



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
prof. Luca Pagano (PO □ PA ■ RU □ RTD □), afferenti al Dipartimento
di Ingegneria Civile, Edile ed Ambientale (S.S.D. ICAR/07 Geotecnica),

CHIEDONO

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

1. Curriculum sintetico dei proponenti (max 500 parole)

Prof. 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;
- embankments, levees, earth dams, coastal and underground structures under working and seismic loading;



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- 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.

Prof. Luca Pagano

Career

1991: Civil Engineer degree.

1996: Ph.D degree in Geotechnical Engineering at the University of Rome La Sapienza.

1998-2000: post-doctoral grant at University of Naples "Federico II";

2000-2011 Researcher in Geotechnical Engineering at University of Naples Federico II.

Since 2011: Associate professor in Geotechnical Engineering at University of Naples Federico II.

Since 2014: National qualification as a Full Professor of Geotechnical Engineering.

Research

Static behavior of earth dams; seismic behavior of earth dams; behavior of river embankments; full-scale physical modelling of flood impacts on river embankments; seismic vulnerability of road embankments; seismic behavior of natural and artificial slopes; behavior of retaining wall; rainfall-induced landslides in shallow volcanic covers; physical modelling of rainfall-induced landslides; physical modelling of soil-atmosphere interaction of silty volcanic soils by lysimeter; monitoring of natural silty-volcanic slopes; development of early warning system for rainfall-induced landslides; development of earthquake early warning systems for embankment dams; development of a MEMS-based device (tensiometer-inclinometer) for early warning monitoring of geotechnical systems.



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Management of research projects

2015-2016 POR Campania Region project “MORFEO” (Landslide Monitoring for risk-management) (principal investigator); 2005-2007 research project PRIN2005 “Monitoring and safety assessment of embankment dams and river embankments” (local coordinator); 2003-2008 PON project “Sistema di monitoraggio, controllo ed informazione per la gestione attiva della sicurezza di un’infrastruttura autostradale” (scientific management of OR2); 2018-2021 POR Campania “Nuove tecnologie e trasformazione digitale nella ingegneria civile e ambientale” (scientific management of the funded research line); 2014-2016 RELUIS project (scientific management of the research topic WP2-Earth Dams; 2005-2008 RELUIS project “Metodi innovativi per la progettazione di opere di sostegno e la valutazione della stabilità dei pendii” (local coordinator)

Recent management of research agreements

2013-2020, agreement between University and Italian Directorate-General for dams on “Study about seismic reassessment of earth dams aimed at guidelines elaboration”; 2022- (in progress), agreement between University and Tangenziale di Napoli on “Definition of Attention Levels of 72 viaducts of the Tangenziale highway against landslides”; 2022- (in progress), agreement between University and SIDECARD s.r.l. on “Seismic reassessment of Sacta and Conza dams”

Teaching

Courses on ‘Foundations’ (M.Sc. Degree in Building Engineering and Architecture), ‘Soil mechanics applied to Infrastructures ’ (M.Sc. Degree in Engineering of Hydraulic and Transportation Systems) - University of Napoli Federico II (Italy)

2018-2022 Short course on Construction of soil embankments at master of Geotechnical Infrastructures – University of Naples Federico II

2007 Short course at the Ph.D school of MarieCurie MUSE network, on “Description and test on the slope prototype”

2012-2016 Coordinator of Ph.D course at Ph.D school in Geotechnical Engineering (University of Naples Federico II) on: “Modelling to interpreting physical quantities in earth dams”

2019 Short course at the Short Mediterranean Ph.D School on Impacts of Climate Change and Sustainable Engineering Responses University of Naples Napoli Federico II) on “Early warning systems against landslides”

2021 Short course at the “11th Alert Olek Zienkiewicz School 2021. Looking into the rhizosphere: the interface between plant science and soil mechanics” on “The effects of of bare and vegetated conditions on the hydrological response of a silty volcanic layer tested by a lisimeter”



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2. Dottorandi dei quali il proponente è stato tutor nell'ultimo triennio	
n. 3	Prof. Francesco Silvestri Giorgio Andrea Alleanza (34th cycle, ministerial grant), Francesco Gargiulo (35th cycle, ministerial grant), Juan Manuel Barbagelata (37th cycle, ministerial grant)
n. 2	Prof. Luca Pagano Lucia Coppola (34th cycle, grant by research project), Maria Grazia Tretola (37th cycle, ministerial grant)

3. Titolo della ricerca proposta
Towards improved landslide predictions in silty volcanic slopes of the Campania Region subjected to rainfalls

4. Area tematica
Ingegneria Geotecnica <input checked="" type="checkbox"/> Ingegneria Strutturale <input type="checkbox"/> Rischio Sismico <input type="checkbox"/> (ma include anche le due precedenti)

5. Tipologia di borsa per la quale si propone il progetto
Ateneo <input checked="" type="checkbox"/> DM 117 (Investimento 3.3) <input type="checkbox"/> <i>(in questo caso indicare l'azienda co-finanziatrice)</i>



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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)

The research activity is aimed at improving early warning predictions for rainfall-induced landslides in sloping volcanic covers typical of the Campania region. Susceptible covers stand in different geological and geomorphological contexts with different properties. Recent events occurred at Sarno (1998), Lattari Mountains (1997 and 2005), Cervinara (1999), Ischia (2006), Casamicciola (2009 and 2022), indicate as main susceptibility factors the material hydraulic, porosity and strength properties, as well as the cover thickness and slope angle. According to differences in these factors, the triggering meteorological histories arose with different features, which identify two main triggering rainfall patterns. The first, which characterizes the landslides of San Pantaleone 1997, Sarno 1998, Cervinara 1999 and Nocera Inferiore 2005, displays significant amounts of antecedent rainfalls followed by long-lasting events not necessarily exceptional in intensity. The second, characterizing the two landslides occurred at Casamicciola in 2009 and 2022, displays less relevant antecedent rainfalls, and a short-lasting ending event with exceptional intensity. Triggering rainfall patterns diverging so much require to be physically interpreted in how they link to the hydrological, mechanical and geometrical properties of the involved covers. Establishing this link is equivalent to develop a general framework depicting all triggering rainfall histories, which is the main aim of the research activity that is proposed for the Ph.D research activity.

The activity will be based on monitoring two different sites selected as susceptible to the two recognized triggering rainfall pattern. The first site will be selected near the Nocera Inferiore 2005 landslide area. The second one will be selected among Casamicciola slopes that experienced instability in November 2022. The monitoring activity will consist of observing meteorological and internal-to-slope hydrological-kinematic variables, over a time span of some months covering the wet-cold and the subsequent dry-hot seasons. This activity will provide the experimental dataset needed for answering the raised question. Observations will in fact be back-analysed by a coupled hydro-thermo-mechanical approach. The resulting calibrated model will represent a predictive tool reliably linking variables expressing causes (meteorological) and effects (cover suction, water content, deformation). This tool will be used to re-interpret the recorded triggering rainfalls available, turning them in slope state at failure,



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from the knowledge of which it will then be possible to identify what further triggering rainfall histories could impact the slope.

The monitoring system will be essentially based on a 'tensio-inclinometer' device suitable to monitor suction and suction-induced deformation occurring in slopes, recently developed at the DICEA department (Coppola et al., 2022). The device was developed to measure suction and tilting by a single shaft pushed in the cover. On-board electronics for data digitisation, data storage and wireless data transmission, and battery-based power supply makes the device fully wireless. The stand-alone tensio-inclinometer is therefore easy to be deployed and allows for designing very flexible and adaptive monitoring systems.

The study will contextually investigate slope behaviour subjected to rainfall by experiments conducted by a physical model already available at the DICEA department. In the experiment it will be possible to test artificial sloping covers, made by the same materials of the two monitored sites, subject to scenarios of rainfall histories, so to further validate results obtained by interpreting site monitoring data.

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

- Rianna G., Reder A., Pagano L. (2023). From empirically to physically based early warning predictions of rainfall-induced landslides in silty volcanic soils: the Lattari Mountains case study. *BULLETIN OF ENGINEERING GEOLOGY AND THE ENVIRONMENT* (2023) 82:223 <https://doi.org/10.1007/s10064-023-03228-x>
- Coppola L., Reder A., Tarantino A., Mannara G., Pagano L.(2022). Pre-failure suction-induced deformation to inform early warning of shallow landslides: Proof of concept at slope model scale. *ENGINEERING GEOLOGY*, ISSN: 00137952, <https://doi.org/10.1016/j.enggeo.2022.106834> , V. 309, 1-16
- Pagano L, Reder A., Rianna G (2019). The effects of vegetation on the hydrological response of silty volcanic covers. *CANADIAN GEOTECHNICAL JOURNAL* ISSN:, 12086010,. [dx.doi.org/10.1139/cgj-2017-0625](https://doi.org/10.1139/cgj-2017-0625) Vol. 56, September 2019, 1261–1277
- Rianna G., Reder A., Pagano L. (2018). Estimating actual and potential bare soil evaporation from pyroclastic soils: Towards improved landslide prediction. *JOURNAL OF HYDROLOGY*. <https://doi.org/10.1016/j.jhydrol/2018.05.005>, 562 (2018) 193–209
- Reder A., Rianna G., Pagano L. (2018). Physically based approaches incorporating evaporation for early warning predictions of rainfall-induced landslides. *NATURAL HAZARDS EARTH SYSTEM SCIENCES*., <https://doi.org/10.5194/nhess-18-613-2018>



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- Greco R., Pagano L. (2017). Basic features of the predictive tools of early warning systems for water-related natural hazards: examples for shallow landslides. *NATURAL HAZARDS EARTH SYSTEM SCIENCES*, 17, 2213-2227, <https://doi.org/10.5194/nhess-17-2213-2017>, 2017
- Reder A., Pagano L., Picarelli L., Rianna G. (2017). The role of the lowermost boundary conditions in the hydrological response of shallow sloping covers. *LANDSLIDES*, 14:861–873 p. 1-13, ISSN: 1612-510X, doi: 10.1007/s10346-016-0753-z
- Rianna G., Pagano L., Urciuoli G. (2014). Rainfall patterns triggering shallow flowslides in pyroclastic soils. *ENGINEERING GEOLOGY* (ISSN:0013-7952) pp. 22 - 35 Vol. 174
- Rianna G., Pagano L., Urciuoli G. (2014). Investigation of soil-atmosphere interaction in pyroclastic soils. *JOURNAL OF HYDROLOGY* (ISSN:0022-1694) pp. 480 - 492 Vol. 510
- Pagano L., Picarelli L., Rianna G., Urciuoli G. (2010). A simple numerical procedure for timely prediction of precipitation-induced landslides in unsaturated pyroclastic soils. *LANDSLIDES* (ISSN:1612-510X) pp. 273 - 289 Vol. 7

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

The research activity is associated with hydrological risk assessment studies performed in the *Spoke VS2 - Ground instabilities* in the framework of the project *RETURN - multi-Risk sciEnce for resilienT commUnities undeR a changiNg climate* (<https://www.fondazionereturn.it/>) and with the recent Research agreement between the DICEA department and the *Government Committee for the emergency on the Ischia island* (<https://sismaischia.it/>), from which an endorsement of the research is ensured.

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:

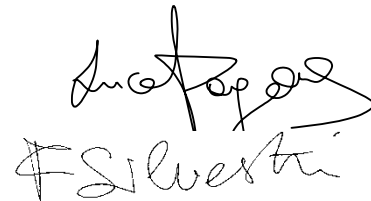
- UPC - UPC Universitat Politècnica de Catalunya, in cooperation with Prof. Jean Vaunat
- University of Strathclyde, Scotland, UK, in cooperation with Prof. Alessandro Tarantino

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

The research activity might stimulate cooperation with the IVM company interested in further developments and practical applications of the tensio-inclinometer device

Napoli, 26/06/2023

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**.