



DIPARTIMENTO DI STRUTTURE PER L'INGEGNERIA E L'ARCHITETTURA
CORSO DI DOTTORATO DI RICERCA IN
INGEGNERIA STRUTTURALE GEOTECNICA E RISCHIO SISMICO

XXXIX CICLO

I sottoscritti prof. Francesco Silvestri (PO ■ PA □ RU □ RTD □)
e dott. Giovanni Forte (PO □ PA □ RU □ RTD ■), afferenti al Dipartimento di Ingegneria
Civile, Edile ed Ambientale, S.S.D. ICAR/07 Geotecnica e GEO/05 Geologia Applicata

CHIEDONO

di essere inseriti tra i possibili tutor di studenti di dottorato per il XXXIX ciclo.

1. Curriculum sintetico dei proponenti (max 500 parole)

Francesco Silvestri

Career

1986: M.Sc. in Civil Engineering at the University of Napoli Federico II, where he took the degree of Ph.D. in Geotechnical Engineering in 1991.

1990: Research engineer - Scientist assistant at the University of Texas at Austin (USA).

1990 to 1998: Research Assistant at the 'Department of Geotechnical Engineering' of the University of Napoli Federico II.

1998 to 2003: Associate Professor at the 'Department of Soil Defense' of the University of Calabria. 2003 to 2007: Full Professor at the 'Department of Soil Defense' of the University of Calabria.

2007 to date: Full Professor at the University of Napoli Federico II, currently at the 'Department of Civil, Architectural and Environmental Engineering'.

Research

Experimental and analytical research on characterisation and analysis of mechanical behaviour of soils under time-variable loads, relevant to working and seismic conditions of buildings and infrastructures.

Specific research topics:

- advanced experimental techniques for measurement of soil mechanical properties;
- constitutive modelling of cyclic/dynamic soil behaviour in pre-failure conditions and at liquefaction;



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- embankments, levees, earth dams, coastal and underground structures under working and seismic loading;
- geotechnical characterisation, seismic response analysis and microzonation of small to large urban centers;
- ground deformations, soil liquefaction, instability of slopes and cavities induced by earthquakes and other natural events;
- soil-foundation-structure interaction for buildings and bridges with shallow or deep foundations;
- propagation, effects and attenuation measures of man-made vibrations;
- ground improvement and early warning technologies for seismic risk reduction.

On the above mentioned research topics, he published more than 300 papers with a h-index = 26.

Appointed as general or panel session reporter, chairman and discussion leader at national and international conferences.

Organizing activities

Guest editor and reviewer of technical papers for National and International Journals and Conferences.

Member of national/international Technical Committees on geotechnical testing, design codes and earthquake geotechnical engineering.

Italian delegate to the International Technical Committee of ISSMGE on 'Earthquake Geotechnical Engineering' since 2006.

Co-chairman of WG6 (Geotechnical Earthquake Engineering) of EAEE (European Association of Earthquake Engineering) since 2015 to 2019.

Member of Organising Committees and Editor of the Proceedings of national/international conferences.

Chairman of the VII International Conference on Earthquake Geotechnical Engineering (Roma, 2019).

Principal Investigator of institutional Research Units in the national Research Projects on soil dynamics and earthquake engineering.

Coordinator of the support about geotechnical aspects to the Department of Civil Protection in the emergency after the Aterno valley earthquake in 2009, the Ischia earthquake in 2017, and the Casamicciola landslide in 2022.

Task coordinator in the national research project ReLUIS since 2010 to date.

Principal Investigator of international research projects.

Participation in investigation projects with private financing.



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Teaching

Courses on 'Soil Dynamics and Earthquake Geotechnical Engineering' and 'Static and Seismic Foundation Design' - M.Sc. Degree in 'Structural and Geotechnical Engineering' - University of Napoli Federico II (Italy).

Short Course on 'Soil dynamics and non-linear site response analysis' - International Master Erasmus Mundus Courses on 'Geomechanics, Civil Engineering and Risks (MGCER)' and on 'Earthquake Engineering and Engineering Seismology (MEEES)' - Laboratoire 3SR - University of Grenoble Joseph Fourier (France).

Short Course on 'Soil Behaviour and Soil-Structure Interaction in Seismic Conditions' (lectures on Fundamentals of Soil Dynamics and Seismic response analysis) - PhD Program in Civil, Chemical and Environmental Engineering - University of Genova (Italy).

Coordinator of international agreements with the Aristotle University of Thessaloniki (Greece) and the University of Cuyo at Mendoza (Argentina) with Erasmus + .

Supervisor of 15 PhD theses in Geotechnical Engineering or Seismic Risk.

Giovanni Forte

Career

Assistant Professor (RTD-B) of Engineering Geology at DICEA, University of Naples Federico II. He has a Bachelor in Earth Sciences (2008), a Master's degree in Geology and Engineering Geology cum laude in 2010. He is PhD in Seismic Risk (XXVI cycle) at University of Naples Federico II defending a thesis on "Integrated approach to the analysis of earthquake triggered landslides and their impact on roadway infrastructures" in 2014. He got the National Scientific Qualification (ASN) for the position of Full Professor on 1st February 2023.

Research

The main scientific research topics deal with natural hazards, slope stability, earthquake engineering and hydrogeology. The results of the researches are presented in several national and international conferences and summarized in several indexed-journals. He participated in several Research Projects as: AMABT (FRA), MASLIDE (FRA), ISTOS (Horizon2020), MITIGO (PON), RELUIS (Department of Civil Protection), VIRA (Department of Civil Protection), CLARITY (Horizon2020), GRISIS (POR), METROPOLIS (PON).

Teaching

Since 2011 he supports the teaching activities of the engineering geology group. Since January 2018 he is Professor of the courses of Engineering Geology (Geologia



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Applicata) 6 CFU, Geological Risks for the design of Civil Engineering works (Rischi geologici nella Progettazione di Opere di Ingegneria Civile) 3/9 CFU for the bachelors and master degrees in civil, building and environmental engineering. Since 2021 he also teaches Digital maps and geological 3D modelling 9 CFU for the master in Transportation Engineering and Mobility.
He supervised more than 35 students for their graduation thesis for both bachelor's and master's degrees.

2. Dottorandi dei quali il proponente è stato tutor nell'ultimo triennio

	Francesco Silvestri
<i>n. 3</i>	Giorgio Andrea Alleanza (34th cycle, ministerial grant), Francesco Gargiulo (35th cycle, ministerial grant), Juan Manuel Barbagelata (37th cycle, ministerial grant)

3. Titolo della ricerca proposta

Multi-level microzonation study of the city of Naples

4. Area tematica

Ingegneria Geotecnica

Ingegneria Strutturale

Rischio Sismico (ma include anche le due precedenti)



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5. Tipologia di borsa per la quale si propone il progetto

Ateneo

DM 117 (Investimento 3.3)

(in questo caso indicare l'azienda co-finanziatrice)

DM 118 (Investimento 4.1 P.A.)

DM 118 (Investimento 4.1 generici)

DM 118 (Investimento 4.1 Patrimonio culturale)

6. Sintesi del progetto di ricerca (max 500 parole. Stato dell'arte, obiettivi e breve programma previsto per le attività e)

Evidence collected after past earthquakes demonstrated that seismic damage depends on three main factors: earthquake source and path characteristics, local geological and geotechnical conditions, structural design and construction features. Seismic microzonation (SM) focuses on the assessment of the first two factors and therefore represents the basis of a sustainable policy for earthquake risk mitigation. It requires a multidisciplinary approach with major contributions from seismology, geology, and geotechnical engineering. The final output should contain recommendations suitable for application by local administrators, urban planners and engineers.

Following literature studies and national and international guidelines, the seismic microzonation of an area should be approached with an increasing level of detail, directly proportional to the accuracy of the subsoil characterization and to the degree of definition of the reference input motion. SM maps at Grades I and II are typically based on qualitative and simplified quantitative evaluations respectively, while Grade III maps are obtained from the results of numerical seismic response analyses.

The results of a Grade III SM study for transient ground motion are typically represented through maps describing the territorial variability of the amplification at surface of a given intensity measure (e.g. spectral acceleration through different ranges of the structural period), or of an engineering demand parameter expressing soil stability, such as a slope sliding displacement or a liquefaction potential index.

The scope of this research program is to take profit of previous pilot literature studies on some selected city districts (e.g. Vinale, 1988; Ebrahimian et al., 2019; Licata et al., 2019; Barbagelata et al., 2019), to produce up-to-date multi-level seismic microzonation maps of the Municipality of Naples in terms of seismic amplification and stability. The development of this research for the selected study area is quite challenging, as the urban territory is provided with a rough, old-fashioned amplification map, although



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featured by a highly heterogeneous geological setting, including unstable rock cliffs or volcanic soil slopes, a cavity network intensely widespread in the tuff bedrock, and potentially liquefiable sandy soils in the coastal plains. Moreover, the local seismicity is affected by the occurrence of both tectonic and volcanic earthquakes.

The study will start with the collection of geological and geotechnical investigations aimed at defining the subsoil model for different districts. Afterwards, both existing data and on-purpose integrative investigations will be adopted for the geotechnical characterization of the main lithological formations. On such a basis, Grade I and II SM maps will be prepared for seismic amplification assessment, soil liquefaction and slope stability. For the most representative sites, 1D and 2D seismic response analyses will be carried out, then up-to-date innovative strategies for the spatial extension of the results in order to draft the Grade III SM maps will be adopted.

7. Eventuali pubblicazioni dei tutor sul tema di ricerca (max 10)

- 1) Lanzo G., Silvestri F., Costanzo A., d'Onofrio A., Martelli L., Pagliaroli A., Sica S., Simonelli A. (2011). *Site response studies and seismic microzonation in the middle Aterno Valley (L'Aquila, Central Italy)*. Bulletin of Earthquake Engineering, 9(5):1417-1442, doi:10.1007/s10518-011-9278-y.
- 2) Puglia R., Vona M., Klin P., Ladina C., Masi A., Priolo E., Silvestri F. (2013). *Analysis of site response and building damage distribution induced by the 31 October 2002 earthquake at San Giuliano di Puglia (Italy)*. Earthquake Spectra, 29(2):497-526, doi: 10.1193/1.4000134.
- 3) Santucci de Magistris F., d'Onofrio A., Penna A., Puglia R., Silvestri F. (2014). *Lessons learned from two case histories of seismic microzonation in Italy*. Natural Hazards, 74(3):2005-2035, doi:10.1007/s11069-014-1281-6.
- 4) Evangelista L., Landolfi L., d'Onofrio A., Silvestri F. (2016). *The influence of the 3D morphology and cavity network on the seismic response of Castelnuovo hill to the 2009 Abruzzo earthquake*. Bulletin of Earthquake Engineering, 14(12):3363–3387. doi:10.1007/s10518-016-0011-8
- 5) Forte G., Fabbrocino S., Fabbrocino G., Lanzano G., Santucci de Magistris F., Silvestri F. (2017). *A geolithological approach to seismic site classification: an application to the Molise Region (Italy)*. Bulletin of Earthquake Engineering, 15(1):175-198, doi:10.1007/s10518-016-9960-1
- 6) Ebrahimian H., Jalayer F., Forte G., Convertito V., Licata V., d'Onofrio A., Santo A., Silvestri F., Manfredi G. (2019). *Site-specific probabilistic seismic hazard analysis for the*



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western area of Naples, Italy. Bulletin of Earthquake Engineering volume 17, pages 4743–4796.

- 7) Licata V., Forte G., d'Onofrio A., Santo A., Silvestri F. (2019). *A multi-level study for the seismic microzonation of the Western area of Naples (Italy)*. Bulletin of Earthquake Engineering, 17(9), 4711-4741. DOI: 10.1007/s10518-019-00665-6.
- 8) Forte G., Chioccarelli E., De Falco M., Cito P., Santo A., Iervolino, I. (2019). *Seismic soil classification of Italy based on surface geology and shear-wave velocity measurements*. Soil Dynamics and Earthquake Engineering, 122, 79–93.
- 9) Forte G., Verrucci L., Di Giulio A., De Falco M., Tommasi P., Lanzo G., Franke K.W., Santo A. (2021). *Analysis of major rock-slides that occurred during the 2016–2017 Central Italy seismic sequence*. Engineering Geology, 290, 106194.
- 10) Mancini M., Cacioli M.C., Gaudiosi I., Alleanza G.A., Cavuoto G., Coltella M., Cosentino G., Di Fiore V., d'Onofrio A., Gargiulo F., Milana G., Pietrosante A., Pompa P.P., Silvestri F., Vassallo M. (2021). *Seismic microzonation in a complex volcano-tectonic setting: the case of northern and western Ischia Island (southern Italy)*. Italian Journal of Geosciences, 140(3), pp. 382-408, doi.org/10.3301/IJG.2021.10

8. Eventuali progetti di ricerca finanziati in cui l'attività si inserisce

The research activity is associated with seismic risk assessment studies performed in the framework of the DPC-ReLUIIS 2022–2024 project (<https://www.reluis.it>), the RETURN (Multi-Risk sciEnce for resilienT commUnities undeR a changiNg climate, <https://www.fondazionereturn.it/>) project.

9. Eventuali fondi disponibili a supporto dell'attività del dottorando (escluso finanziamento borse)

The research activity will consist of numerical and experimental studies, which will be supported by the abovementioned research projects and additional funding for research mobility both inside and outside Europe.



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10. Informazioni relative ad un periodo di ricerca all'estero (minimo tre mesi) previsto per il dottorando (indicare Università/ente di ricerca e docente/ricercatore di riferimento con indirizzo mail) (max 300 parole)

The PhD student is expected to spend 6 months in a major university or research centre, such as Aristotle University of Thessaloniki (Greece), in cooperation with Prof. Dimitris Pitilakis (DPitilakis@civil.auth.gr)

11. Eventuali collaborazioni con imprese/aziende sul tema di ricerca (max 300 parole)

A fruitful interaction can be established with companies operating in the field of surveys, subsoil investigation and geo-database development, including for instance 'TECNO-IN S.p.A.' who already provided geo-referenced high-quality subsoil data for previous referenced research activities.

Napoli, 27/07/2023

FIRMA

Il presente modulo va compilato in ogni sua parte ed inviato all'indirizzo di posta elettronica phd.dist@unina.it entro e non oltre il 30/06/2023.