BIOGRAPHICAL SKETCH

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NAME: Ettore Biondi

eRA COMMONS USER NAME (credential, e.g., agency login): ETTOREBIONDI

POSITION TITLE: Assistant Professor of Geophysics

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
University of Genoa (Italy, Genoa)	B.S.	07/2010	Earth Science and Geology
University of Pisa (Italy, Pisa)	M.Sc.	12/2012	Geophysics
Scuola Normale Superiore of Pisa (Italy, Pisa)	Diploma	11/2013	Chemistry
Stanford University (Stanford, CA)	Ph.D.	01/2021	Geophysics
California Institute of Technology (Pasadena, CA)		01/2023	Seismology/Geophysics

A. Personal Statement

I am an Earth and computational scientist who worked in different applications of imaging. During my studies and professional experience, I developed novel algorithms within the fields of medical, radar, and seismic imaging. This year, I will be joining the Stanford Geophysics Department as an assistant professor of Geophysics. In this role, I will be developing novel processing and field deployment procedures for distributed acoustic sensing (DAS) instrumentations.
My research interests span multiple areas, from computational, experimental, and theoretical image processing and optimization. One of my main focuses is how accurate imaging procedures can lead us to a better understanding of the fundamental processes occurring within our planet and human bodies. Throughout my career, I developed multiple imaging techniques using various types of datasets at different scales, from large-scale systems such as volcanoes using natural earthquakes to millimeter-level images using ultra-sounds data. Since 2024, I have been actively consulting for Vortex Imaging to achieve high-resolution imaging capabilities using ultrasound data. My background in seismic imaging translates well into millimeter scales as multiple challenges encountered in imaging using seismic data are similar to the ones faced by ultrasound waves.

B. Positions, Scientific Appointments, and Honors

Positions and Employment

2025 to present	Assistant Professor of Geophysics, Stanford University, Stanford, CA
2018 to present	Research Consultant (for Vortex Imaging since 2024), Pasadena, CA
2023 to 2025	Research Scientist, California Institute of Technology, Seismo Laboratory, Pasadena, CA
2021 to 2023	Postdoc, California Institute of Technology, Seismo Laboratory, Pasadena, CA
2014 to 2021	Graduate Researcher, Stanford University, Department of Geophysics, Stanford, CA
2019	Summer Internship, Computational Researcher, Schlumberger, Menlo Park, CA
2018	Summer Internship, Geophysicist, Chevron, San Ramon, CA
2017	Summer Internship, Geophysicist, Chevron, Houston, TX
2016	Summer Internship, Geophysicist, Shell International, Houston, TX
2013 to 2014	Geophysics Researcher, University of Milan, Department of Earth Science, Milan, Italy

Other Experience and Professional Memberships

2025- Organizer of the Optica Incubator entitled “Next-Gen Fiber Sensing: How to Exploit Telecom Infrastructure?”

2023- Associate Editor for the peer-reviewed journal Geophysics published by the SEG

2024- Member of the NASA Development and Advancement of Lunar Instrumentation (DALI23) Review Panel.

2021- Member of the NASA Development and Advancement of Lunar Instrumentation (DALI20) Review Panel.

2021- Coordinator of the DAS Research Coordination Network GitHub channel.

2021- Technical committee member of the First International Meeting for Applied Geoscience & Energy

2020 Co-organizer along with Andreas Fitchner (ETH), Carene Larmat (Los Alamos National Lab), and Monica Maceira (Oak Ridge National Lab) of the AGU 2020 session “Frontiers in Theoretical and Computational Seismology”

2020 Technical Committee member of the 89th SEG Annual Meeting 2020

2023- Member, IEEE Photonics

2018- Member, Seismological Society of America (SSA)

2015- Member, American Geophysical Union (AGU)

2015-2024 Member, Society for Industrial and Applied Mathematics (SIAM)

2014- Member, Society of Exploration Geophysicists (SEG)

2012- Member, European Association of Geoscientists and Engineers (EAGE)

Honors

2021 Winner of the EAGE and SPE's "Gustavo Sclocchi" Theses Awards 2021 with my PhD’s degree thesis entitled “Target-oriented elastic full waveform inversion”

2019 SEG19 Best Student Paper Award: Best Student Paper Presented at the 2019 SEG Annual Meeting for the paper entitled "Waveform inversion by model reduction using spline interpolation"

2019 Awarded with the 2019 Centennial Teaching Assistant Award within the School of Earth, Energy & Environmental Sciences of Stanford University for the work performed for the class "Inverse Theory" (GEOPHYS 281).

2013 Winner of the EAGE and SPE's "Gustavo Sclocchi" Theses Awards 2013 with my master’s degree thesis entitled “Fourth-order NMO non-stretch through iterative partial correction and deconvolution for time and offset varying waveforms”

C. Contributions to Science

1. Currently, my main scientific efforts are dedicated to using fiber-sensing data for imaging and monitoring purposes to enable the usage of the full potential of this novel kind of dataset. I have authored and co-authored multiple peer-reviewed papers where we proposed different algorithms to advance our understanding of earthquake physics and subsurface velocity structure definition. Related to high-resolution imaging, I hold a US patent on the usage of telecommunication fiber for subsurface tomography using passive and active seismic sources.
    - Zhu, W., **Biondi, E.**, Li, J., Yin, J., Ross, Z.E. and Zhan, Z., 2023. Seismic arrival-time picking on distributed acoustic sensing data using semi-supervised learning. Nature Communications, 14(1), p.8192.
    - Li, J., Kim, T., Lapusta, N., **Biondi, E.** and Zhan, Z., 2023. The break of earthquake asperities imaged by distributed acoustic sensing. Nature, 620(7975), pp.800-806
    - Li, J., Zhu, W., **Biondi, E.** and Zhan, Z., 2023. Earthquake focal mechanisms with distributed acoustic sensing. Nature Communications, 14(1), p.4181
    - **Biondi, E.**, Zhu, W., Li, J., Williams, E.F. and Zhan, Z., 2023. An upper-crust lid over the Long Valley magma chamber. Science Advances, 9(42), p.eadi9878

- **E Biondi**, Z Zhan, J Li, W Zhu - US Patent App. 18/752,231, 2024

2. In addition to my main PhD project, I also developed, along with Guillaume Barnier, a novel full-waveform inversion methodology. In this velocity estimation scheme, we quantitively retrieve the wave speed of the subsurface using seismic data from controlled-source experiments. The method is based on the usage of an extended-imaging operator that allows us to correctly predict any seismic data, even for very inaccurate starting velocity guesses. Any waveform method is an iterative process from a starting guess, using an optimization method, the velocity model is improved so that the observed seismic data can be correctly predicted by the final obtained velocity model. Our proposed method shows the ability to retrieve the correct subsurface velocity model starting from a very inaccurate initial guess. In the various papers, we laid the theoretical foundation of the method and successfully applied the method to multiple geological scenarios in which conventional methodologies cannot retrieve the correct velocity model.
   - G. Barnier, and **E. Biondi**, 2020, *Full waveform inversion by model extension using a model-space multi-scale approach*: 89th Annual International Meeting, SEG, Expanded Abstracts
   - **E. Biondi** and, G. Barnier, 2020, *Elastic-parameter estimation by combining full-waveform inversion by model extension and target-oriented elastic inversion*: 89th Annual International Meeting, SEG, Expanded Abstracts
   - G. Barnier, **E. Biondi**, and R. G. Clapp, 2019, *Waveform inversion by model reduction using spline interpolation*: 88th Annual International Meeting, SEG, Expanded Abstracts
   - G. Barnier, **E. Biondi**, and B. Biondi, 2018, *Full waveform inversion by model extension*: 87th Annual International Meeting, SEG, Expanded Abstracts
   - G. Barnier, **E. Biondi**, and B. Biondi, 2018, *A Modified Approach For Tomographic Full Waveform Inversion Using Variable Projection*: 80th EAGE Conference & Exhibition 2018, Extended Abstract. **DOI:** 10.3997/2214-4609.201800688

3. As part of my Ph.D. studies, I proposed a novel estimation technique based on the concept of redatuming. By redatuming, we mean the ability of synthesize seismic data as if seismic sources and recording devices were placed in proximity of target areas. This process allows the estimation procedure to be localized and thus makes its computational cost a fraction of the one associated with inverting the original recorded dataset. We demonstrated the efficacy of the novel target-oriented elastic FWI process to synthetic data generated on a well-known subsurface model called Marmousi. We also applied this new methodology to field data acquired in the Gulf of Mexico from Shell. In this application, we correctly estimate the elastic property of a potential gas prospect located in the proximity of a salt body, one of the most challenging exploration areas.
   - **E. Biondi**, M. A. Meadows and, B. Biondi, *True-amplitude migration through extended linearized waveform inversion*: Geophysics (accepted)
   - **E. Biondi**, and G. Barnier, 2020, *Elastic-parameter estimation by combining full-waveform inversion by model extension and target-oriented elastic inversion*: 89th Annual International Meeting, SEG, Expanded Abstracts
   - **Biondi, E.**, M. A. Meadows, and B. Biondi, 2019, *Amplitude preserving migration through extended acoustic least-squares RTM*: 88th Annual International Meeting, SEG, Expanded Abstracts
   - **E. Biondi**, B. Biondi and, G. Barnier, 2018, *Target-oriented elastic full-waveform inversion through extended-migration redatuming*: 87th Annual International Meeting, SEG, Expanded Abstracts
   - **E. Biondi**, G. Barnier, and B. Biondi, 2017, *Preconditioned elastic full-waveform inversion with approximated Hessian*: 86th Annual International Meeting, SEG, Expanded Abstracts. **DOI:** 10.1190/segam2017-17686019.1

4. During my graduate studies in Pisa, I developed and successfully applied a novel seismic imaging technique to process reflection seismic data to form an accurate subsurface image. My new technique is based on an iterative process in which the seismic data are shifted according to the computed reflection travel time. One of the most novel steps in this process is given by the reflection signal estimation based on a singular-value-decomposition (SVD) approach to separate crossing reflected events at longer source-receiver offsets.
   We demonstrated the efficacy and accuracy of the proposed method on synthetic data presenting significant amplitude variations as a function of offset and showed the ability of this workflow to correctly preserve these variations in the final corrected seismic gathers. We also apply the technique

to field data acquired on a partly submerged landslide foothill and show a clear improvement in the seismic image quality, which helped us understand the slope stability and the position of the bedrock base.

- **E. Biondi,** E. Stucchi, and A. Mazzotti, 2013, Non-Stretch Fourth Order NMO through Iterative Partial Corrections and Deconvolution: 75th EAGE Conference & Exhibition 2013, Extended Abstract. DOI: 10.3997/2214-4609.20130020