# ROMANIAN RESEARCH GALA

## Award Nomination Request

## Dr. Laura Petrescu

**1. Candidate**

Family name: Petrescu

Given name: Laura

PhD award date: September 2017

Position: Researcher (degree II) and Associate Professor

Affiliation: National Institute for Earth Physics and University of Bucharest

Phone no.:

**2. Romanian Research Gala Edition:** 2024

**3. Award cathegory**: individual award for the "Grigore Cobalcescu" prize for Earth Sciences, Environment and Climate Change (c)

**4. Team leader:** *not applicable*

**5. Team members:** *not applicable*

**6. Description of scientific contributions in the last 5 years**

My research focusses on the structure, dynamics and evolution of the solid Earth, using a wide range of seismic imaging techniques or time-series analysis of natural field oscillations that heavily rely on mathematical algorithms, computer power and more recently artificial intelligence. My activities are always a mixture of programming, reviewing the latest ideas and results from literature, while gaining knowledge on the geological processes that shape the Earth and its future.

In the past 5 years I have had the opportunity to be part of many research projects, wrote a few successful research and grant proposals, and collaborated with many similar-minded academics. A list of my most notable research articles and projects that I have had the pleasure to participate in are provided in sections 8 and 9 of this application.

My most recent and challenging activity of my career was the EENSANE project, a fundamental research project hosted by the National Institute for Earth Physics (NIEP) during 2021-2024. In this project, I served as the principal investigator and led a team of five researchers at NIEP (both doctoral students and senior researchers) to develop and implement new techniques of seismic imaging, using the least invasive and inexpensive resource: noise. Vibrations of the surface of the Earth recorded at pairs of seismic stations were analysed and processed to construct 3D images of the Earth's lithosphere and mantle, at both continental and urban scale. Our new applications served to obtain the highest resolution images of the European continent, capturing structures dating back to the Precambrian (more than 500 million years ago) in Ukraine to the Alpine-aged mountain roots of the Carpathians, or the Black Sea basin. Our results provided

fundamental clues on the nature, formation and Evolution of the Earth crust through geological time, by suggesting a lateral tectonic regime for the formation of the Precambrian cratons - vestiges of the Earth's paleocontinents. This idea can potentially have ripple repercussions on models of climate change or mass extinction research and was published (Petrescu et al., 2024) together with our newest tomography model in Gondwana Research in 2024 - one of the highest ranked peer-reviewed geosicence journals and Geophysical Journal International - a Q1 journal in the Field of Geophysics (Borleanu et al., 2024). Another important discovery was published in Physics of the Earth and Planetary Interiors in 2022 and focusedd on the Evolution of the Black Sea Basin - a unique sedimentary basin with debated and contrasting evolution hypotheses. While some authorssuggested it is a remnant of the Paleotethys ocean, others claim it was formed more recently by rifting apart the Southern margin of the Eurasian continent. Our new ambient noise tomography showed that rifting did not evolve into seafloor spreading and gthat the Black Sea is likely underlain by hyper thinned continental remnants. This result affects our view of how the Tethyan ocean closed, with fundamental implications for ocean circulation patterns, which are closely related to atmospheric models of climate change, but also the formation of sedimentary basins and, more generally mechanisms of continental break-up (Petrescu et al. 2022, PEPI).

To prove the usefulness of our new methods, we also focused on the city of Bucharest as a testing ground for the power of ambient noise seismic Tomography. Using a legacy temporary network (URS) from 2004, we were able to construct a 3D Image of the subsurface structures beneath Bucharest down to a depth of 20 km, using only one year of noise. Our results were presented at the European Geosicence Union in 2023 (Comand and Petrescu, 2023, EGU) and demonstrated to be useful non-invasive imaging techniques adapted for both fundamental research at a large-scale, while also serving the practical needs of small-scale urban settings. Generally, subsurface imaging is done with either dynamite or vibroseis trucks, both of which are impossible to use in an unrban setting. Our new methods thus created new opportunities to peer beneath the subsurface in restricted areas without invasive methods or active sources.

While tomography was an important tool we improved and applied in the EENSANE project, we also used the seemingly "useless" ambient seismic noise for another application: the reconstruction of historical earthquakes. By cross-corelating noise recorded for years at simultaneously operating seismic sttaions, we were able to turn one station into a virtual source, as if it were an impulse earthquake. This principle has been used for already a decade to construct virtual seismograms. However, with only the knowledge of the earthquake mechanism, we were able to add the signature of this event to our virtual seismograms, reconstructing the full seismic wavefield for destructive earthquakes such as the 1940, 1977 and 1986 earthquakes in Romania, as if they were recorded today by the NIEP network of broadband seismometers. Our results were published in one of the highest ranked seismology journals (and Q1 overall): Seismological Research Letters (Petrescu et al., 2023, SRL).

In 2023, I started two concurrent projects: the nationally-funded DTE-Climate PNRR project and the international MULTICARE project, for which I serve as work package leader. In DTE-Climate ("Centre for Competence Center for Climate Change Digital Twin for Earth forecasts and societal redressment") we are implementing the European strategy for adaptation to climate change in Romania by consolidating a national network of excellence between several national universities and fresearch insitutes. My activities focus on establishing a coupled atmosphere-hydrosphere-lithosphere data monitoring service to provide for the first time an integrated view of how climate-change-stimulated phenomena can impact ground structure and motion properties in seismically vulnerable locations. The MULTICARE (Multi-hazard low-carbon resilient technologies and multi-scale digital services for a future-proof, sustainable and user-centred built

environment) project aims to increase the resiliance of the built enviornment in multiple natural hazards. Here, I interface with a team of civil engineers from TU Delft to provide intelligent building facades adapted to increase heat and seismic protection in Bucharest, as well as developing algorithms for earthquake early-warning.

During 2022-2023 I was also involved in a research project (AFROS), studying the space-time variation of intermediate-depth seismicity focussing on the anomalous and highly controversial Vrancea region. Our results indicated that earthquakes have a time-stationary Poissonian distribution, suggesting that the seismic cycle is a mainly random process without memory of past events. This result has powerful implications for *seismic modeling and hazard*, and for our understanding of earthquake generation processes because, at least in Vrancea, dehydration of the subducting slab may be the only responsible mechanism for rock embrittlement and energy release, resultiung in a seemingly chaotic seismogenic system.

In 2022, I was involved in a project focused on using *artificial intelligence* for detecting earthquakes (Phenomenal). My contribution consisted in scanning geomagnetic field records with convolutional neural networks and look for possible anomalous signals that may have been *precursors to earthquakes.* Our work was published in *Machine Learning and Knowledge Extractio*n and set an important precedent in using artificial intelligence in connecting different types of Geophysical observables to earthquake precursory phenomena, with the ultimate aim to mitigate the impact of natural disasters, resilience and preparedness in economically and seismically vulnerable countries.

Between 2021-2022, I also focussed on deep earth imaging, together with researchers from University of Bucharest and GFZ Potsdam. Using body waves radiated by global telesesimic earthquakes propagating through the Earth's solid inner core, we were able for the first time to construct a 2D attenuation *tomography of the inner-outer core interface* at 5150 km below the surface of the Earth. Attenuation depends on both fluidd content, temperature, and grain size, so it can offer crucial clues on the geodynamic processes of inner core growth and rotation, the heat exchange between the two (solid and fluid) cores of the Earth, and ultimately provide constraints on the geodynamo process that fuels the Earth's magnetosphere - a result of fluid dynamics in the outercore and solid inner core freezing. Our article was published in Geophysical Journal International, a Q1 journal in the field of Geophysics.

Lastly, between 2018-2020 I was invited to be part of the research team of the Newton Project, coordinated by University of Padova and INGV (The Italian National Institute of Geophysics and Volcanology). Working with a team of geodynamic modelers and seismologists, I analysed seismic waves that propagated through the Earth's outer core to look at the mantle convection currents beneath Central Europe - a natural laboratory for investigating continental collision, subduction, oceanic consumption, and mantle flow and deformation in response to these large geological phenomena that shaped the European continent in the past hundred million years.

## 7. Curriculum vitae

Laura Petrescu, PhD, Seismology Researcher
National Institute for Earth Physics, Romania

### About me

I image the Earth's interior using earthquakes and ambient noise recorded at broadband seismic stations. I use passive seismological methods such as receiver functions, surface wave dispersion, seismic tomography, and core-refracted shear wave splitting to place constraints on the crustal and upper mantle structure at regional scales. I am interested in improving our understanding of fundamental geophysical phenomena such as the evolution of continents, collisional orogens, subduction systems, as well as mantle geodynamics and plate tectonics. Throughout my career, I had the opportunity to be part of international research teams at top universities, to manage the deployment of broadband seismic networks in less accessible areas such as eastern Canada and the Carribbean, to coordinate master-level projects and research assistants, organise international and national conferences and meetings, and to acquire valuable experience in multicultural research environments. Lastly, I am a member of several scientific organisations (American Geophysical Union- 2011, British Geophysical Association- 2014, The Royal Astronomical Society-2016).

### Research profiles and indices

Google Scholar profile: https://scholar.google.co.uk/citations?user=hVhiX3wAAAAJ&hl=en
ResearchGate: https://www.researchgate.net/profile/Laura-Petrescu-2
Brainmap: U-1700-037J-7751
Orcid: 0000-0001-5462-4546
Hindex = 10 (Google Scholar, ResearchGate), 9 (Web of Science)
No. of citations: 275 (ResearchGate), 257 (Google Scholar), 204 (Web of Science)
Cumulated AIS = 5.06 *(see Table 1, section 8)*

### Education

2013 – 2017 Imperial College London, Ph.D. Geophysics (Seismology), London, UK
2011 – 2012 University of California Berkeley, International exchange student, Berkeley, USA
2009 – 2013 University of Edinburgh, B.Sc. Geophysics, 1st class with Honours, Edinburgh, UK
2005 – 2009 Colegiul National Mihai Viteazul, Bucuresti, Romanian Baccalaureate 9.75

### Professional experience

*Researcher, National Institute for Earth Physics (RO) 2021-present:*

Between 2021-2024, I led a fundamental research project (EENSANE - Eastern European Ambient Seismic Noise, https://eensane.infp.ro) focused on developing and applying cutting-edge seismci imaging techniques using only ambient noise from ground vibrations. The techniques enabled the extraction of valuable information from the underground by turning noise into signal, which served as input for *3D seismic tomography*. The new images brought fundamental implications for Early Earth tectonics, the *evolution and formation of continents*, the structure and composition of subducted and accreeted terrains and key insights into the generation mechanisms of earthquakes and volcanism, which pose some of the greatest hazards in the world. Leading a team of 5 people comprising both doctoral students and senior researchers, we were able to produce high resolution images of the Eastern European lithsophere - a region previously unexplored with 3D imaging techniques. Additionally, using ambient noise, we were able to recreate the full seismic wavefield

from destructive historical earthquakes as if they were recorded decades later by modern broadband seismometers. Our results were published in top international peer-reviewed journals.

In 2022, I was involved in a project focused on using *artificial intelligence* for detecting earthquakes (Phenomenal). My contribution consisted in scanning geomagnetic field records with convolutional neural networks and look for possible anomalous signals that may have been *precursors to earthquakes.* Our work was published in *Machine Learning and Knowledge Extraction* and set an important precedent in using artificial intelligence in connecting different types of Geophysical observables to earthquake precursory phenomena, with the ultimate aim to mitigate the impact of natural disasters, resilience and preparedness in economically and seismically vulnerable countries.

Between 2022-2023 I was also involved in the AFROS (Analysis and FOrecast of Romanian Seismicity) project - a fundamental research project led by Kyoto University professor Bogdan Enescu, with whom I investigated the space-time clustering and migration of earthquakes in Vrancea, the anomalous and controverially deep seismic nest of the south-east Carpathians. Our results indicated that earthquakes have a time-stationary Poissonian distribution, suggesting that the seismic cycle is a mainly random process without memory of past events. This result has powerful implications for *seismic modeling and hazard*, and for our understanding of earthquake generation processes because, at least in Vrancea, dehydration of the subducting slab may be the only responsible mechanism for rock embrittlement and energy release, resultiung in a seemingly chaotic seismogenic system.

In 2022, I also focussed on deep earth imaging, together with researchers from University of Bucharest and GFZ Potsdam. Using body waves radiated by global telesesimic earthquakes propagating through the Earth's solid inner core, we were able for the first time to construct a 2D attenuation *tomography of the inner-outer core interface* at 5150 km below the surface of the Earth. Attenuation depends on both fluidd content, temperature, and grain size, so it can offer crucial clues on the geodynamic processes of inner core growth and rotation, the heat exchange between the two (solid and fluid) cores of the Earth, and ultimately provide constraints on the geodynamo process that fuels the Earth's magnetosphere - a result of fluid dynamics in the outercore and solid inner core freezing. Our article was published in Geophysical Journal International, a Q1 journal in the field of Geophysics.

*ERC postdoctoral researcher, Newton Project (University of Padova/Istituto Nazionale di Geofisica e Vulcanologia, Bologna) (IT) 2018 - 2019:*

During the Newton project I worked closely with Manuele Faccenda at Universiyt of Padova and Silvia Pondrelli at INGV to investigate the geodynamics of the Alpine region and bridge the gap between numberical simulations and observational seismology. My role within the international research group was to analyse mantle seismic anisotropy with core-refracted shear waves recorded at seismic stations located in the Alps and the surrounding regions.

*Postdoctoral researcher, National Institute for Earth Physics (RO) 2017 - 2018:*

My main activities at NIEP consisted in developing new seismic velocity models for the Romanian crust and upper mantle, as well as developing local seismic bulletins by participating in the 24/7 earthquake monitoring activities. During my employment at NIEP, I participated in international research projects such as the South Carpathian Project with the University of Leeds, and the VOILA project with Imperial College London, which involved the deployment of a broadband seismic network in the Lesser Antilles Islands in 2017. I also supervised a research assistant and organised the "Science Cafe", a weekly meeting to discuss frontier geophysical research. My articles were

awarded by NIEP with the "Best article by a young researcher" and by UEFISCDI for "Highimpact articles published in the red zone".

*Technical Assistant, Imperial College London (UK) 2017*:

As part of the project NERC (Natural Environment Research Council)-funded VOILA project (Volatiles in the Lesser Antilles), I deployed a network of broadband seismic stations in the Carribean with the West Indies Seismic Research Center (http://www.voila.ac.uk)

*Visiting researcher, Centre de Recherche GEOTOP Montréal (CA) 2015:*

At GEOTOP I cworked closely with seismologists from the Canadian National Data Center and Universite du Quebec a Montreal to analyse telesesimic earthquake wave propagation through the lithsophere of the ancient Canadian Shield and construct frequency-dependent images of the crust and mantle beneath the region.

*Visiting researcher, University of Hong Kong (HK) 2014:*

In Hong Kong I worked closely with one of the leading Tibet-focussed geologists, Dr. Jess King to review the most recent tomography images of the Himalaya-Tibet orogenic System in conjunction with geological and geochemical studies, placing constraints on the nature of the subducting Indian plate.

*Ph.D., Imperial College London (UK) 2013-2017:*

At ICL I was a Janet Watson scholarship-funded student and the title of my thesis was: "Precambrian lithospheric formation and evolution: evidence from broadband seismology in eastern Canada". Part of my PhD was to manage and service a network of broadband seismic stations in Nova Scotia, Canada. I also had the opportunity to be a visiting researcher at Centre de Recherche GEOTOP in Montreal, Canada in 2015, working on a new seismic tomography model of Eastern Canada, as well as winning a mobility grant to attend a summer doctoral school at the University of Hong Kong, where I looked at lithospheric structure variations along the Asia-India collision zone. I also led two master projects in 2014 and 2015 under the supervision of my PhD director and worked as a teaching assistant for multiple courses in the Earth Science and Engineering Dept: Global Seismology, Global Geophysics, Marine Geology and Geophysics, Seismic reflection data processing, Impact Cratering, Mathematical Methods, Advanced Geophysical Modelling. I also assisted with the organisation of the 2016 British Geophysical Association Meeting and the EAGE Geophysics Bootcamp in Emmlichein, Germany (2014).

*Undergraduate research assistant, University of Edinburgh (UK) 2012-2013:*

During my last year as a Bachelor of Science student, I worked on developing and testing new algorithms of ambient seismic noise interferometry, and probing their suitability on small-scale geophone arrays in various locations around Edinburgh

*Undergraduate research assistant, Berkeley Seismology Laboratory (USA) 2011-2012:*

During my international exchange year at UC Berkeley, I worked as a research assistant, investigating moment tensor solutions for earthquakes that occurred in the Mendocino Triple Junction, and improved 1D models beneath the western coast of US

## Conference presentations

Borleanu, F., **Petrescu, L.**, de Siena, L., Placinta, A., Grecu, B., Radulian, M. Preliminary results of attenuation tomography in the Carpathian-Pannonian region revealed by the analysis of ambient seismic noise, 37th General Assembly of the European Seismological Commission, Corfu Greece (Presentation)
**Petrescu, L.**, Borleanu, F., Placinta, A., Kastle, E., Liashchuk, A., Marmureanu, A. Imaging the Eastern European lithosphere with ambient seismic noise, American Geophysical Union Fall Meeting, New Orleans, USA (Presentation)
**Petrescu, L.**, Borleanu, F., Placinta, A. The EENSANE project: an open-source database of ambient noise cross correlations and virtual earthquake simulations in Europe. American Geophysical Union Fall Meeting, New Orleans, USA (Poster)
Borleanu, F., **Petrescu, L.**, Seghedi, I., Thomas, C., de Siena, L. Spatial variations of scattering and absorption features in the crust of the Eastern Carpathians and surroundings, revealed by attenuation tomography. The 2021 International Lithosphere Program Sedimentary Basins Task Force, Rueil Malmaison, France (Poster)
Placinta, A., **Petrescu, L.**, Borleanu, F., Radulian, M. Historical earthquake simulation using ambient seismic noise in Vrancea (Romania): preliminary results. EGU General Assembly Conference Abstracts, Vienna, Austria (Presentation)
**Petrescu, L.**, Kalmar, D. Slab graveyards versus mantle plumes: clues from the mantle transition zone beneath the Carpathian region imaged with ambient noise. The 17th Symposium of SEDI, Study of the Earth's Deep Interior, Zurich, Switzerland (poster)
Popa, M., Radulian, M., **Petrescu, L.** Shallow seismic structure around the Vrancea Seismic Zone from joint inversion of H/V ratios and Rayleigh wave dispersion. The Third European Conference on Earthquake Engineering and Seismology, Bucharest, Romania (Poster)
Borleanu, F., **Petrescu, L.**, Placinta, A. Crustal Structure of the East European Craton and Surrounding Orogens From Ambient Noise Tomography: Key Aspects of Craton Erosion and Mantle Plume Impact. Seismological Society of America Seismic Tomography Conference, Toronto, Canada (Poster)
**Petrescu, L.**, Placinta, A., Borleanu, F. Reconstructing ground motion from past earthquakes in the Vrancea Seismic Zone using ambient seismic noise. The 28th International Union of Geodesy and Geophysics General Assembly, Berlin, Germany (poster)
Kalmar, D., **Petrescu, L.**, Hetenyi, G., Stipcevic, J, Balazs, A. The lithospheric structure of the Alpine-Pannonian-Carpathians-Dinarides system: Inferences from P and S receiver function analysis. IThe 28th International Union of Geodesy and Geophysics General Assembly, Berlin, Germany, (presentation)
Coman, A., **Petrescu, L.** Near-surface ambient noise seismic tomography of Bucharest, Romania. EGU Conference, Vienna, Austria (poster).
Kalmar, D., **Petrescu, L.**, Hetenyi, G., Stipcevic, J, Balazs, A. S-to-P receiver function analysis in the Alpine-Carpathian-Pannonian system. European Geoscience Union General Assembly, Vienna, Austria. (Presentation)
**Petrescu, L.**, Borleanu, F., Placinta, A., Kastle, E., Stephenson, R., Liashchuk, A. A New 3d Shear Wave Tomography Model Of The Eastern European Lithosphere From Ambient Seismic Noise. Geosicence Symposium, Bucharest, Romania (presentation)
**Petrescu, L.**, Borleanu, F., Placinta, A., Kastle, E., Stephenson, R., Radulian, M., Popa, M., Comand A. New methods and models of ambient seismic noise imaging in Eastern Europe. Geoscience Symposium. Bucharest, Romania (poster)
**Petrescu, L.**, Andrei, M., Borleanu, F. Slab tear and rotation imaged with core-refracted shear wave anisotropy. European Geoscience Union General Assembly, Vienna, Austria (presentation)
Borleanu, F., **Petrescu, L.**, de Siena, L., Thomas, C., Seghedi, I. Shear wave velocity and attenuation tomography acquired from seismic ambient noise data analysis in a complex collisional area at the edge of the East European Craton. European Geoscience Union General Assembly, Viena, Austria (poster)
Andrei, M., **Petrescu, L.**, Radulian, M. Investigating Rayleigh Wave Dispersions across the Carpathian Orogen. Atmosphere and Earth Science Meeting Abstracts, Faculty of Physics, Bucharest, Romania (presentation)
Andrei, M., **Petrescu, L.**, Borleanu, F. Multi-Layer Inversions Of SKS Waves In The South-East Carpathians Vrancea Subduction Zone Flow From Core-Refracted Shear Wave Anisotropy. International Geoscience Symposium, Bucharest, Romania (presentation)
Placinta, A., **Petrescu L.**, Borleanu, F., Radulian, M. The EENSANE (Eastern European Ambient Seismic Noise) project: a new database of ambient noise cross-correlations and crustal tomography models. The 8th World Multidisciplinary Earth Sciences Symposium, Prague, Czech Republic (poster)
Placinta, A., **Petrescu L.**, Borleanu, F., Cioflan, C. Reconstructing the 1977 Vrancea earthquake using ambient noise recordings. The 8th World Multidisciplinary Earth Sciences Symposium, Prague, Czech Republic (presentation)

Goes, S., Eeken, T., Altoe, I., **Petrescu, L.**,Foster, A., Pedersen, H., Arndt, N., Darbyshire, F., Bouilhol, P. Thermochemical structure of cratons from Rayleigh wave phase velocities., EGU General Assembly Conference Abstracts, Vienna, Austria., 2020
**Petrescu, L.**, Pondrelli, S. , Salimbeni, S., Faccenda, M. Mantle deformation beneath the central Alps from SKS anisotropy, EGU General Assembly Conference Abstracts, Vienna, Austria., 2019
Pondrelli, S., **Petrescu, L.**, Salimbeni, S., Seismic anisotropy analysis in the Alps: contribution of permanent stations to AlpArray temporary network, EGU General Assembly Conference Abstracts, Vienna, Austria, 2019
Borleanu, F., **Petrescu, L.**, Enescu, B., Radulian, M., Popa, M.. Use of Double Difference seismic tomography to reveal seismicity and crustal structure patterns across the Eastern Carpathians, Romania, 2019, In EGU General Assembly Conference Abstracts, Vienna, Austria.
**Petrescu, L**, Stuart, G., Houseman, G., Bastow, I.D. (2018) Probing mantle deformation beneath Central and Eastern Europe with core-refracted shear waves. in AGU Fall Meeting Abstracts, Washington DC, USA.
Bala A., Toma-Danila D., Mircea R., Placinta A., **Petrescu, L.** (2018) Focal mechanism and resulting horizontal stress in the Earth crust of Romania. In ESC General Assembly, Valetta, Malta.
Darbyshire, F.A., Bastow, I. D., **Petrescu, L.**, Gilligan, A., Thompson, D. (2018, Jun). Comparing Ancient and Modern Orogenic Processes: Evidence from Present-Day Crustal Structure. In *AOGS Annual Meeting Abstracts*, Honolulu, USA.
Borleanu, F., **Petrescu, L.**, Radulian, M., Popa, M., Enescu, B. (2018, April). The missing craton edge: crustal structure of the East European Craton edge beneath the Caprathian Orogen revealed by double difference tomography. In *EGU General Assembly Conference Abstracts*, Vienna, Austria.
Mihai, A., **Petrescu, L.**, Radulian, M. (2018, April). Lithospheric structure across the Trans-European Suture Zone in Eastern Carpathians from surface wave dispersion. In *EGU General Assembly Conference Abstracts*, Vienna, Austria.
**Petrescu, L.**, Tataru, D., Stuart, G., Grecu, B., (2017, April). Crustal structure of the Carpathian orogen from receiver function analysis: how craton subduction and active delamination affect the crust. In *EGU General Assembly Conference Abstracts*, Vienna, Austria.
**Petrescu, L.**, Bastow, I.D., Darbyshire, F.A., Totten, E.J., (2015, December). The story of a craton: illuminating cratonic lithosphere with Rayleigh wave phase velocities in eastern Canada. In *AGU Fall Meeting Abstracts,* San Francisco, USA.
**Petrescu, L.**, Bastow, I.D., Darbyshire, F.A., Levin, V., Menke, W. (2015, June). Precambrian crustal evolution: Seismic constraints from Eastern Canada. In *EarthScope Meeting Conference Abstracts,* Stowe, USA.
**Petrescu, L.**, Bastow, I.D., Darbyshire, F.A., Levin, V., Menke, W., (2015, May). Craton structure through time: seismic imaging of the Canadian Shield from heart to margins *In AGU Joint Assembly Conference Abstracts*, Montréal, Canada.
Darbyshire, F. A., Levin, V. L., Menke, W. H., Bastow, I. D., **Petrescu, L.**, Boyce, A., Neitz, T. (2014, December). The Assembly and Evolution of Eastern Laurentia: Evidence from the QM-III Experiment. In *AGU Fall Meeting Abstracts*, San Francisco, USA.
**Petrescu, L.**, Bastow, I. D., Darbyshire, F. A., Levin, V. L., Menke, W. H. (2014, December). Evolution of the Precambrian Crust and Sub-Continental Lithosphere in Eastern Canada: Constraints from Probabilistic Inversion and Hk Stacking of Receiver Functions. In *AGU Fall Meeting Abstracts*, San Francisco, USA.
**Petrescu, L.** (2014, September), H-k stacking and Bayesian probabilistic inversion of receiver functions. In *BGA Research in Progress Meeting Abstracts*, Liverpool, UK.
**Petrescu, L.**, Bastow, I., Darbyshire, F., Levin, V., Menke, W., & Illsey-Kemp, F. (2014, May). Constraining crustal structure through time: receiver function analysis in eastern Canada. In *EGU General Assembly Conference Abstracts*, Vienna, Austria.

## Reviewer activities

Provided invited peer-review feedback for articles submitted to high-profile scientific journals:

- Geophysical Journal International (6 reviews between 2021 and 2023 verified on Web of Science)
- Seismological Research Letters (2 reviews in 2023 verified on Web of Science)
- Gondwana Research (1 review in 2023 verified on ORCID)
- Geophysical Research Letters (1 review in 2020 verified on ORCID)
- Pure and Applied Geophysics (1 review in 2021 verified on Web of Science, 1 review in 2020 verified on ORCID)
- Acta Geophysica (1 review in 2022 verified on Web of Science, 2 reviews in 2022 and 2024 verified on ORCID)

- Applied Sciences (3 reviews in 2022 verified on Web of Science)
- Acta Geodetica et Geophysica (1 review in 2022 verified on Web of Science and ORCID)
- Tectonophysics (1 review in 2022)
- Remote Sensing (1 review in 2022)

**Grants and prizes**

- UEFISCDI PREHEECH2023 prize for research team MULTICARE (PN-IV-P8-8.1-PRE-HE-ECH2023-0194)
- UEFISCDI PRECISI prizes for published articles in red and green zones (2020-2023): PN-III-P1-1.1-PRECISI-2020-44003, PN-III-P1-1.1-PRECISI-2020-44042, PN-III-P1-1.1-PRECISI-2020-52311, PN-III-P1-1.1-PRECISI-2021-62772, PN-III-P1-1.1-PRECISI-2021-61942, PN-IV-P2-2.3-PRECISI-2023-85311, PN-IV-P2-2.3-PRECISI-2023-87249
- European Research Council postdoctoral grant 2018-2020
- NIEP prize "Cea mai buna lucrare a unui tanar cercetator" 2018
- Mobility grant European Geoscience Union, 2017
- Janet Watson Scholarship, Imperial College London, 2013-2017
- Audience Favourite Presentation Prize, Three minute thesis competition, Imperial College London, Mar 2016
- Conference travel and accommodation grant, EarthScope National Meeting, Vermont, 2015
- PhD summer school scholarship, University of Hong Kong, 2014
- Audience Favourite Presentation Prize, British Geophysical Association, Liverpool, Sep 2014
- Best Geophysics Student Medal, University of Edinburgh 2013
- Geomagnetism Edinburgh 1981 Prize for best Geoscience Student, University of Edinburgh, 2010

**Teaching experience**

*Associate professor-* Earth dynamics and Seismology, Master in Enviornmental Physics, Department of Physics, University of Bucharest, 2024

*Short-course lecturer:* Early-career workshop, 3rd European Conference on Earthquake Engineering and Seismology, Bucharest, Sep 2022

*Master projects supervisor*

- Precambrian Crustal Evolution: Receiver Function Evidence from Southeast Canada, 2014-2015, Hayley Meek, Imperial College London
- Cratonic Lithosphere in Southeast Canada: Insights from Rayleigh Wave Phase Velocity and Azimuthal Anisotropy, 2015-2016, Eoghan Totten, Imperial College London

*University teaching assistant*

- Bachelor and master's courses: Global Seismology, Global Geophysics, Marine Geology and Geophysics, Seismic reflection, Impact Cratering, Mathematical Methods, Advanced Geophysical Modelling. Imperial College London, 2013-2016.
- EAGE demonstrator: Seismic reflection and refraction data acquisition, EAGE Geophysics Bootcamp, Emmlichein, Germany, 2014.

**Organisational experience**

- Chair and convener of Surface Wave research group meetings of the AdriaArray consortium (https://orfeus.readthedocs.io/en/latest/adria_array_crg.html)
- Conference organising committee member for the 3rd European Conference on Earthquake Engineering and Seismology 2022, Bucharest, Romania
- Conference assistant: British Geophysical Association – New Advances in Geophysics Meeting, Feb 2016, London, UK.

**Outreach activities**

- Radio show interview for Radio Romania Cultural, "Precursori seismici", RO, May 2019 (https://www.radioromaniacultural.ro/sectiuni-articole/stiinta/intre-6-si-10-mai-stiinta-in-cuvinte-potrivite-este-la-institutul-national-de-cercetare-dezvoltare-pentru-fizica-pamantului-incdfp-de-la-magurele-id18045.html)
- Earthquake early warning, *Research Salon, Romanian Parliament, Bucharest, RO,* Oct 2017
- An interactive exhibition on earthquakes and building stability, *Bucharest Museums Night, Museum of Geology, Bucharest, RO,* May 2017
- Plate tectonics and seismology workshop, *Science Museum Lates*, London, UK, Jun 2016
- Women in numerical modelling, *Watson Forum YouTube Interviews (*https://www.youtube.com/watch?v=sRcqCtPwRuw*), UK,* Feb 2016

**Membership in scientific organisations**

Society of Exploration Geophysicists (2010), American Geophysical Union (since 2011), British Geophysical Association (2014), The Geological Society (2016), The Royal Astronomical Society (since 2016), European Geoscience Union (since 2013).

**Other competencies:**

*Computer skills:* Linux environment, MATLAB, SAC (Seismic Analysis Code), GMT (Generic Mapping Tools), Adobe Illustrator, Microsoft Office, Fortran, Python.
*Foreign languages:* Romanian (native), English (fluent), French (advanced)
*Driving licence type:* B

**8. List of publications**


- **Petrescu, L.**, Borleanu, F., Kästle, E., Stephenson, R., Plăcintă, A. and Liashchuk, O.I., 2024. Seismic structure of the Eastern European crust and upper mantle from probabilistic ambient noise tomography. *Gondwana Research*, *125*, pp.390-405. (accepted Aug 2023, online Sep 2023)
- Borleanu, F., **Petrescu, L.**, Placinta, A.O., Magrini, F., Grecu, B., Radulian, M. and De Siena, L., 2024. Seismic attenuation tomography of Eastern Europe from ambient seismic noise analysis. *Geophysical Journal International*, *236*(1), pp.547-564. (accepted and online Oct 2023)
- Kalmár, D., **Petrescu, L.**, Stipčević, J., Balázs, A., János Kovács, I., 2023. Lithospheric Structure of the Circum-Pannonian Region Imaged by S-To-P Receiver Functions. *Geochemistry, Geophysics, Geosystems*, *24*(9), p.e2023GC010937.
- **Petrescu, L.**, Mihai, A. and Borleanu, F., 2023. Slab tear and rotation imaged with core-refracted shear wave anisotropy. *Journal of Geodynamics*, *157*, p.101985.
- **Petrescu, L.,** Popa, M. and Radulian, M., 2023. Shallow seismic structure around the Vrancea Seismic Zone from joint inversion of ambient noise H/V ratios and surface wave dispersion. *Tectonophysics*, *859*, p.229897.
- **Petrescu, L.**, Plăcintă, A.O., Borleanu, F., Radulian, M. and Cioflan, C., 2023. Past earthquake simulations using ambient seismic noise in Vrancea, Romania. *Seismological Research Letters*, *94*(5), pp.2373-2383.
- Borleanu, F., **Petrescu, L.**, Seghedi, I., Thomas, C. and De Siena, L., 2023. The seismic attenuation signature of collisional orogens and sedimentary basins within the Carpathian Orogen. *Global and Planetary Change*, *223*, p.104093.
- **Petrescu, L.** and Moldovan, I.A., 2022. Prospective Neural Network Model for Seismic Precursory Signal Detection in Geomagnetic Field Records. *Machine Learning and Knowledge Extraction*, *4*(4), pp.912-923.

- Ivan, M., **Petrescu, L.** and Wang, R., 2022. An attenuating, isotropic and heterogeneous uppermost inner core: evidence from global PKiKP-PKIKP amplitude ratio tomography. *Geophysical Journal International*, *231*(1), pp.159-171.
- **Petrescu, L.,** Borleanu, F. and Placinta, A.O., 2022. Seismic structure of a Tethyan back-arc: transdimensional ambient noise tomography of the Black Sea lithosphere. *Physics of the Earth and Planetary Interiors*, *325*, p.106854.
- Borleanu, F., **Petrescu, L.,** Enescu, B., Popa, M. and Radulian, M., 2021. The missing craton edge: Crustal structure of the East European Craton beneath the Carpathian Orogen revealed by double-difference tomography. *Global and Planetary Change*, *197*, p.103390.
- **Petrescu, L.**, Borleanu, F., Radulian, M., Ismail-Zadeh, A. and Mațenco, L., 2021. Tectonic regimes and stress patterns in the Vrancea Seismic Zone: Insights into intermediate-depth earthquake nests in locked collisional settings. *Tectonophysics*, *799*, p.228688.
- **Petrescu, L.**, Pondrelli, S., Salimbeni, S. and Faccenda, M., 2020. Mantle flow below the central and greater Alpine region: Insights from SKS anisotropy analysis at AlpArray and permanent stations. *Solid Earth*, *2020*, pp.1-26.
- Eeken, T., Goes, S., **Petrescu, L.** and Altoe, I., 2020. Lateral variations in thermochemical structure of the Eastern Canadian Shield. *Journal of Geophysical Research: Solid Earth*, *125*(7), p.e2019JB018734.
- **Petrescu, L.**, Stuart, G., Houseman, G. and Bastow, I., 2020. Upper mantle deformation signatures of craton–orogen interaction in the Carpathian–Pannonian region from SKS anisotropy analysis. *Geophysical Journal International*, *220*(3), pp.2105-2118.
- **Petrescu, L.**, Stuart, G., Tataru, D. and Grecu, B., 2019. Crustal structure of the Carpathian Orogen in Romania from receiver functions and ambient noise tomography: how craton collision, subduction and detachment affect the crust. *Geophysical Journal International*, *218*(1), pp.163-178.
- Radulian, M., Bălă, A., Ardeleanu, L., Toma-Dănilă, D., **Petrescu, L.** and Popescu, E., 2019. Revised catalogue of earthquake mechanisms for the events occurred in Romania until the end of twentieth century: REFMC. *Acta Geodaetica et Geophysica*, *54*, pp.3-18.
- Darbyshire, F.A., Bastow, I.D., **Petrescu, L.**, Gilligan, A. and Thompson, D.A., 2017. A tale of two orogens: Crustal processes in the Proterozoic Trans-Hudson and Grenville Orogens, eastern Canada. *Tectonics*, *36*(8), pp.1633-1659.
- **Petrescu, L.**, Darbyshire, F., Bastow, I., Totten, E. and Gilligan, A., 2017. Seismic anisotropy of Precambrian lithosphere: Insights from Rayleigh wave tomography of the eastern Superior Craton. *Journal of Geophysical Research: Solid Earth*, *122*(5), pp.3754-3775.
- Gilligan, A., Bastow, I.D., Boyce, A., **Petrescu, L.**, Liddel, M., Darbyshire, F.A., Hawthorne, D.A., Lane, V., Daly, D., Simpson, D. and Heffler, D., 2016. Peering beneath the Canadian crust. *Astronomy & Geophysics*.
- Gilligan, A., Bastow, I.D., Watson, E., Darbyshire, F.A., Levin, V., Menke, W., Lane, V., Hawthorn, D., Boyce, A., Liddell, M.V. and **Petrescu, L.,** 2016. Lithospheric deformation in the Canadian Appalachians: evidence from shear wave splitting. *Geophysical Journal International*, *206*(2), pp.1273-1280.
- **Petrescu, L.**, Bastow, I.D., Darbyshire, F.A., Gilligan, A., Bodin, T., Menke, W. and Levin, V., 2016. Three billion years of crustal evolution in eastern Canada: Constraints from receiver functions. *Journal of Geophysical Research: Solid Earth*, *121*(2), pp.788-811.

*Table 1. Articles between 2019-2023, number of authors, individual AIS*, and cumulated AIS.*

| ARTICLE | AIS | #AUT. | SCORE |
|---|---|---|---|
| • **Petrescu, L.**, Borleanu, F., Kästle, E., Stephenson, R., Plăcintă, A. and Liashchuk, O.I., 2024. Seismic structure of the Eastern European crust and upper mantle from probabilistic ambient noise tomography. *Gondwana Research, 125*, pp.390-405. Accepted on Aug 2023, online on Sep 2023) | 1.983 | 6 | 0.3305 |
| • Borleanu, F., **Petrescu, L.**, Placinta, A.O., Magrini, F., Grecu, B., Radulian, M. and De Siena, L., 2024. Seismic attenuation tomography of Eastern Europe from ambient seismic noise analysis. *Geophysical Journal International, 236*(1), pp.547-564. Accepted and online on Oct 2023) | 1.076 | 7 | 0.1537142 |
| • Kalmár, D., **Petrescu, L.**, Stipčević, J., Balázs, A., János Kovács, I., 2023. Lithospheric Structure of the Circum-Pannonian Region Imaged by S-To-P Receiver Functions. *Geochemistry, Geophysics, Geosystems, 24*(9), p.e2023GC010937. | 1.703 | 5 | 0.3406 |
| • **Petrescu, L.**, Mihai, A. and Borleanu, F., 2023. Slab tear and rotation imaged with core-refracted shear wave anisotropy. *Journal of Geodynamics, 157*, p.101985. | 0.783 | 3 | 0.261 |
| • **Petrescu, L.**, Popa, M. and Radulian, M., 2023. Shallow seismic structure around the Vrancea Seismic Zone from joint inversion of ambient noise H/V ratios and surface wave dispersion. *Tectonophysics, 859*, p.229897. | 1.184 | 3 | 0.3946666 |
| • **Petrescu, L.**, Plăcintă, A.O., Borleanu, F., Radulian, M. and Cioflan, C., 2023. Past earthquake simulations using ambient seismic noise in Vrancea, Romania. *Seismological Research Letters, 94*(5), pp.2373-2383. | 1.315 | 5 | 0.263 |
| • Borleanu, F., **Petrescu, L.**, Seghedi, I., Thomas, C. and De Siena, L., 2023. The seismic attenuation signature of collisional orogens and sedimentary basins within the Carpathian Orogen. *Global and Planetary Change, 223*, p.104093. | 1.430 | 5 | 0.286 |
| • Ivan, M., **Petrescu, L.** and Wang, R., 2022. An attenuating, isotropic and heterogeneous uppermost inner core: evidence from global PKiKP-PKIKP amplitude ratio tomography. *Geophysical Journal International, 231*(1), pp.159-171. | 1.076 | 2 | 0.538 |
| • **Petrescu, L.**, Borleanu, F. and Placinta, A.O., 2022. Seismic structure of a Tethyan back-arc: transdimensional ambient noise tomography of the Black Sea lithosphere. *Physics of the Earth and Planetary Interiors, 325*, p.106854. | 0.951 | 3 | 0.317 |
| • **Petrescu, L.** and Moldovan, I.A., 2022. Prospective Neural Network Model for Seismic Precursory Signal Detection in Geomagnetic Field Records. *Machine Learning and Knowledge Extraction, 4*(4), pp.912-923. | 0.786 | 2 | 0.393 |
| • Borleanu, F., **Petrescu, L.**, Enescu, B., Popa, M. and Radulian, M., 2021. The missing craton edge: Crustal structure of the East European Craton beneath the Carpathian Orogen revealed by double-difference tomography. *Global and Planetary Change, 197*, p.103390. | 1.430 | 5 | 0.286 |
| • **Petrescu, L.**, Borleanu, F., Radulian, M., Ismail-Zadeh, A. and Mațenco, L., 2021. Tectonic regimes and stress patterns in the Vrancea Seismic Zone: Insights into intermediate-depth earthquake nests in locked collisional settings. *Tectonophysics, 799*, p.228688. | 1.184 | 5 | 0.2368 |
| • **Petrescu, L.**, Pondrelli, S., Salimbeni, S. and Faccenda, M., 2020. Mantle flow below the central and greater Alpine region: Insights from SKS anisotropy analysis at AlpArray and permanent stations. *Solid Earth, 2020*, pp.1-26. | 1.167 | 4 | 0.29175 |
| • Eeken, T., Goes, S., **Petrescu, L.** and Altoe, I., 2020. Lateral variations in thermochemical structure of the Eastern Canadian Shield. *Journal of Geophysical Research: Solid Earth, 125*(7), p.e2019JB018734. | 1.513 | 4 | 0.37825 |
| • **Petrescu, L.**, Stuart, G., Houseman, G. and Bastow, I., 2020. Upper mantle deformation signatures of craton–orogen interaction in the Carpathian–Pannonian region from SKS anisotropy analysis. *Geophysical Journal International, 220*(3), pp.2105-2118. | 1.076 | 4 | 0.269 |
| • **Petrescu, L.**, Stuart, G., Tataru, D. and Grecu, B., 2019. Crustal structure of the Carpathian Orogen in Romania from receiver functions and ambient noise tomography: how craton collision, subduction and detachment affect the crust. *Geophysical Journal International, 218*(1), pp.163-178. | 1.076 | 4 | 0.269 |
| • Radulian, M., Bălă, A., Ardeleanu, L., Toma-Dănilă, D., **Petrescu, L.** and Popescu, E., 2019. Revised catalogue of earthquake mechanisms for the events occurred in Romania until the end of twentieth century: REFMC. *Acta Geodaetica et Geophysica, 54*, pp.3-18. | 0.287 | 6 | 0.0478333 |
| **TOTAL** | | | **5.0561142** |

** AIS score was taken from the scientometry database compiled by UEFISCDI from the Journal Citation Reports-JCR available at https://uefiscdi.gov.ro/scientometrie-baze-de-date and Web of Science*

## 9. List of research projects

*Table 2. List of research projects and their details; N - national, I - international.*

| | Project abbrev. | Member category & dates | N/I | Project title | Funding Agency | Total project funding | Project dates | Award number | Project website |
|---|---|---|---|---|---|---|---|---|---|
| **1** | **EENSANE** | **Principal Investigator 2021-2024** | **N** | **Eastern European Ambient Seismic Noise** | **UEFISCDI, Romania** | **1 197 532.00 RON** | **2021-2024** | **PN-III-P4-ID-PCE-2020-2972** | **https://eensane.infp.ro** |
| 2 | DTE-CLIMATE | Work package leader 2023-2026 | N | Competence Center for Climate Change Digital Twin for Earth forecasts and societal redressment: DTEClimate | Ministerul Investiţiilor şi Proiectelor Europene | 3.800.000 EUR | 2023-2026 | PNRR-III-C9-2022 - I5 | https://climate.edw.ro/ |
| 3 | MULTICARE | Work package leader 2023-2027 | I | Multi-hazard low-carbon resilient technologies and multi-scale digital services for a future-proof, sustainable & user-centred built environment | European Climate, Infrastructure and Environment Executive Agency (CINEA) | 7.497.153 EUR | 2023-2027 | HORIZON-CL5-2022 - D4-02-101123467 | https://asmresearch.pl/en/international-projects/eu-framework-programme/multicare/ |
| 4 | PHAZER | Work package leader 2021-2022 | N | Fenomenul seismic de la scară globală la scară locală într-o abordare multidisciplinară | Ministerul Cercetării, Inovării şi Digitalizării (MCID), Romania | 42.696.878 RON | 2019-2022 | PN 19080102 | https://program-nucleu.infp.ro/public/index.php?opt=despre&an=2019 |
| 5 | MULTIRISC | Work package leader 2023-2026 | N | Cercetări multidisciplinare ale fenomenului seismic în vederea creşterii rezilienţei la cutremure | Ministerul Cercetării, Inovării şi Digitalizării (MCID), Romania | 55.000.000 RON | 2023-2026 | PN23360201 | https://program-nucleu.infp.ro/public/index.php?opt=despre&an=2023 |
| 6 | AFROS | Researcher 2022-2023 | N | Analysis and Forecasting of Romanian Seismicity | UEFISCDI, Romania | 1.198.032 RON | 2021-2023 | PN-III-P4-ID-PCE-2020-1361 | http://afros.infp.ro/ |
| 7 | PHENOMENAL | Researcher 2022 | N | Virtual Platform for the collEctioN and interactive analysis Of MultidisciplinAry GeophysicAL data | UEFISCDI, Romania | RON 600.( | 2020-2022 | PN-III-CERC-CO-PED-2-2019 | http://phenomenal.infp.ro/index.php |
| 8 | NEWTON | Postdoctoral researcher 2018-2020 | I | NEw Window inTO Earth's iNterior) | European Research Council (ERC) | 1.236.030 EUR | 2018-2023 | 758199 | https://newtonproject.geoscienze.unipd.it/ |

| | Project abbrev. | Member category & dates | N /I | Project title | Funding Agency | Total project funding | Proje ct dates | Award number | Project website |
|---|---|---|---|---|---|---|---|---|---|
| 9 | VOILA | Technical Assistant 2017 | I | Volatile cycling in the Lesser Antilles arc) | U.K. Natural Environmen t Research Council (NERC) | 322.346 GBP | 2015-2021 | NE/ K010824/ 1 | https:// voilanerc.w ebspace.dur ham.ac.uk/ |
| 10 | QMIII | Doctoral student 2013-2017 | I | Deep Structure of Three Continental Sutures in Eastern North America | US National Science Foundation (NSF) | 455.260 USD | 2012-2018 | 1147742 | https:// www.nsf.g ov/ awardsearc h/ showAward ? AWD_ID= 1147742& HistoricalA wards=fals e |