

CURRICULUM VITAE ET STUDIORUM

Dr. Francesco Mirabella

PRESENT POSITION

Since December **2017**: Associate Professor, University of Perugia (Italy).

Since December **2014**: Adjunct Research Professor in the Department of Geology, Appalachian State University, Boone NC, USA.

FUNDED PROJECTS

2021-2025: PI of the project "Geological sheet F300 "Gubbio", 1:50.000 scale, realization and informatization", funded by ISPRA (Italian Institute for Environmental Protection and Research) 300k euros.

2022-23: PI of the project "Surface Faulting hazard evaluation in the Farneto del Principe DAM (CS, Italy): Regional and site morphotectonic study and Surface geological mapping and morfotectonic analysis of the Roggiano Fault". In collaboration with the University of Chieti (Italy) and the Osservatorio Geofisico Sperimentale (OGS) Triest, Italy, 26k euros.

2021-2022: PI of the project "Evaluation of the Surface faulting hazard of the Montedoglio DAM, Tiber River AR, Italy, Geological and geomorphological site study". Funded by the Umbria and Tuscany water management body, 20k euros.

2019-2020: co-PI of the project "Evaluation of the Surface faulting hazard of the Montedoglio DAM, Tiber River AR, Italy". Funded by the Umbria and Tuscany water management body, 17k euros.

2017-2019: co-PI of the project "Characterisation of the hydrogeological systems of the area struck by the 2016 earthquake in the Umbria region. Evaluation of the earthquake effects on water supply". Funded by the Umbria Region, 110k euros.

2017: PI of the project "Seismic micro-zoning in the areas struck by the 2016 seismic crisis in Central Italy". Funded by the National Research Council, 24k euros.

2015-17: PI of the project "Interconnections between tectonics and fluid circulation in the recent extensional basins: insights from case histories in Central Italy" funded by "Dept. of Physics and Geology, University of Perugia" 4k euros.

2012-13: PI of the project "High precision surveys on recent deposits and bedrock rivers for the identification of potentially active faults" funded by "Fondazione Cassa di Risparmio, Perugia" 12k euros.

2007-09: Coordinator of the working package "Upper crust structure" within a project named "*Test-sites for the multidisciplinary monitoring of active faults - test site Altotiberina fault*" funded by INGV and by the Italian Civil Defense Department.

EDUCATION AND PREVIOUS EXPERIENCE

2014-2017: Research associate at the National Research Council, Institute for the Hydrogeological research and protection (CNR-IRPI).

2009-2017: University Researcher (Lecturer) in Structural Geology at the University of Perugia, Department of Physics and Geology.

2006-08: Research fellow at University of Perugia, Earth Sciences Department. Project "*Probable earthquakes in 2005-2035 in Italy*".

2004-05, Research contract at the "National Institute of Geophysics and Volcanology - INGV" (Rome).
Project "*Active seismic sources in the Marche region (Central Italy)*".

2003-04 Post-Doctoral research fellow at the "Department of Earth Sciences of the University of Perugia (Italy). Project "*Integration of geological and geophysical data for the geometric and dynamic definition of the seismogenic faults of the Umbria-Marche chain*".

2003 PhD at the University of Perugia with a dissertation entitled "*Seismogenesis of the Umbria-Marche region (Central Italy): geometry and kinematics of the active faults and mechanical behaviour of the involved rocks*". The PhD project developed a research based on the integration of different data sources, aimed at a seismotectonic study of the Umbria-Marche region (Northern Apennines of Italy). The main tools were the surface geological mapping, structural analysis, the interpretation of about 300 km of seismic reflection profiles calibrated with boreholes. These data, independently acquired, were compared with seismological data of mainshocks and aftershocks sequences occurred in the area in the last 30 years in order to identify the geological expression of the active faults. The aim was to identify the structural and lithological controls on the distribution of the seismic sequences and to understand if the different mechanical characteristics of the rocks could drive the distribution of the seismicity.

2001 Visiting researcher at the "*Rock Deformation Laboratory*" of the Earth Sciences Department of the University of Manchester (U.K.). The aim of the project was to perform rock deformation experiments on anhydrite-rich rocks in order to study their mechanical and frictional properties.

TITLES

2003, PhD, University of Perugia. Thesis title: "*Seismogenesis of the Umbria-Marche region (Central Italy): geometry and kinematics of the active faults and mechanical behaviour of the involved rocks*", advisor, Prof. M. Barchi;

1998, Laurea (B.Sc + M.Sc) with honours (full marks with academic laude) in Geological Sciences with full marks and honours with a work entitled "*Integration of structural geological data and seismic reflection profiles across the Inner Ridge of the Umbria-Marche Apennines*"."

PROFESSIONAL MEMBERSHIPS

Member of the Italian Geological Society

Member of the European Geosciences Union

SERVICES

Reviewer for Geological Magazine, Annals of Geophysics, Geophysical Journal International, Journal of Structural Geology, Natural Hazards and Earth System Sciences (NHESS), Geomorphology, Geosphere, Journal of the Geological Society (London), Scientific Reports.

Field-trip guide for the MOLE (Multidisciplinary Observatory and Laboratory Experiments at depth) workshop, May 2008. The field trip was across two extensional systems, the Colfiorito and Alotiberina systems in the Northern Apennines of Italy.

Field-trip guide for the Gordon Research Conference on Rock Deformation. The field trip was across the extensional tectonic structure of the Northern Apennines of Italy.

LANGUAGES

Italian, native language

English: fluent, both written and spoken

COMPUTER SCIENCE KNOWLEDGES

Operating systems: Unix/Linux, Mac-Os, MSDOS, Sun, Windows*

Software:

Text processors: LaTeX, OpenOffice, MS-Office;

Bibliographic databases: BibTeX

Electronic sheets: Gnumeric, Openoffice-calc, Excel;

Management of geographic data (G.I.S): GRASS-GIS, QGis, ArcGis;

Graphics: Sketch, Inkscape, Gimp, Adobe Illustrator, Corel Draw, Adobe Photoshop.

Programming languages: bash, some knowledges of PostScript ed HTML.

AWARDS

December 1999 My thesis (BSc+MSc) was awarded by Eni oil-company with the "*Thesis Award*", for the best 1998 thesis, award funded by SPE-EAGE-ASSOMIN.

RESEARCH

My research concerns the study of active faults from different points of view: 1) long-term deformations and 2) mid-short-term deformations.

The long-term-deformations (research line 1) are addressed through the investigation of faults segmentation and interaction both at the surface and at depth, the identification of the seismogenic layer thickness, the estimate of long-term deformation rates from balanced geological cross-sections, the comparison of geological data with earthquakes locations.

The mid-short-term deformations (research line 2) are addressed through the study of the tectono-sedimentary evolution of fault-controlled Quaternary basins, the landscape response to faulting in terms of both the morphological anomalies and the rivers network evolution as shown by rivers terraces and the rivers incision distribution.

Research line 1 has taken benefits from the collaboration with the seismological group of the Italian Institute of Geophysics and Volcanology (INGV) and by data exchange with the ENI oil company. The main applications of this research concern the seismic hazard and the activities related to drillings (deep boreholes and tunnels). I am involved in the ICDP drilling project "STAR - A strainmeter Array along the Alto Tiberina low angle normal fault system; <https://www.icdp-online.org/projects/by-continent/europe/star-italy>" aimed at installing a set of strainmeters at depth in the ATF-Taboo Near Fault Observatory (<https://www.ont.ingv.it/infrastrutture-di-ricerca/sismologia/taboo>), part of the EPOS research infrastructure (<https://www.epos-eu.org/tcs/near-fault-observatories>) in the Northern Apennines of Italy.

Research line 2 is aimed at filling the gap between long-term deformations (in the order of the MA) and active deformations (as revealed by seismicity and GPS data). This research is based on the extraction of active tectonics information from the landscape (in terms of both the morphology and the fluvial network) by using the competition between large-wavelength, regional deformations (e.g. regional uplift) and local effects due to active faulting (uplift/subsidence at foot-wall/hanging-wall of active faults). This research is in collaboration with CNR-IRPI (Italian Research Council, Institute for the Hydrogeological research and protection).

Along with the above mentioned works, I have recently conducted a research focussed at understanding the hydrogeological perturbation triggered by strong earthquakes rupturing the topographic surface and the earthquake effect on groundwater flow, focussing on the role of faults and fractures in guiding groundwater flow and how they change their role through the seismic cycle.

The main methods I use are the geological interpretation of geophysical data, field mapping, fault analysis, the construction of integrated geological cross-sections, aerial photographs interpretation, the management and analysis of geographical and digital topographic data into G.I.S. systems.

The products of the research are published on international journals and presented at several national and international conferences. The number of received citations is over 900 in WOS (ISI-web of science), the h-index is 18 (WOS accessed on April 17th, 2024).

TEACHING EXPERIENCE

I presently hold the "Field mapping" and the "Geology of Earthquakes" courses at the University of Perugia.

The "Field mapping" course is given to the three-year degree students (BSc) and is composed of room and field classes. In the room classes the students learn how to read a geological map, extract both surface and subsurface information from a geological map and how to draw cross-sections and 1:10.000 and 1:25.000 scale.

The "Geology of Earthquakes" course is given to the Master's Degree (MSc) students. The students are taught the principles of the seismic cycle, stress, strain, fault and fold analysis, faults growth and evolution, the reconstruction of paleo-stress from faults data, tectonic geomorphology and paleoseismology. The course gives principles of seismic risk and microzonations and also foresees some field excursions.

Teaching activity in the field

I commonly lead field excursion for both undergraduate and graduate students. I also lead field excursions for foreign students in collaboration with foreign colleagues.

I organize and manage a 8-days field mapping camp for the third year of the BSc. The field camp is organized in collaboration with two colleagues at Appalachian State University (USA). We bring the two groups of students (Italians and Americans) together and make them work in groups of 4 (2 americans and 2 italians) to map an area of about 6-7 square kilometers at 1:10.000 scale. The students take practice with the methods of mapping, the construction of lithology boundaries, the making of a stratigraphic column, and how to use a compass and a GPS. The students are trained to read a topographic and geological map and to draw cross-sections.

At the end of the camp each student has to draw her/his own geological map, cross section, stratigraphic column. As a group they present their work to the department staff during a short poster session.

This is a stimulating experience for both students and staff and is very much appreciated by the students of both nationalities.

Other teaching experiences

I am advisor of PhD students and of several BSc and MSc thesis concerning the seismotectonics and earthquake geology.

In **2015** I taught the "Structural Geology and maps reading" course for the Integrated Petroleum Geosciences Course of ENI oil company (IPGC course).

During **2010,2011,2012,2013,2014** I taught the "Geology of Earthquakes course" for the MSc.

During **2006,2007,2013** I taught in short-term opensource G.I.S. courses for professionals and public institution employees.

Perugia, April, 2024
Francesco Mirabella