

Curriculum Vitae

Lucia Zaccarelli

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Personal notes:

- ✓ Born in Bologna on the 11/11/1976
- ✓ Living in via san Vitale 40, 40125, Bologna, Italy
- ✓ 2 daughters born on the 08/23/2013 and 02/15/2016

Current position:

31st of December 2014 – present day: Researcher at the Istituto Nazionale di Geofisica e Vulcanologia, department of Bologna (Italy).

Past position:

16th of November 2011 – 30th December 2014: Researcher (temporary contract) at the Istituto Nazionale di Geofisica e Vulcanologia, department of Bologna (Italy).

1st of March, 2009 – 15th of November 2011: Post-doctorate contract at the Institut de Physique du Globe de Paris (in Paris, France), in the seismology team directed by N.M. Shapiro.

1st of April, 2005 – 5th of February, 2009: Post-doctorate at the Istituto Nazionale di Geofisica e Vulcanologia, department of Naples, Vesuvius Observatory (Italy), in the Mobile Seismic Network group, led by F. Bianco.

Education:

20th of May 2005: PhD in Geophysics at the University of Bologna. Thesis title: “*Stochastic modeling of the eruptive processes and the relationship with the per-eruptive seismicity*” – tutor Prof. W. Marzocchi.

14th of December 2001: Master degree in Physics at the University of Bologna, relatore Prof. E. Boschi, correlatore Prof. W. Marzocchi.

Publications:

1. **Zaccarelli L.**, and Bianco F. (2017). Noise-based monitoring of the Campi Flegrei caldera, *Geophys. Res. Lett.*, 44, doi:10.1002/2016GL072477.
2. Tierz, P., Sandri, L., Costa, A., Sulpizio, R., **Zaccarelli, L.**, Di Vito, M. A. and Marzocchi, W. (2016). Uncertainty Assessment of Pyroclastic Density Currents at Mount Vesuvius (Italy) Simulated Through the Energy Cone Model, in *Natural Hazard Uncertainty Assessment: Modeling and Decision Support* (eds K. Riley, P. Webley and M. Thompson), John Wiley & Sons, Inc., Hoboken, NJ, USA. doi: 10.1002/9781119028116.ch9
3. Tierz, P., Sandri, L., Costa, A., **Zaccarelli, L.**, Di Vito, M. A., Sulpizio, R., and Marzocchi, W. (2016). Suitability of energy cone for probabilistic volcanic hazard assessment: validation tests at Somma-Vesuvius and Campi Flegrei (Italy), *Bull. Volcanol.*, 78:79, DOI 10.1007/s00445-016-1073-9.

4. Soldati G., **Zaccarelli L.**, Faenza L., Michelini A. (2015). Monitoring of crustal velocity variations in the L'Aquila fault zone inferred from noise cross-correlation, *Geophys. J. Int.*, 202, 604-611, doi: 10.1093/gji/ggv172.
5. Piccinini D., **Zaccarelli L.**, Pastori M., Margheriti L., Lucente F.P., De Gori P., Faenza L., Soldati G. (2015): Seismic measurements to reveal short-term variations in the elastic properties of the Earth crust, *Bollettino di Geofisica Teorica e Applicata*, 56, 2, 257-274, DOI 10.4430/bgta0140.
6. Moretti M. et al. (2012): Rapid-response to the earthquake emergency of May 2012 in the Po Plain, Northern Italy, *Annals of Geophysics* 55, 4, 583-590.
7. Pastori M., Piccinini D., Valoroso L., Wuestefeld A., **Zaccarelli L.**, Bianco F., Kendall M., Di Bucci D., Margheriti L., Barchi M. (2012): Crustal fracturing field and presence of fluid as revealed by seismic anisotropy: the case histories from seismogenic areas in the central Apennines, *Bollettino di Geofisica Teorica e Applicata* 53, 4, 417-433.
8. **Zaccarelli L.**, Bianco F., Zaccarelli R. (2012): Splitting Parameter Yield (SPY): A program for semi-automatic analysis of shear wave splitting, *Comp. Geosci.* 40, 138-145.
9. **Zaccarelli L.**, Shapiro N.M., Faenza L., Soldati G., Michelini A. (2011): Variations of crustal elastic properties during the 2009 L'Aquila earthquake inferred from cross-correlations of ambient seismic noise, *Geophys. Res. Lett.* 38, L24304, doi 10.1029/2011GL049750.
10. Clarke D., **Zaccarelli L.**, Shapiro N.M., Brenguier F. (2011): Assessment of resolution and accuracy of the Moving Window Cross Spectral technique for monitoring crustal temporal variations using ambient seismic noise, *Geophys. J. Int.*, vol. 186, 867-882.
11. Bianco F., **Zaccarelli L.**, Castellano M., Gargiulo G. (2010): Complex wavelet transform: an application to retrieve shear wave splitting time behavior at Mt. Vesuvius, *Bollettino di Geofisica Teorica e Applicata*, vol 51, 2-3, 253-263.
12. **Zaccarelli L.**, Pandolfi D., Bianco F., Saccorotti G., Bean C., Del Pezzo E. (2009): Temporal changes in seismic wave propagation characteristic during the 2002-2003 Mt. Etna eruption, *Geophys. J. Int.*, 178, 1779-1788, DOI: 10.1111/j.1365-246X.2009.04219.x.
13. Del Pezzo E., Bianco F., **Zaccarelli L.** (2009): Reply to comment on "Separation of Qi and Qs from passive data at Mt. Vesuvius: a reappraisal of the seismic attenuation estimates" by Ugalde A., and Carcole' E., *Phys. Earth and Planet. Int.*, v.173, p.195-196, DOI:10.1016/j.pepi.2008.10.002
14. Bianco F., **Zaccarelli L.** (2009): A reappraisal of shear wave splitting parameters from Italian active volcanic areas through a semi-automatic algorithm, *J. Seismol.*, v.13, p.253-266, DOI: 10.1007/s10950-008-9125-z.
15. Saccorotti G., Petrosino S., Bianco F., Castellano M., Galluzzo D., La Rocca M., Del Pezzo E., **Zaccarelli L.**, Cusano P. (2007): Seismicity associated with the 2004 – 2006 renewed ground uplift at Campi Flegrei caldera, Italy, *Phys. Earth and Planet. Int.*, v.165, p.14-24.

16. Del Pezzo E., Bianco F., **Zaccarelli L.** (2006): Separation of Qi and Qs from passive data at Mt. Vesuvius: a reappraisal of the seismic attenuation estimates, *Phys. Earth and Planet. Int.*, v.159, p.202-212, DOI:10.1016/j.pepi.2006.07.005
17. Marzocchi W., **Zaccarelli L.** (2006): A quantitative model for the time-size distribution of eruptions, *J. Geophys. Res.*, v.111, B04204, DOI 10.1029/JB003709
18. Marzocchi W., **Zaccarelli L.**, E. Boschi (2004): Phenomenological evidence in favor of a remote seismic coupling for large volcanic eruptions, *Geophys. Res. Lett.*, v.31, L04601, DOI 10.1029/2003GL018709
19. Sandri L., Marzocchi W. **Zaccarelli L.** (2004): A new perspective in identifying the precursory patterns of eruptions, *Bull. Volcanol.* 66:263-275, DOI 10.1007/s00445-003-0309-7

Open file reports:

- i. **Zaccarelli L.**, Camassi R., Saccorotti G., Pondrelli S., Cavaliere A., Pesci A., Loddo F. (2016). Monitoraggio del Pontelungo (Bologna) durante l'esplosione controllata di un ordigno bellico, *Rapporti Tecnici INGV*, 359, 17 p.
- ii. R. M. Azzara, A. Cavaliere, S. Danesi, A. Morelli, **L. Zaccarelli** (2014): Il monitoraggio sismico della torre degli Asinelli e della Garisenda. Risultati preliminari dell'analisi dei dati. *Rapporti Tecnici INGV*, 284, 42 p.
- iii. M. Moretti et al. (2013): Emergency structure activities performed after the Emilia-Romagna earthquake: report on the first month. *Quaderni di Geofisica*, 110, 43 p.
- iv. **Zaccarelli L.**, Bianco F.: A shear wave analysis system for semi-automatic measurements of shear wave splitting above volcanic earthquakes: description and applications; *Open-File Report*, rendiconto del progetto DPC-INGV V4, <http://www.earth-prints.org/handle/2122/3891>
- v. Petrosino S., Damiano N., Cusano P., Veneruso M., **Zaccarelli L.**, Torello V., Del Pezzo E.: Seismic noise at Solfatara volcano (Campi Flegrei, Italy): acquisition techniques and first results; *Open-File Report*, INGV-Osservatorio Vesuviano, <http://www.ov.ingv.it/pubblicazioni.html>
- vi. Del Pezzo E., Bianco F., Saccorotti G., La Rocca M., Galluzzo D., Nisii V., Petrosino S., Cusano P., **Zaccarelli L.**, Damiano N., Tranelli A., De Astis G., Breton M., Orozco-Rojas J., Navarro C., Ibanez J., Ocana E., Garcia A.: Seismic survey of Colima volcano (Mexico): November 2005 – May 2006; *Open-File Report*, INGV-Osservatorio Vesuviano, <http://www.ov.ingv.it/pubblicazioni.html>
- vii. Cusano P., Damiano N., Petrosino S., **Zaccarelli L.**, Corsini A., Borgatti L., Cervi F., e F. Ronchetti: Acquisizione di rumore sismico nell'Appennino Reggiano-Modenese; *Open-File Report*, INGV-Osservatorio Vesuviano <http://www.ov.ingv.it/pubblicazioni.html>

Invited seminars:

- 02/04/2012 – University of Hamburg (D):
“Stress-field monitoring based on cross-correlations of ambient seismic noise”
- 17/06/2011 – INGV, Bologna (I):

“Stress-field monitoring based on cross-correlations of seismic noise”

- 27/04/2011 – *University of Perugia (I)*:
“Stress-field monitoring through cross-correlations of ambient seismic noise”
- 18/02/2011 – *INGV, Roma (I)*:
“Co-seismic velocity changes during the 2009 Mw 6.3 L'Aquila earthquake inferred from seismic noise cross-correlations”
- 19/02/2010 – *INGV, Napoli (I)*:
“Monitoring crustal temporal variations from ambient seismic noise correlations”
- 19/06/2009 – *University of Leeds (UK)*:
“Forecasting volcanic activity through seismic waveform analysis”
- 12/12/2008 – *University of Granada (E)*:
“Forecasting volcanic eruptions”
- 26/11/2007 – *University College Dublin (IRL)*:
“Seismic wave temporal changes during the 2002-2003 Mt. Etna eruption”

Meetings:

- *NGTGS 2014 – Bologna 23-25/11/2014*:
Zaccarelli L., Bianco F., La Rocca M., Galluzzo D.
Monitoring the Campi Flegrei Caldera through Passive Image Interferometry. (Oral presentation)
- *AGU 2012 – San Francisco (USA) 3-7/12/2012*:
Zaccarelli L., Saade M., Cupillard P., Roux P., Montagner J.P., Brenguier F.
Crustal anisotropy viewed by noise cross-correlation. (Poster)
- *EGU 2011 – Vienna (Austria) 4-8/4/2011*:
Zaccarelli L., Droznin D., Shapiro N., Senyukov S., Gordeev E., Chebrov V.
Monitoring the activity of Kliuchevskoi volcano through seismic noise cross-correlations. (Poster)
- *EGU 2011 – Vienna (Austria) 4-8/4/2011*:
Zaccarelli L., Shapiro N.M., Faenza L., Soldati G., Michelini M.
Co-seismic velocity changes during the 2009, Mw 6.3 L'Aquila earthquake inferred from seismic noise cross-correlations. (Oral presentation)
- *ESC 2010 – Montpellier (France) 6-10/09/2010*:
Zaccarelli L., Droznin D., Shapiro N., Senyukov S., Gordeev E., Chebrov V.
Monitoring the activity of Kliuchevskoi volcano through seismic noise cross-correlations. (Oral presentation)
- *AGU 2009 – S. Francisco (USA) 14-18/12/2009*:
Zaccarelli L., Clarke D.S., Shapiro N.M., Brenguier F.
Monitoring crustal temporal variations from ambient seismic noise correlations: resolution and accuracy assessments. (Poster)
- *EGU 2008 – Vienna (Austria) 14-19/04/2008*:
Zaccarelli L., Pandolfi D., Bianco F., Saccorotti G., Bean C.
Crustal velocity and anisotropy temporal variations at Etna volcano. (Oral presentation)
- *EGU 2008 – Vienna (Austria) 14-19/04/2008*:
Zaccarelli L., Pandolfi D., Bianco F., Saccorotti G., Bean C.
Seismic wave temporal changes during the 2002-2003 Mt. Etna eruption. (Oral presentation)
- *NGTGS 2007 – Roma 13-15/11/2007*:

- Zaccarelli L.**, Pandolfi D., Bianco F., Saccorotti G., Bean C.
Seismic wave temporal changes during the 2002-2003 Mt. Etna eruption. (Oral presentation)
- *12IWSA – International Workshop on Seismic Anisotropy – Beijing (China) 22-27/10/2006:*
Bianco F., **Zaccarelli L.**, Del Pezzo E., Scarfi L.
Shear Wave Splitting on the Italian active volcanic areas. (Oral presentation)
 - *EGU 2005 – Vienna (A) 24-29/04/2005:*
Marzocchi W., **Zaccarelli L.**
A quantitative model for the time-size distribution of eruptions. (Oral presentation)
 - *Workshop “Statistics in Volcanology” – Bristol (UK) 22-26/03/2004:*
Zaccarelli L., Marzocchi W.
The time-size distribution of eruptions; statistical analysis and inferences on the physics of the eruptive process. (Poster)
 - *Annual Workshop of the Working Group on Volcano Seismology of the European Seismological Commission – La Palma, Canarie (E) 7-11/9/2004:*
Zaccarelli L., Marzocchi W.
Time series analysis of the 1989-1990 seismic swarm at Colli Albani, Italy. (Oral presentation)
 - *IAVCEI 2004 – Pucon (Cile) 14-19/11/2004:*
Zaccarelli L., Marzocchi W.
Stochastic modeling of the occurrence of volcanic eruptions. (Poster)
 - *2003 EGS AGU EGU Joint Assembly – Nice, 06-11/04/2003:*
Marzocchi W., **Zaccarelli L.**
Phenomenological evidence in favor of a remote seismic coupling for large volcanic eruptions. (Poster)
 - *Cities On Volcanoes 3 meeting – Hilo, Hawai’i (USA) 14-18/07/2003:*
Marzocchi W., **Zaccarelli L.**
Phenomenological evidence in favor of a remote seismic coupling for large volcanic eruptions. (Poster)

Field works:

- ✓ 20th September 2013 – 10th April 2014: Installation of 8 seismometers on the 2 towers of Bologna, and 2 temporary arrays at the base of the towers of respectively few days and few hours on September and on March.
- ✓ 21st of June – 17th of September, 2012: Installation of 7 seismometers on the 2 towers of Bologna, for the evaluation of their own oscillations and their possible variations.
- ✓ 19th of September – 11th of October, 2009: installation of broad-band seismometers on the Piton de la Fournaise volcano, La Reunion, inside the UnderVolc project: “UNDER standing VOLCanic processes; towards eruption prediction and risk mitigation, an application to Piton de la Fournaise volcano, La Reunion”, resp. F. Brenguier
- ✓ 11-21st of January, 2008: antarctic campaign for installing three broad-band seismometers in the antarctic peninsula, funded by the project: “Crustal structure of the South Shetland area through receiver function analysis from broad-band permanent stations”, resp. J. Almendros
- ✓ 2-6th of April, 2007: seismic noise acquisition in the Solfatara crater (Campi Flegrei volcano), for superficial structure and site effects studies.
- ✓ 11-15th of Aprile, 2006: seismic data acquisition on the Apennines mounts (near

Reggio Emilia) for imaging and monitoring the landslide system

- ✓ 7-21st of January, 2006: seismic campaign on the Colima volcano, Mexico
- ✓ 19th of May – 19th of August, 2003: stage at the Alaska Volcano Observatory in Fairbanks, Alaska, USA. Seismic monitoring duties and GPS campaign on the Denali fault.
- ✓ 13-28th of April, 2001: oceanographic cruise organized by the Marine Geology Institute of the CNR, Bologna, for a side-scan sonar campaign of the seafloor around Stromboli island.

Schools:

- 22-27th of April, 2013: International workshop: “*Ambient noise Imaging and Monitoring Workshop*”, at the Institut d’Etudes Scientifiques de Cargese, France.
- 9-13th of May, 2011: International workshop: “*Passive Imaging in wave physics: from seismology to ultrasound*”, at the Institut d’Etudes Scientifiques de Cargese, France.
- 1-2nd of July, 2008: “*Waves in heterogeneous media*”, lessons by J. Virieux at the Physical Science of the University Federico II in Naples, Italy.
- 6-10th of November, 2006: 27th Workshop of the International School of Geophysics: “*Quantifying long- and short- term volcanic hazard*”, Erice, Italy.
- 9th and 16th of October, 2006: “*Course for decoding and archiving the mobile seismic network data*” by M. La Rocca at the Mobile Seismic Network Laboratory of the INGV, department of Naples, Vesuvius Observatory.
- 21st of June, 2005: “*Course for the seismic monitoring duty*” by the seismic monitoring center of the INGV, department of Naples, Vesuvius Observatory.
- July, 2003: “*Katmai volcanological field school*” by prof. J. Eichelberger on the Katmai National Park, Alaska, USA.
- 10-15th of July, 2001: 18th Symposium of the International School of Geophysics: “*Advances in the assessment of earthquake and volcanic hazard*”, Erice, Italy.

Teaching:

- November 2012 – January 2013: internship of Eleonora Crescenzi Lanna, Master student in Geology at the University of Bologna.
- June – July 2012: internship of two students of the polytechnic school ITIS Belluzzi of Bologna.
- 17/02/2011: European member of the PhD commission of Marina Pastori, at the Perugia University (Italy). Thesis title “*Crustal fracturing field and presence of fluid as revealed by seismic anisotropy: case-histories from seismogenic areas in the Apennines*”.
- 11/12/2008: European member of the PhD commission of Luisa Buontempo, at the Granada University (Spain). Thesis title “*Anisotropia sismica en la peninsula Iberica*”.

- May 2005: "The geophysics in the kitchen" open laboratory organized by E. Rivalta at the Physics Department of the University of Bologna (Italy).

Other:

- January 2014 – present: in charge of the seminar organization for the INGV department of Bologna.
- June 2012 – July 2012: part of the Seismic Emergency Operational Center in response of the Emilia sequence of May 2012
- September 2010 – November 2011: in charge of the seminar organization for the seismology team at the IPGP.
- 1st of April 2005 – 31st of March 2006: volcano monitoring duties at the INGV, Naples.

Computing skills:

Operating systems:

very good knowledge: linux, unix, MAC
 good knowledge: VMS, Ms-dos, Windows

Programming:

very good knowledge: Fortran 77 e 90

Software:

very good knowledge: Matlab, LaTeX, Gnuplot, SAC
 good knowledge: Xfig, GMT

Foreign languages:

Italian native
English fluent
French fluent
Spanish good