UNIVERSITÀ DEGLI STUDI
DELL'INSUBRIA

"Geological Hazard"

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PeriGeo

Purpose

The PERIGEO research group focuses on the characterization of geological hazards through a multidisciplinary approach.

We use techniques and methods from various disciplines, including Quaternary Geology, Active Tectonics and Seismic Risk, Structural Geology, Engineering Geology, Hydrogeology, Volcanic Geology, and Urban Geology.

A fundamental part of our research is based on the direct acquisition of field data (for example, surveying environmental effects following earthquakes), combined with indirect investigation methods, laboratory analyses, and satellite-derived data.

Location: Department of Science and High Technology, Como, Italy

Organization: The facility integrates expertise from various fields of environmental sciences and geology.

Resources include instruments and software for field data collection, laboratory sample analysis, and digital analysis and modeling. The instrumentation enables:

- acquisition of high-resolution topographic data
- processing of 3D surface and subsurface models

The laboratories associated with the facility are:

- "Cartography and Geological Microscopy Laboratory"
- "Sedimentology and Stratigraphy Laboratory"

Connections with CRIETT Technological Platforms and University Scientific Facilities

We collaborate with other research groups within the University, particularly:

- the Environmental Chemistry group
- the Environmental and Occupational Hygiene group

Publications:

1. Livio, F. A., Blumetti, A. M., Comerci, V., Ferrario, F., Binda, G., Caciagli, M., ... & Michetti, A. M. (2025). Paleoseismic history of the intermountain Rieti Basin (Central Apennines, Italy). NHESS, 1-52.
2. Ferrario, M. F., Livio, F., & Serva, L. (2025). Prediction of Coseismic Rupture Locations from Fault Maps. BSSA 115 (4), 1551–1569 https://doi.org/10.1785/0120240227
3. Martinelli, E., Grassi, B., Livio, F., Ferrario, M. F., Redaelli, M., & Michetti, A. M. (2025). What is that building doing there on Via Borgo Vico? New archaeological perspectives on the Iron Age occupation of the Como (Northern Italy) lakeshores. QEH, 100091.
4. Muccignato, E., & Ferrario, M. F. (2025). Exploiting earthquake-induced landslide inventories for macroseismic assessment using the environmental seismic intensity (ESI-07) scale. Frontiers in Earth Science, 13, 1468787.
5. Scaramuzzo, E., Livio, F. A., Fellin, M. G., & Maden, C. (2025). Evidence for multi-rifting in the Variscan–Alpine cycle transition: insights from the European western Southern Alps. Solid Earth, 16(7), 619-640.
6. Tringali, G., et al. (2025). New paleoseismological and morphotectonic investigations along the 2018 surface ruptures of the Fiandaca Fault, eastern flank of Etna volcano (Italy). Solid Earth, 16(12), 1473-1491.
7. Ferrario, M. F., & Livio, F. (2024). Rapid Mapping of Landslides Induced by Heavy Rainfall in the Emilia-Romagna (Italy) Region in May 2023. Remote Sensing, 16(1), 122.
8. Pizza M., M. F. Ferrario, A. M. Michetti, M. Magdalena Velázquez-Bucio, P. Lacan, and S. Porfido (2024). Intensity Prediction Equations Based on the Environmental Seismic Intensity (ESI-07) Scale: Application to Normal Fault Earthquakes. Appl. Sci. 2024, 14, 8048. https://doi.org/10.3390/app14178048
9. Silva-Fragoso, A., Norini, G., Nappi, R., Groppelli, G., & Michetti, A. M. (2024). Improving the Accuracy of Digital Terrain Models Using Drone-Based LiDAR for the Morpho-Structural Analysis of Active Calderas: The Case of Ischia Island, Italy. Remote Sensing, 16(11), 1899; https://doi.org/10.3390/rs16111899
10. Thomas, F., Livio, F.A., Ferrario, F., Pizza, M., Chalaturnyk, R. (2024) A review of subsidence monitoring techniques in offshore environments. Sensors 2024, 24, 4164. https://doi.org/10.3390/s24134164
11. Livio, F., Ferrario, M. F., Martinelli, E., Talamo, S., Cercatillo, S., & Michetti, A. M. (2023). The footprint of a historical paleoearthquake: the sixth-century-CE event in the European western Southern Alps. NHESS, 23(11), 3407-3424.
12. Pizza, M., Ferrario, M. F., Thomas, F., Tringali, G., & Livio, F. (2023). Likelihood of Primary Surface Faulting: Updating of Empirical Regressions. BSSA, 20, 1-13.
13. Tringali, G., Bella, D., Livio, F., Ferrario, M. F., Groppelli, G., Pettinato, R., & Michetti, A. M. (2023). Aseismic creep and gravitational sliding on the lower eastern flank of Mt. Etna: Insights from the 2002 and 2022 fault rupture events between Santa Venerina and Santa Tecla. Tectonophysics, 856, 229829.
14. Ferrario, M. F., Livio, F., & Michetti, A. M. (2022). Fifteen years of Environmental Seismic Intensity (ESI-07) scale: Dataset compilation and insights from empirical regressions. Quaternary International.
15. Scaramuzzo, E., Livio, F. A., Granado, P., Di Capua, A., & Bitonte, R. (2022). Anatomy and kinematic evolution of an ancient passive margin involved into an orogenic wedge (Western Southern Alps, Varese area, Italy and Switzerland). Swiss Journal of Geosciences, 115(1), 1-21.

Instrument		Field and Survey
Total Station Leica TC307		High-precision topographic surveying instrument for measuring angles and distances and reconstructing 3D terrain models.
GPS RTK Leica 1250		A high-precision GPS system based on real-time corrections, used to obtain centimeter- to meter-level coordinates in geological surveys, surveying, and monitoring.
Reflex Nikon D 5200		Professional cameras with high optical quality, suitable for documenting outcrops, terrestrial photogrammetric surveys, and detailed morphological analyses.
Phantom 4 Pro+ Drone		A drone equipped with a high-resolution camera, used for aerial photogrammetry, topographic surveys, and 3D modeling of geological surfaces.

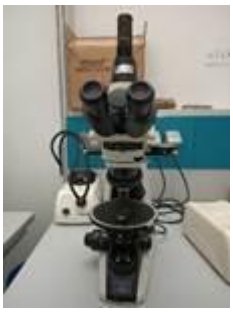
Matrice RTK 350 Drone		Professional drone with an integrated RTK system, ideal for high-precision surveying, advanced mapping, and surveys of complex areas.
Mavic Mini 4 Pro Drone		A lightweight and versatile drone, suitable for rapid surveys and photogrammetry in hard-to-reach areas, while maintaining good image quality.
Geometrics MagArrow II magnetometer		A device for measuring variations in the Earth's magnetic field, used in geophysical prospecting to identify buried structures, intrusions, and magnetic anomalies in the subsurface.
LiDAR DJI ZENMUSE L2		A drone-mounted LiDAR sensor capable of generating digital terrain models even under vegetation cover, ideal for geomorphological studies and high-resolution mapping.

ERT PASI POLARES 32		An electrical tomography system that uses alternating currents to reconstruct the resistivity of the subsurface, used to identify aquifers, fractures, and lithological variations.
24-channel seismic system PASI GEA 24		Seismic equipment for refraction or surface wave surveys, used to determine stratigraphy, the depth of rigid layers, and dynamic parameters such as Vs30.
Seismic gun ISOTTA		Consisting of a cylindrical, tubular stainless steel body, it features a removable front section (cartridge chamber) designed to hold an 8-gauge blank or industrial cartridge (readily available at any gun shop). This cartridge chamber has no barrel, thus allowing for the axial ejection of the energy wave caused by the cartridge's explosion and generating "p" (longitudinal) and "s" (transverse) waves.
Hammer drill MAKITA DHR171RTJ		Power tool used for drilling through tough materials.

Schmidt's hammer and Burton's comb	 	Tools used to assess the quality of rock masses.
Sifters and hydrometers		Instruments for sediment grain size analysis, used to characterize loose materials and identify their origin and depositional processes.
Precision scale KERN PKS 360-3		A measuring instrument used to weigh laboratory materials and samples with high precision, such as in the case of particle size analysis or sediment moisture content analysis.
Sieve shaker		A device that facilitates particle size separation through controlled vibration, improving the reproducibility of sediment analyses.

Shear testing machine MATEST		Geotechnical equipment for measuring soil shear strength, which is essential for slope stability studies and geotechnical design.
Soil testing machine MATEST		A soil compressibility testing instrument used to evaluate the settlement and deformation characteristics of geological materials.
Carrot juicer MATEST		Equipment for extracting intact cylindrical samples from rock or soil, essential for geotechnical, geomechanical, and petrographic analyses.
Cut-off machine STRUERS Secotom-10		Equipment for the precise cutting of rock samples or cores, used in the preparation of thin sections and other laboratory samples.

Ovens		Drying and baking ovens used to prepare soil or rock samples, remove moisture, and conduct specific thermal tests.
Polishing Machine STRUERS LaboPol- 5		Equipment for grinding and polishing thin sections or rock surfaces, essential for high-quality petrographic analysis.
Vehicle Jeep Renegade 4xe		An off-road vehicle used to reach geological sites in remote areas, useful for transporting equipment and conducting fieldwork.
Stereoscopic microscope Zeiss Stemi SV 6 con Photonic PL100		A reflected-light microscope that enables macro- and microscopic observations of samples, useful for identifying structures, fractures, and coarse mineralogy.

Petrographic microscope Nikon Eclipse E200		A polarizing microscope used to analyze thin sections of rock and determine their composition and mineralogical textures.
Computing workstations		High-performance computers used for complex computations, 3D modeling, GIS, photogrammetry, and geophysical analysis.
External server		A dedicated remote computing server for large-scale simulations, geophysical processing, and the management of large datasets.
Tablet with stylus/GPS		Rugged tablet with a stylus and GPS navigation, used for field surveys, digital mapping, and field notes.

Hammers, sockets, magnifying glasses		Traditional manual instruments essential for geological surveys, structural analysis, leveling measurements, and detailed observations.
Cold room		A refrigerated environment designed for the storage of sensitive samples, saturated sediments, or biological materials for subsequent analysis.
Soil corer Eijkelkamp		A hand-held tool for taking stratigraphic soil cores, used in soil science, surface geology, and environmental surveys.
Micro reel Corr-Tek		A hydrometric device used to measure water velocity in shallow water (streams, lakes, ponds).