Mattia Guerri

Curriculum Vitæ - 02/2018

Dublin Institute for Advanced Studies
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Research interests

- Inverse Problem
- Computational Fluid Dynamics
- Mantle Convection
- Computational Seismology
- Thermodynamic Modeling
- Crust and Mantle composition

Education

2012–2016 **PhD in Geophysics**, University of Copenhagen, Denmark.
Thesis: Thermo-chemical structure of the Earth's mantle and continental crust: Insights from a multidisciplinary approach involving seismic, gravity and mineral physics constraints. Link to degree certificate.

2014 **Visiting Graduate Student**, Geophysical Fluid Dynamics Group, ETH Zurich, Switzerland.
Numerical modelling of the interactions between mantle convection and surface (dynamic) topography.

2013 **CIDER Summer Program**, Earth and Planetary Science Department, University of California, Berkeley, USA.
Multi-disciplinary investigation (seismology, geodynamics, petrology, mineral physics) of the lithosphere formation and dynamics.

2009–2011 **M.Sc. in Geophysics, 110/110 cum laude**, Universitá degli Studi di Perugia, Italy.
Thesis: Seismic anisotropy parameters and their relations with the active stress field and structural features. Link to degree certificate.

2005–2008 **B.Sc. in Geology, 110/110 cum laude**, Universitá degli Studi di Perugia, Italy.
Thesis: Fractal analysis of chaotic mixing dynamics in melts. Link to degree certificate.

Professional appointments

2017–present **Postdoctoral Researcher**, Dublin Institute for Advanced Studies, School of Cosmic Physics, Ireland.
Forward modeling of lithosphere physical properties and related geophysical observables. Joint inversion (Bayesian framework) of multiple data (seismic, gravity, heat flow) for the crust and upper mantle thermo-chemical structure. Full-waveform modelling at the continental scale in crust and mantle models.

2012–2013 **Teaching Assistant**, University of Copenhagen, Denmark.
Teaching Assistant for the class of Applied Geophysics. Main topics: seismic exploration methods (reflection and refraction), seismic profiles interpretation in terms of tectonic regime and structural elements, gravity data forward modelling and inversion, heat flow measurements.

Programming languages

- **modern FORTRAN (90/95)** 5+ years of experience.
- **MATLAB** 5+ years of experience.
- **Python** 2+ years of experience.
- **C++** 1+ years of experience.

Software and libraries

- **StagYY** [Tackley, 2008]: finite difference / finite volume Fortran code to model mantle convection on various 2D and 3D geometries.
- **PerpleX** [Connolly, 2009]: Fortran code to perform thermodynamic modelling adopting a variety of thermodynamic formalisms and mineral properties databases.
- **Seismic Analysis Code (SAC)**: libraries written in C to perform signal processing.
- **Paraview (SAC)**: open-source platform for data analysis and visualization.
- **SPECFEM (2D and 3D cartesian)**: modelling of seismic wave propagation adopting the spectral-element method.
- **Python libraries**: **Pandas** (data analysis), **Numpy** (scientific computing), **TensorFlow** (machine learning).
- **PETSc**: routines for the scalable solution of partial differential equations, supporting parallel CPU/GPU calculations.

Relevant courses in High Performance Computing

2018 **14th Advanced School on Parallel Computing**, CINECA, Italy.
Topic: advanced MPI, many integrated core (MIC) architecture, heterogeneous programming (CPU+GPU) in CUDA, CUDA Fortran and OpenACC, domain specific libraries for Deep Learning, libraries for PDEs, software profiling, intra-node optimization. Link to course attendance `certificate`.

2018 **Scientific Programming Concepts**, Irish Center for High-End Computing (ICHEC), Ireland.
Topics: Introduction to high performance computing using architectures and software written using Fortran and C.

Peer reviewed publications

Link to my `Google Scholar`.

2018 **Guerri M.**, J. Fullea, T. Bodin. Trans-dimensional Bayesian joint inversion of receiver functions, surface waves and topography for the thermal structure and chemical composition of the crust and upper mantle. In preparation.

2017 Cammarano F. and **M. Guerri**. Global thermal models of the lithosphere, *Geophysical Journal International*, (2017) 210 (1): 56-72. `doi:10.1093/gji/ggx144`.

2016 **Guerri M.**, F. Cammarano, P.J. Tackley. Modelling Earth's surface topography: decomposition of the static and dynamic components, *Physics of the Earth and Planetary Interiors*, Vol. 261, 172-186, doi:10.1016/j.pepi.2016.10.009.

2015 **Guerri M**, F. Cammarano, J.A.D. Connolly. Effects of chemical composition, water and temperature on the physical properties of the continental crust, *Geochemistry, Geophysics, Geosystems*, 16, 2431–2449, doi:10.1002/2015GC005819.

Selected conference abstracts

2017 **Guerri M.**, F. Cammarano, P.J. Tackley. Modeling Earth's surface topography: decomposition of the static and dynamic components. *Invited talk at AGU Fall Meeting*, New Orleans.

2017 **Guerri M.**, M. Youssof, J. Fullea. Chemical composition of the continental crust: Insights from a quantitative interpretation of the Vp/Vs ratio. *AGU Fall Meeting*, New Orleans.

2014 **Guerri, M**, Cammarano, F. Seismic velocities-density relationship for the Earth's crust: effects of chemical compositions, amount of water, and implications on gravity and topography, *EGU General Assembly Conference Abstracts*.

2012 **Guerri, M**, Pastori, M, Margheriti, L, D'Alema, E, Piccinini, D, Barchi, MR. Seismic anisotropy and micro-seismicity in the upper crust at north of Gubbio basin (Central Italy), *GNGTS, Potenza, 2012*.

2009 **Guerri, M**, Perugini, D. Fractal analysis of fragmentation processes during mixing of magmas: a new method for estimating magma volumes in plumbing system. *Geoitalia 2009, VI Forum Italiano di Scienze della Terra*.

Personal interests

- Computational Physics.
- Blockchain technology and cryptocurrencies.
- Martial Arts (Boxing, Muay Thai, MMA).

References

- **Dr. Javier Fullea**. School of Cosmic Physics, Dublin Institute for Advanced Studies. Phone: +353-1-653-5147. E-mail: jfullea@cp.dias.ie.
- **Prof. Fabio Cammarano**. Department of Geological Sciences, Universitá Roma Tre, Italy. E-mail: fabio.cammarano@uniroma3.it.
- **Prof. James A. D. Connolly**. Institute of Mineralogy and Petrology, ETH Zurich, Switzerland. Phone: +41 44 632 78 04. E-mail: james.connolly@erdw.ethz.ch.
- **Prof. Paul J. Tackley**. Institute of Geophysics, ETH Zurich, Switzerland. Phone: +41 44 633 27 58. E-mail: paul.tackley@erdw.ethz.ch.