IAG/USP), Brazil. Duration: 40 hours (two groups of 20 hours each). Voluntary teaching. Instructors: Caio Ciardelli and Israel Dragone. Offered by IAG Júnior.
2015 – 2015	Minicourse on Relative Location with Phase Correlation, Observatório Sismológico (SIS), University of Brasília (UnB), Brazil. Duration: 4 hours. Voluntary teaching. Instructor: Caio Ciardelli.

Links to Online Profiles

ORCID: https://orcid.org/0000-0001-6414-3295
Google Scholar: http://scholar.google.com/citations?user=tYcIv28AAAAJ

Academic Quantitative Indicators

1. Books published: 0
2. Publications in journals with a selective editorial policy: 7
3. Book chapters: 0
4. Supervised Undergraduate theses: 0 (ongoing) | 1 (concluded)
5. Supervised Undergraduate research projects: 0 (ongoing) | 1 (concluded)
6. Supervised Undergraduate summer projects: 0 (ongoing) | 1 (concluded)
7. Supervised Master's dissertations: 0 (ongoing) | 0 (concluded)
8. Supervised Doctoral theses: 0 (ongoing) | 0 (concluded)
9. Co-supervised Doctoral theses: 1 (ongoing) | 0 (concluded)
10. Postdoctoral supervisions: 0 (ongoing) | 0 (concluded)
11. Number of citations received according to Google Scholar: 229
12. Patents applied for, granted patents, and licensed patents: 0
13. Products developed and launched on the market: 0
14. Optimized processes implemented in companies or social organizations: 0
15. Created or supported companies: 0
16. Relevant technical and scientific consultancy: 1