UNIVERSITY OF NAPLES FEDERICO II

DEPARTMENT OF STRUCTURES FOR ENGINEERING AND ARCHITECTURE
PHD PROGRAM IN
STRUCTURAL, GEOTECHNICAL ENGINEERING AND SEISMIC RISK

CYCLE XXXVIII

The undersigned prof. __Matteo Picozzi__

(Full □ Associate X Researcher □)

Department of Physics

S.S.D. FIS/06 Earth and Atmosphere Physics

ASKS

to be included in the list of tutors for cycle XXXVIII.

1. Curriculum vitae (max 500 words)

Matteo Picozzi is Associate Professor in Solid Earth Physics (FIS/06), Department of Physics, University of Naples Federico II, Italy. From 2006 to 2011, he was researcher at the Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences, Germany (GFZ-Potsdam), where he carried out research activities mainly in the research field of the earthquake early warning. During the 2012, he worked in the private sector as exploration geophysicist and seismologist at the geothermal company Magma Energy Italia, a subsidiary of the Canadian Alterra Power Corp. Since March, 2013 he worked at the Department of Physics at the University of Naples Federico II, where he participated to several national and international research projects, acting both as unit coordinator and work-package leader.
He has been Principal Investigator of the research project TIMES, "Tracking Fluid Migration In Geothermal Fields By Seismic Interferometry" (Bando STAR Linea 1 – 2014, from 2015 to 2017).
He is principal investigator of the research project DRAGON, "HOW TO CATCH A DRAGON KING", (Bando STAR Plus 2020 – Linea, from 2022 to 2024).
He is a founding member of the Academic Spinoff RISS: Real Time Innovative Solutions for Seismology (2015-2021; http://www.riss-srl.com) and also associate editor for "Academic Platform Journal of Natural Hazards and Disaster Management" (https://dergipark.org.tr/en/pub/apjhad/) and "Forecasting" (https://www.mdpi.com/journal/forecasting/).
He is author of 80 articles, my h-index is 26, and the citation number is 2059 (Source SCOPUS, 2022). His scientific interests include the study of the source of natural and induced earthquake and the characterization of the ground shaking generated, investigations with seismic noise, development of earthquake early warning and rapid response methodologies.

2. PhD students of whom the undersigned has been a tutor in the last three years

n. __1__	*specify the type of scholarship: university funds, PON, POR, etc.* *_____ PON RI 2014-2020___(Antonio Giovanni Iaccarino)_____*

3. Topic of the proposed research

Preparatory processes of large earthquakes.

4. Field of study

Geotechnical Engineering □

Structural Engineering □

Seismic Risk X

5. Summary of the research project (max 500 words. State of the art, short program planned for the activities, etc.)

Large earthquakes have a major impact on the society in terms of casualties and damages to structures and productive sectors, with typical losses of the order of billions of euros. Although the scientific community has made huge efforts to study them and significant progresses have been achieved in understanding them, determining how large earthquakes are generated remains one of the fundamental unresolved scientific questions.

Recent studies, taking advantage of the new major developments in scientific data infrastructure and data management, have shown that large earthquakes are, at least in some cases, anticipated by systematic patterns in seismicity and crustal deformation (Bouchon et al., 2013; Kato et al., 2012;

Socquet et al., 2017). Kato and Ben-Zion (2020) proposed a generation model of large earthquakes in which the progressive localization of shear deformation around a rupture zone evolves into a final rapid loading (i.e., generating foreshocks) of a localized volume nearby the hypocenter of the major dynamic rupture. Picozzi and Iaccarino (2021) demonstrated that, by transforming the information of seismic catalogues into features providing information on the evolution of the crustal stress condition, the level of organization, and fractal dimension of the earthquakes population, machine learning (ML) approaches have the potential to identify several hours of preparatory phase for moderate-magnitude (M 4) induced earthquakes in The Geysers geothermal field, California. This pilot study motivated to extend the developed method to areas where natural large magnitude earthquakes occur. Areas considered in the research are those where some of the larger earthquakes, or those with larger impact, have occurred in the last decade (e.g. 2009 L'Aquila and 2016-2017 Central-Italy seismic sequences in Italy; 2019 Ridgecrest in California; 2014 Chile megathrust; 2015 Nepal; 2011 Japan). The analysis of seismic catalogues will be accompanied by analysis of seismic and geodetic time series to compute features that will allow us to intercept anomalous trends and transients in the spatio-temporal evolution of background seismicity and crustal deformation, which may suggest the beginning of the preparation phase of large earthquakes.

6. Research publications

1. Picozzi, M.; Iaccarino, A.G. Forecasting the Preparatory Phase of Induced Earthquakes by Recurrent Neural Network. Forecasting 2021, 3, 17–36. https://doi.org/ 10.3390/forecast3010002.
2. Picozzi, M., Bindi, D., Zollo, A. et al. Detecting long-lasting transients of earthquake activity on a fault system by monitoring apparent stress, ground motion and clustering. Sci. Rep. 9, 16268 (2019) doi:10.1038/s41598-019-52756-8
3. Picozzi M., D. Bindi, D. Spallarossa, A. Oth, D. Di Giacomo, and A. Zollo. Moment and energy magnitudes: diversity of views on earthquake shaking potential and earthquake statistics. Geophys. J. Int. (2019) 216, 1245–1259 doi: 10.1093/gji/ggy488
4. Picozzi, M., Bindi, D., Spallarossa, D., Di Giacomo, D., Zollo A. (2018). A rapid response magnitude scale for timely assessment of the high frequency seismic radiation. Scientific Reports – Nature (2018) 8:8562 | DOI:10.1038/s41598-018-26938-9.

7. Funded research projects in which the proposed research fits

A STAR Plus 2020 proposal on this topic has been financed (prj. DRAGON).
The research fits also the PRIN-FLUIDS - Detection and tracking of crustal fluid by multi-parametric methodologies and technologies. PRIN – Bando 2017 Prot. 20174X3P29.

8. Funds available for research grants, equipment, missions, etc.
Funds for mission, equipment and other research activities are available from the STAR PLUS project DRAGON.

9. Information related to the research period abroad (min. 3 months) provided for the PhD student (please indicate University/research institution and professor/researcher of reference) (max 300 words)
The PhD candidate will have the possibility to spend a period abroad (6 months) at the GFZ-Potsdam/University of Potsdam to cooperate with Prof. Fabrice Cotton.

10. Collaborations with companies on the research topic (if available) (max 300 words)

Naples,__05/07/2022____ SIGNATURE

This form must be filled and sent to the e-mail address phd.dist@unina.it no later than Friday 30/04/2021.

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