



DEPARTMENT  
OF GEOSCIENCES

YEARBOOK 2022

UNIVERSITY OF PADOVA

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OF GEOSCIENCES

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UNIVERSITY OF PADOVA

## A WORD FROM OUR DIRECTOR



In this brief introduction to the fourth edition of the Yearbook, I would like to summarize and point out some key aspects that occurred in 2022. Let's start with some numbers about people working in the Department. We are about 170 people: 69 professors and researchers (16 full professors, 31 associate professors, 22 researchers); 30 technical and administrative staff; about 100 PhD students and postdoc. Teaching activity has changed significantly over the last few years, by offering new courses and degrees. A new bachelor degree in "Earth and Climate Dynamics" was designed in 2022 (the degree will start in October 2023). Overall, we are involved in 9 bachelor and 10 master degrees, and we are hosting and managing 2 BSc ("Geological Sciences" and "Earth and Climate Dynamics") and 2 MSc degrees ("Environmental Geology and Earth Dynamics" and "Geophysics for Natural Risks and Resources"). The PhD course in

"Geosciences" keeps running very well, offering a large number of scholarships (20 in 2022) and attracting several students from abroad (25-35 % of the PhD students came from abroad over the last three years). What about our research activity? We performed very well in the last research assessment at national level (VQR 2015-19; results published in May 2022) and this allowed us to apply for the "Excellence Projects" funded by the Ministry of University and Research. The project "The Geosciences for Sustainable Development" was successful and will run for five years (2023-2027). Among the different activities of scientific dissemination, I would like to point out the great effort for the completion of the "Museum of Nature and Humankind" (Museo della Natura e dell'Uomo - MNU) that will include the former Department's collections (rocks, fossils and minerals) and other University collections of zoology and anthropology. The Museum will be open in June 2023. Prof. Fabrizio Nestola finished his appointment as Head of Department in September 2022. Many thanks to Fabrizio for his hard, and inspiring, work over the last four years. Finally, this Yearbook, as previous editions, is very rich of information and gives a comprehensive overview of the Department activities, enjoy the reading!

*Prof. Nicola Surian  
Head of the Department of Geosciences*

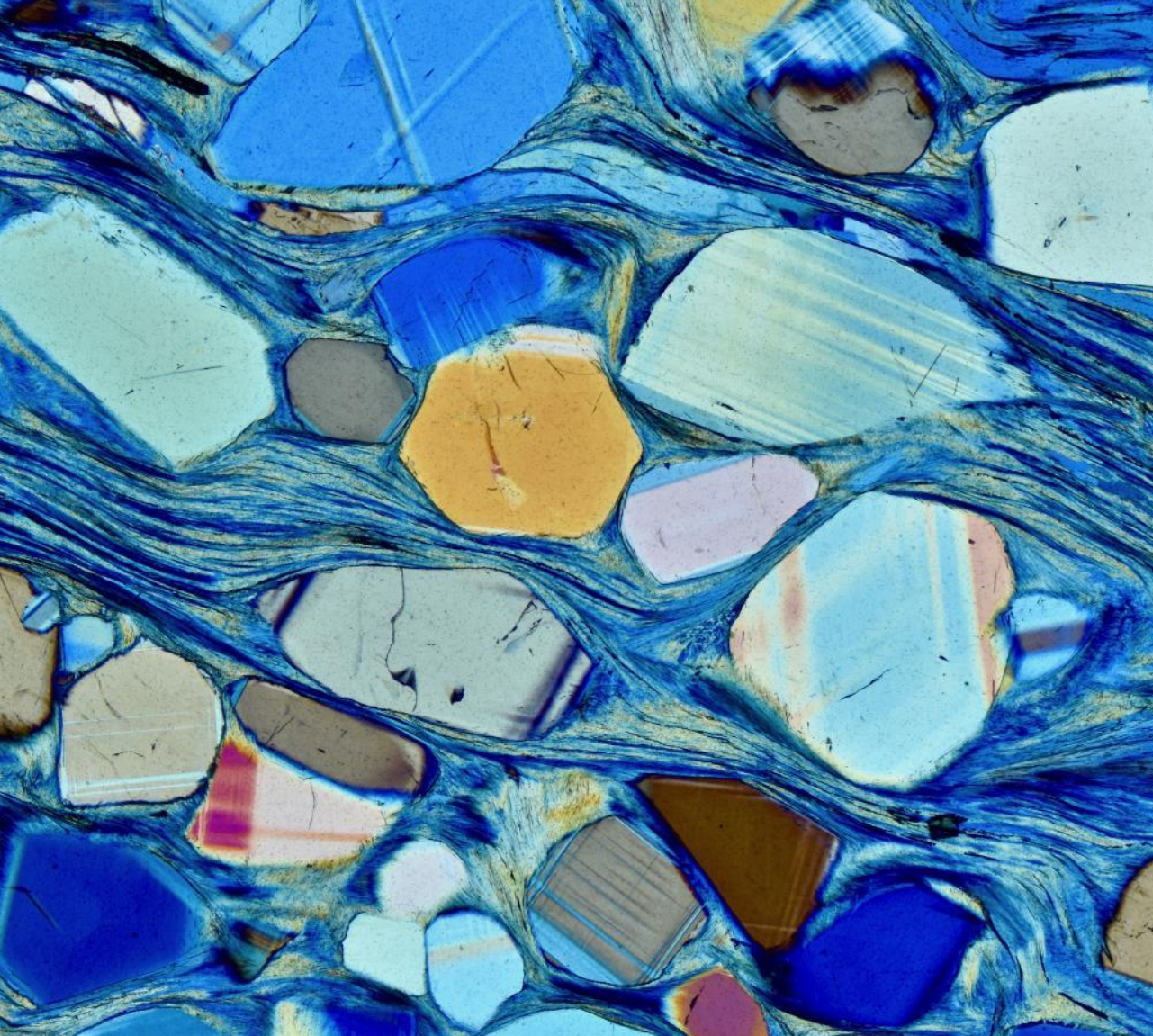


# History



## HISTORY *by L. Capraro*

The University of Padova played a fundamental role in promoting and advancing the development of modern Geology as we know it. Teaching of Earth Sciences at the University of Padova dates back to 1734, when A. Vallisneri Jr. bestowed to the “Magistrato dei Riformatori dello Studio di Padova” the extensive naturalist collections previously owned by his late father. In view of that, the course of study in “Storia Naturale Speciale” was established, this representing the ancestor of the modern Natural Sciences curriculum. Separation between biological (i.e., Zoology and Comparative Anatomy) and non-biological sciences occurred in 1869, when Giovanni Omboni was awarded the Chair of Mineralogy and Geology. In 1883, the geo-mineralogic collections, hitherto housed in the main building of the University (Palazzo del Bo), were further subdivided into a mineralogic and a geologic collection. The former Chair of “Storia Naturale Speciale” was accordingly converted and split into an Institute and Museum of Mineralogy (Chair Ruggero Panebianco) and an Institute and Museum of Geology (Chair Giovanni Omboni). In 1932, the mineralogic and geologic collections were moved to “Palazzo Cavalli” compound, where they are presently hosted. In the 1980s, Institutes were reformed into Departments, with further separations between the former institutions. At that time, Geosciences at Padova were structured into three separate Departments: the Department of Mineralogy and Petrology and the Department of Geology, Paleontology and Geophysics, both located at Palazzo Cavalli, and the Department of Geography, which was hosted in a separate building. In 2007, the Departments housed at Palazzo Cavalli merged into the Department of Geosciences, which is nowadays located in a building launched in late 2010. Since 2012, the Department also includes Physical Geographers previously afferent to the Department of Geography.



# Management



**NICOLA SURIAN**  
Head of the Department



**PAOLO NIMIS**  
Vice-Head of the Department



**PAOLA SARACINO**  
Head of the Administrative Staff



**CLAUDIA AGNINI**  
Coordinator of the PhD Programme



**PAOLO MOZZI**

Coordinator of first cycle degree in Geological Sciences and second cycle degree in Geology and Technical Geology



**GIORGIO CASSIANI**

Coordinator of the second cycle degree in Geophysics for Natural Risks and Resources





**Technical and  
administrative staff**

# ADMINISTRATION AND GENERAL SERVICES



PAOLA SARACINO  
Head of the Administrative staff



ANNA DI MURO



KATIA BELCARO



MARIA IRENE BERTULLI



LAURA CORAIN



CRISTIAN IOZZIA



MARIA LETIZIA MINOTTO



GIADA MIOTTO



MICHELA NORDIO



AMABILE PELOI

# SERVICES TO TEACHING, POST-LAUREAM, RESEARCH AND OUTREACH



ELISA FACCIOLO  
Service Coordinator



CATERINA CONGIU



ANGELA DE FALCO



PIERSAVINO LICHINCHI



STEFANIA VEGRO



SARA VETTORE

# TECHNICAL AND IT SERVICES



PAOLA SARACINO

Head of the Technical and IT staff



BRUNO CIERVO



ALBERTO DE LORENZI



MARIA ORNELLA ROSSIN



NICOLA PRATICELLI



ANTONELLA RASSU \*

\* Photo not published on request  
of the employee

# LABORATORIES AND SPECIALIZED SERVICES



LEONARDO TAURO  
Service coordinator



CARLOTTA BETTO



STEFANO CASTELLI



SILVIA CATTO'



MARCO FAVERO



GIAMPAOLO GIRARDI



NICOLA MICHELON



JACOPO NAVA



DARIA PASQUAL



ROBERTO MARIA ROSSI



LISA SANTELLO



**Full Professors**



**CLAUDIA AGNINI**

My research field is micropaleontology and I particularly focus on the study of calcareous nannofossils both as biostratigraphic and paleoceanographic tools.



**GILBERTO ARTIOLI**

My research interests are: the materials science of alternative and green building materials; Reuse and recycle of industrial materials for circular economy; solidification and stabilization of contaminated soils; the materials science of cultural heritage.



**ALESSANDRO CAPORALI**

My research interests are: Solid Earth Physics, Seismology; Seismic sources; Interpretation of space geodetic data for the measurement of surface deformation; Reference frames; Precision positioning; GNSS technology.



**GIORGIO CASSIANI**

My research interests are: Geophysical methods for environmental applications; Seismological micro-scale zoning and other soil dynamics uses of exploration geophysics; Integration of hydrological modeling with geophysical methods; Geomechanics for environmental applications.



**FILIPPO CATANI**

My research interests are: landslide hazard, machine learning applied to geohazards, surface processes monitoring and modelling, applications of remote sensing to landslide studies, oil & gas environmental impact and risk, surface monitoring in open-pit mines, scaling processes.



**BERNARDO CESARE**

I work on metamorphic petrology, with special interest for: High-grade metamorphism and partial melting of pelitic rocks; Origin of Granites; Fluid and melt inclusions; Petrologic mineralogy.



**FRANCESCA DA PORTO**

My research interests are: Seismic vulnerability; Analysis, intervention and monitoring of historic and modern masonry buildings, RC structures and bridges; Development of procedures for large scale assessment of seismic risk.



**ANDREA D'ALPAOS**

I am a hydraulic engineer who studies the biomorphodynamic evolution of coastal and fluvial landscapes in response to climate change and human pressure, through field observations, laboratory experiments, and mathematical modeling.



**GIULIO DI TORO**

I investigate earthquake physics and faulting by integrating: Field studies of seismogenic fault zones; Rock deformation experiments; Microstructural/geochemical investigations of natural and experimental fault zone products.



**SILVANA MARTIN**

My research interests are: Structural setting of the Alps; Geodynamics of subduction zones; Paleoseismogenic faults and material, Monitoring and dating alpine rock avalanches and landslides



**FABRIZIO NESTOLA**

My research interests are: Mineralogy under extreme conditions of pressure and temperature; Geothermobarometry of diamond-inclusion systems; Carbon phases in meteorites.



**CRISTIANO NICOSIA**

I am a geoarchaeologist who studies Bronze Age domestic contexts and that analyzes the sediments in and around archaeological sites to reconstruct the anthropic impact on the paleo-environment.





**PAOLO NIMIS**

My research fields are:  
Thermobarometry and  
geochemistry of mantle rocks and  
diamonds; Mafic-ultramafic-hosted  
seafloor massive sulfide deposits;  
Alpine copper metallogeny and  
provenancing.



**GIORGIO PENNACCHIONI**

My research interests are:  
Exhumed paleoseismic  
(pseudotachylite-bearing  
faults); Nucleation and  
localization in ductile shear  
zones; Microstructures in  
mylonitic zones; Fluid-rock  
interaction in the ductile field.



**CRISTINA STEFANI**

My research interests are  
composition and provenance of  
terrigenous sediments (sand  
composition and transparent  
heavy mineral associations) in  
different geological contexts  
for paleogeographic and  
paleoclimatic reconstructions.



**NICOLA SURIAN**

My research interests are:  
Geomorphic response to  
extreme flood events and  
assessment of flood hazard;  
Sediment dynamics and  
estimate of bedload transport  
in large gravel-bed rivers;  
Channel adjustments and their  
evolutionary trajectory and  
prediction of future scenarios.



**MASSIMILIANO ZATTIN**

My research interests are:  
Applications of thermochronology  
to tectonic evolution of orogenic  
chains, basin analysis, provenance  
studies and paleogeographic  
reconstructions; Feedbacks  
between tectonics, erosion,  
sedimentation and climatic  
variations.



Associate Professors



### **OMAR BARTOLI**

My research interests are: High temperature metamorphism; Crustal melting and granite formation; Melt inclusions in magmatic and metamorphic rocks; P-T-t evolution of high-grade metamorphic terranes; Volatiles in crustal magmas.



### **SIMONE BIZZI**

Fluvial Geomorphology in particular: the use of emerging remote sensing technology to develop model of sediment transport, sediment connectivity and fluvial processes in general. The use of this knowledge to support river management.



### **JACOPO BOAGA**

I'm an applied geophysicist. My research interests concern mainly engineering and environmental geophysics such as geophysics for natural hazard scenarios, electrical and electro-mag.



### **LAPO BOSCHI**

I study how waves propagate in complex media and apply this knowledge to a number of different fields of research, within the general domains of acoustics and seismology. I am interested in wave-based imaging in geology; sound localization in acoustics; acoustic display.



### **ANNA BREDI**

Facies analysis and sequence stratigraphy of clastic and mixed sedimentary successions of continental to shallow-marine environments in terms of depositional processes and stratigraphic architecture.



### **LUCA CAPRARO**

My research focuses on reconstructing the stratigraphy and climatic evolution of the Central Mediterranean during the Pliocene and Pleistocene based on the study of onland marine sediments from Southern Italy.



**MARIA CHIARA DALCONI**

My research activity focuses on mineralogy applied to the study of industrial materials and their impact on the environment. I mainly use powder diffraction technique to characterize raw materials, industrial materials and their by-products and wastes.



**PAOLO FABBRI**

My research field includes: Geostatistics in hydrogeology; Hydrogeology of geothermal areas; Hydrogeological parameterization of aquifers.



**MANUELE FACCENDA**

I am a solid earth geophysicist working on numerical simulations of plate tectonics and mantle convection processes. I aim at improving our understanding of the Earth's dynamics by reproducing the complex interplay of different geological processes.



**MARIO FLORIS**

My research field includes: Probabilistic and deterministic modeling of rainfall-induced landslides; GIS-based landslide hazard analysis; Remote sensing techniques in landslide identification and characterization; A-DInSAR techniques for subsidence and landslide analyses.



**ALESSANDRO FONTANA**

I am a geomorphologist and Quaternary geologist with interest in the evolution of the alluvial and coastal environments and in the geoarchaeological aspects.



**ELIANA FORNACIARI**

My research interests are upper Cretaceous-Cenozoic calcareous nannofossil biostratigraphy, biochronology and paleoecology with special reference to tempo and mode of the extinction/recovery pattern of nannofossils during environmental perturbations.



### **ANTONIO GALGARIO**

My research interests are: Geothermics; Artificial Intelligence; Machine learning; Landslides risk, early warning and monitoring.



### **MASSIMILIANO GHINASSI**

I am a clastic sedimentologist working mainly on alluvial and coastal deposits. I aim at improving models to interpret the sedimentary record by linking sedimentary products with modern processes and experiments.



### **LUCA GIUSBERTI**

I study foraminifera as tools for investigating the climatic variability in the Cretaceous and Paleogene. Secondly, I am currently working on several aspects of Italian Cretaceous and Paleogene Fossil-Lagerstätte.



### **LARA MARITAN**

I work on mineral-petrographic application to cultural heritage materials and sites, archaeometry, new mix design for sustainable brick production.



### **MATTEO MASSIRONI**

My research interests are: Exploration and geology of planetary surfaces and small bodies of the Solar System; Geological mapping including Remote Sensing, GIS and 3D modelling; Fault architectures and regional tectonics.



### **CLAUDIO MAZZOLI**

Petrography applied to archeological materials, and stone deterioration. New building materials using industrial waste. Petrography and geochemistry of carbonates in paleoclimate studies. Radon risk. Metamorphic petrology and monazite geochronology.



### **STEFANO MONARI**

I focus on all aspects of paleontology of Mesozoic bivalves and gastropods, including systematics, phylogenetic analysis, stratigraphical significance, paleoecology and paleobiogeography.



### **PAOLO MOZZI**

My research fields are: Geomorphology; Quaternary geology; geoarchaeology; palaeopedology; alluvial, glacial and lagoon landforms and deposits; geomorphological mapping; mapping of Quaternary deposits.



### **MARTHA PAMATO**

I study unique samples forming in the deep Earth, such as inclusions in diamond. I also conduct experiments to determine the properties of mantle minerals. My research goal is to understand the structure, composition and evolution of the Earth.



### **LEONARDO PICCININI**

My research focuses on applied geology and hydrogeology.



### **NEREO PRETO**

My research fields are: Stratigraphy, sedimentology and cyclostratigraphy of carbonate platforms; isotopic geochemistry; petrology and diagenesis of carbonates aimed at paleoclimatic reconstructions and modelling the depositional architecture of carbonate platforms.



### **MANUEL RIGO**

My cross-disciplinary research aims to decipher the evolution of the Earth, evaluating the role of the oceanic processes in the global climate and environmental changes on modern and geological timescales.



**GABRIELLA SALVIULO**

Application of iron oxide nanoparticles for waters and soils remediation from heavy metals and the role of soils mineralogical composition in the pollutants release. Relationships between mineralogy, sustainability human rights.



**RAFFAELE SASSI**

My research fields are: Petrology; tectono-metamorphic evolution of crystalline basements; crystal chemistry of micas; Cultural Heritage materials; radon occurrence vs. geology s.l..



**PAOLO SCOTTON**

My research focuses on: Debris Flows; Snow avalanches; Geothermal heat exchange.



**ALBERTA SILVESTRI**

My research activity focuses on archaeometric studies of ancient glass (vessels, mosaic tesserae, stained glass and glazes), aiming at identifying raw materials, production technologies and alteration processes.



**RICHARD SPIESS**

Understanding the significance of microstructures within terrestrial and extraterrestrial rocks. Study of microstructures within experimentally formed and deformed rock analogues. Metamorphic petrology. Geodynamics. Microstructures in all materials.



**TELEMACO TESEI**

My research interests are: Structural geology of faults and shear zones; Experimental rock mechanics and earthquake mechanics; Microtectonics.



**LUCA VALENTINI**

I work on design, characterization and modelling of sustainable building materials based on clay and industrial waste.



**DARIO ZAMPIERI**

Brittle tectonics (kinematic analysis of faults, transfer zones, natural fracture systems, active tectonics, geological structure of geothermal fields, rockslide hazard), geological mapping, geodynamics of the Adria plate, humans as geomorphic agents.





Assistant Professors



**ROBERTO GATTO**

All aspects of paleontology of Mesozoic and Cenozoic benthic molluscs, especially gastropods, including systematics, paleoecology, paleobiogeography and evolution.



**CHRISTINE MEYZEN \***

Tectonic, magmatic, and hydrothermal processes at mid-ocean ridges. Composition, evolution and dynamic of the earth's mantle. Formation of the oceanic lithosphere and crustal evolution at ridges.

\* Photo not published on request of the employee



RTDa



**ILARIA BARONE**

The focus of my research are seismic waves, in particular surface waves, to derive information about the deep to shallow structures of the subsurface.



**RICCARDO BIONDI**

I use remote sensing to investigate extreme atmospheric events such as severe convection and volcanic clouds.



**BRUNA BORGES-CARVALHO**

My research interests are: Anatexis at high to ultra-high temperature and ultra-high pressure conditions; Melt and fluid inclusions in peritectic garnet; Volatile contents of granitic magmas; Fluid regime of the deep crust.



**CHIARA COLETTI**

My main research interests are: Cultural Heritage decay and climate change; Green solutions for new mix design recycling waste; Radon occurrence in soils, rocks, and construction materials.



**ELOISA DI SIPIO**

My main research interests are geothermal energy resources, geophysics application to geothermal studies, petrophysical characterization of lithological materials and hydro-geological characterization (e.g. saltwater intrusion, isotope geochemistry).



**MARCO DONA'**

Passive control of structures and building contents by seismic isolation and energy dissipation. Seismic behaviour of structural and non-structural masonry elements. Seismic vulnerability and risk of structures and infrastructures.



### **ALVISE FINOTELLO**

Alvisè's research interest focuses on the study of how the complex interactions between water, sediment, vegetation, anthropogenic pressures, and other environmental factors control the evolution of fluvial and coastal landscapes.



### **MICHELE FONDRIEST**

I am a structural geologist and my research interests are: the internal structure and mechanics of seismogenic fault zones; rock deformation and fluid-rock interaction experiments; near-surface geophysics in fault zones.



### **SANSAR RAJ MEENA**

My research interests are in using Remote Sensing and Geographic Information Systems for natural hazard and risk assessment with the focus on landslide problems, especially in the use of spatial information for landslide detection and hazard assessment.



### **RICCARDO POZZOBON**

My research focuses on planetary geology and structural geology. The main topics are 3D geo-modeling of planetary surface/subsurface, structures related to diapirism, mud volcanism and lava tubes and planetary analogues.



### **SANDRO ROSSATO**

I am a geomorphologist interested in the evolution of Alpine valleys and alluvial plains in the late Quaternary. I mainly work in geological mapping, DEM analyses and geochronological investigations.



### **GIACOMO VINCI**

The general goal of my research is to understand the evolution of landscapes through time and the interplay between human and the environment in the past.



**RTDb**



### **FRANCESCO MARRA**

I'm interested in the interface between atmospheric processes, climate/global change, hydrology, and geomorphology, with a special focus on hydro-meteorological extremes and related hazards approached with advanced statistical methods.



### **DAVIDE NOVELLA**

I am an experimental geochemist studying global geochemical cycles (particularly of volatile elements and stable isotopes) to understand the evolution of the solid Earth via magmatic processes.



### **VALERIO OLIVETTI**

My main research interests are tectonics, orogenic processes, quantification of erosion, thermochronology.



### **PIERO POLI**

I am an observational seismologist working with data to understand how earthquakes starts and characterize the structure of the Earth.



### **ASCANIO ROSI**

My research interests are landslide hazard and risk assessment from local scale to wide areas; Artificial intelligence applied to landslide hazard forecasting; remote sensing, surface processes mapping, monitoring, and modelling.



Post-Doc





### **JACOPO AMALFITANO**

My research interests comprise the evolution of fossil ichthyofaunas, in particular of northeastern Italy, during the Cretaceous climatic hyperthermal events.



### **AIKATERINI ANESIADOU**

My research work focuses on the analysis of extreme weather events with regard to aviation safety. My research interests are in atmospheric physics, air pollution, meteorology and remote sensing.



### **LÁSZLÓ E. ARADI**

The aim of my research is to reveal the fluid regime in the deep lithosphere by studying fluid and melt inclusions, especially with 3D Raman mapping.



### **ANNA BARBARO**

My research interests are: mineralogy applied to the study of extraterrestrial materials; investigations of carbon phases in ureilites meteorites; minerals under extreme conditions of pressure and temperature (dynamic shock).



### **ELENA BELLIZIA**

My research focuses on morphological and sedimentological features of Holocene channel belts in the Venetian Plain (IT)



### **VLADIMIRO BOSELLI**

1) Time-reversal and source localization by elastic waves: application to the sonar of dolphins. 2) SPECFEM3D, OpenFoam modelling. 3) Wadi Hydrology. 4) Terraced Agroecosystems. 5) History of hydrology and geosciences.



**ELISA BOZZOLAN**

My research focuses on identifying new tools and indicators that can better explain how rivers evolve in space and time. With that aim, we are now combining satellite images and physically-based models to track changes in the morphology of the Po river.



**ANDREA BRENNA**

I am a fluvial geomorphologist. My research interests focus on sediment dynamics in gravel-bed rivers, and responses of mountain streams to high-magnitude hydrological events.



**ELISA CANDEO**

My research deals with the application of photogrammetry techniques for the three-dimensional mapping of human skin and the use of IR thermography for the diagnosis of melanoma cancer.



**CATERINA CANOVARO**

My research is focused on the study of ancient copper and bronze artefacts. The main goal is to establish the geological origin of the metal employed, by investigating each sample from a mineralogical, metallurgical, chemical and isotopic point of view.



**DAVIDE CAPPELLARI**

My research is focused on the hydrogeology of the Venetian Plain and on the sustainability of groundwater resources, evaluated through numerical modeling.



**EDOARDO CARRARO**

My research interests concern the improvement and integration of different slope monitoring methods for landslides hazard assessment, as well as the processing of monitoring data for ear-ly-warning purposes.



### **SANDY CHKEIR**

A first stage researcher on ALARM project related to air traffic management and aviation safety in Europe. My research interests comprise machine learning applied in remote sensing and environmental risks, specifically nowcasting extreme weather events around Milano Malpensa and Brussel airports



### **FEDERICA CHIMENTO**

My research interest comprise the Eocene-Oligocene boundary stratigraphy and Oxygen and Carbon stable isotope analysis, in particular in the Berici Hills, Northeast Italy. This work is in the framework of the Interreg Italia-Slovenia Project "Geokarst" as the study of a test area.



### **MARTA DAL CORSO**

My research interests concern the interaction of people with plants in the past, with a focus on prehistoric Europe. Palynology and phytolith analysis are applied to reconstruct vegetation history and different plant uses by human communities.



### **GIORGIA DALLA SANTA**

My main research interests are: Shallow geothermal systems for building conditioning, mechanical and permeability effects induced by freezing-thawing processes in sediments, sediments and rocks thermal properties; FEM modelling of fluid and heat transfer processes in porous media.



### **ILARIA MARIA D'ANGELI**

I am a speleologist and geomorphologist with main expertise in the field of hypogene cave systems. I focused on the study of sulfuric acid caves of Italy. Currently I'm working on the synthesis of titanate nanotubes with the aim of use them in environmental remediation.



### **ISOLINA DIAZ RAMOS**

My research interest are on architectural finishes conservation, building heritage, historic urban landscapes, colour, historical use of pigments, composition of mortars and the texture of renderings



### **SABRINA FERRARI**

I am a planetary geologist working on non-ambient condition spectroscopy. My current research focuses on hyperspectral imaging acquisition and analysis.



### **LUIGI GERMINARIO**

My research field is heritage science, e.g., stone decay and durability in historical buildings, caves, and geoheritage; impact of air pollution, climate change, microclimate, and water; provenance of archaeological stone.



### **RODRIGO GOMILA OLMOS DE AGUILERA**

I am a Structural Geologist. My area of interest and research is the dynamic interaction between hydrothermal fluids and fault-zones in the crust at seismogenic structural levels.



### **FRANCESCO GOSIO**

I'm field work geologist of the 061 Borgo Valsugana sheet within the national cartographic project CARG. My research focuses on the Southalpine basement and its associated intrusive bodies mapping and petro-structural analysis.



### **VERONIKA IVÁN**

My main research interests are hydrogeophysics and sustainable water management. Currently I am investigating soil-water-plant interactions and hydrogeological processes by geophysical methods.



### **ROSALIA LO BUE**

My research focuses on the study of Mt. Etna through P-wave anisotropic seismic tomography with the main goal of bringing new insights into the complex structures beneath the volcano.



**BENJAMIN MARY**

I study soil-plant interactions for water using geophysics.



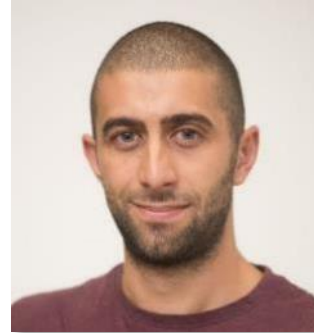
**ALESSANDRA MASCITELLI**

My research activity has been carried out within the project titled "SESAR-ALARM" funded by European Union. During my fellowship I worked with big datasets with different formats and from different sources and I worked on the selection of areas with high convective risk near airports.



**ALESSIA MODESTI**

I am a field work geologist of a Carg project. My research consists of mapping the crystalline basement and Cima d'Asta intrusive body of 061 Borgo Valsugana sheet. I complete this work by the petrographic study and petro-chemical analyses.



**SIMONE MOLINARI**

Application of iron nanoparticles for industrial wastewater remediation. Use of an innovative system (HPSS) for stabilizing and recycling of highly polluted soils.



**ALBERT DE MONTSERRAT NAVARRO**

My research aims at understanding the development of mechanical anisotropy in multi-phase aggregates, and its role in geodynamic processes.



**SIMONE PAPA**

My research focuses on the microstructural record associated with earthquakes, both in natural (pseudotachylite-bearing) and experimental faults, as a tool for understanding the rheology of the lower crust.



### **FRANCESCO RAPPISI**

My research interests cover the field of seismic imaging with particular attention to seismic anisotropy used as tool to constrain upper mantle structures and dynamics.



### **GIULIA RICCI**

I am an archaeological scientist working on the diagnostic of Cultural Heritage encouraging interdisciplinary connections. My current research is the characterization and radiocarbon dating of historical mortars aiming at contributing to the cultural valorization of the built heritage.



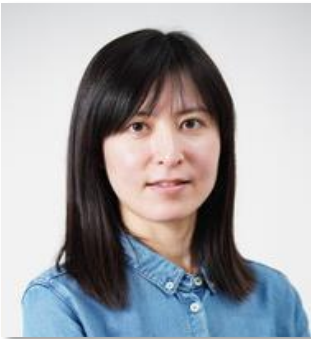
### **LIVIO RONCHI**

I am mostly interested in the evolution of alluvial plains linked to the last marine transgression.



### **ELISA SALER**

My research field focuses on seismic vulnerability assessment at large scale of masonry and r.c. school buildings, for the evaluation of seismic risk and damage scenarios.



### **HONAMI SATO**

My research interests are: Geochemistry and stratigraphy of Mesozoic successions to understand environmental changes through Earth history and its trigger (e.g. extraterrestrial impact and volcanic events).



### **DAVIDE TOGNIN**

My research topic focuses on the morphodynamic evolution of tidal systems under natural and anthropogenic changes, through field observations and numerical modelling.



### **GLORIA TOGNON**

My research interests are the geology of planetary bodies, the production of geologic maps through remote sensing and GIS, the integration of geology and spectral information, the dating of planetary surfaces.



### **ROBERTO TONUCCI**

Implementation of a hydrogeological numerical model of Venetian plain, starting from a dataset made up of the data collected from boreholes in Veneto region.



### **FABRIZIO TURSI**

I am a petrologist working in the field of metamorphism. I investigate changes in intensive and extensive thermodynamic parameters recorded in rock microtextures to gain information on tectono-metamorphic processes that occurred, and still do, in the Earth's lithosphere.



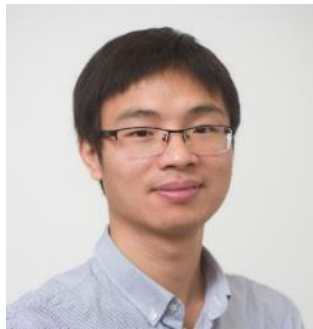
### **FILIPPO TUSBERTI**

My research aims to develop and study 3D models of ancient coral reefs, located in the Berici hills.



### **BRANDON VANDERBEEK**

My research focuses on improving seismic imaging strategies to better constrain the anisotropic structure of Earth's interior.



### **JIANFENG YANG**

I am a geodynamicist working on the numerical modeling of subduction zone dynamics and intraplate volcanism. I apply the petrological-thermo-mechanical models to study the complex dynamics in the Mediterranean region.



PhD students





**FEDERICA BUBOLA**

*C. Mazzoli, E. Balliana, C. Coletti*

Diagnostic study and assessment of the conservation state of the plaster replicas of the Colonna Traiana located in the Museo della Civiltà Romana (Rome).



**PIETRO CALZONI**

*L. Giusberti, G. Carnevale*

Fish fauna paleobiodiversity during the early Paleogene greenhouse world: the Fossil-Lagerstätten record of northeastern Italy.



**NICOLE COSTA**

*M. Massironi*

Integrating spectral, radar data and 3D modelling to investigate the stratigraphy of the Martian Polar Caps.



**GIANMARIO DEL PICCOLO**

*M. Faccenda*

Exploration of innovative methods for the inversion of seismological data and their optimization for seismic tomography models.



**FILIPPO DISCONZI**

*G. Artioli*

Physico-chemical properties and reactivity of silicate melts by thermodynamic modelling. Implementation for valorization and engineering of steel slags.



**ALESSANDRO FONTANARI**

*G. Artioli*

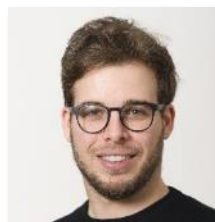
Ceramic manufacturing process optimization and recovery of waste materials.



**MARCO GASPARI**

*F. Da Porto*

Seismic risk assessment of building classes.



**RICCARDO GUIDA**

*G. Artioli*

Use of the mineralized phase in cements: mechanisms of interaction between the components and the long-term cement and alternative uses to SCM.



**CHIARA LUCARELLI**

*G. Artioli*

Archaeometric investigations on Bronze Age metal artifacts from Southern Italy.



**MARIA EMANUELA MASCARO**

*L. Maritan*

Lying on the seabed: modelling post-depositional alteration of pottery in marine environments.



**NICOLA MOLON**

*F. Da Porto*

Optimization of SHM system for infrastructural safety.



**MICHOL RAMPADO**

*F. Da Porto*

My research field focuses on seismic vulnerability assessment of churches through multiscale modelling approaches.



**LEIDY CAROLINA SANDOVAL ESPINEL**

*M. Zattin*

Thermotectonic history of the southernmost northern Andes.



**FRANCESCA UGUAGLIATI**

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Microplastics in rivers: from depositional processes to the Anthropocene stratigraphic record.



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Experimental studies of fluid-rock interaction and seismic cycle in geothermal fields.



**BEATRICE BASCHETTI**

*M. Massironi, C. Carli, F. Altieri*  
Understanding the Noachian-Hesperian transition in the area of Meridiani Planum, Mars: a stratigraphic, compositional and morphological study



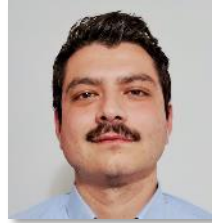
**KUSHANAV BHUYAN**

*M. Floris, C. Van Westen, F. Catani*  
Application of complex artificial intelligence models in landslide investigation and assessment



**TEGAN BLOUNT**

*A. D'Alpaos, S. Silvestri, M. Marani*  
Salt marsh and seagrass meadow dynamics: sediment origin and carbon sequestration capacity



**AMEDEO CAPRINO**

*F. Da Porto, M. Floris*  
Integrated monitoring and modelling approaches for better assessment of structural response to natural hazard



**MIRIANA CHINELLO**

*G. Di Toro, E. Spagnuolo, O. Plümper*  
Formation of polished surfaces in natural rocks: experimental and field constraints



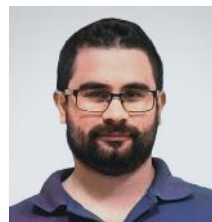
**ANDREA CURTOLO**

*D. Novella*  
The distribution of volatile elements in the Earth's mantle



**MARINA FACCI**

*A. Galgari, P. Marchetti*  
Deep Closed Loop Geothermal Heat Exchanger and Energy Transition by O&G Wells Reuse



**SEBASTIAN GRANADOS**

*N. Surian*  
Fluvial processes and flood hazard in humid tropical catchments of Costa Rica



**XIAOQIN JIAO**

*M. Zattin, V. Olivetti, J. Wang*

Single-grain multi-technique dating of sediments: a new approach to study the uplift and exhumation of the northeastern Tibetan Plateau



**RICCARDO MAITAN**

*M. Ghinassi*

Peak-discharge variability in meandering rivers: linking morphodynamics to sedimentary products



**ALESSANDRO MICHIELOTTO**

*A. D'Alpaos*

Management strategies for coastal ecosystems in the face of climate change and increasing human pressure



**SARA MOZZON**

*F. Da Porto, A. D'Alpaos*

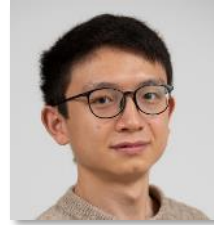
Assessment and mitigation of climate change impact on urban systems



**LORENZO NAVA**

*F. Catani, E.M. Monserrat*

Improving multi-scale landslide forecasting with machine intelligence.



**JUN REN**

*M. Faccenda, D. Novella*

Mantle metasomatism and devolatilization from coupled thermo-mechanical and petrological simulations



**FEDERICA VANZANI**

*A. Fontana, P. Mozzi*

Remote sensing in the geomorphological and geoarchaeological study of alluvial plains



**QIANGWANG WU**

*M. Rigo*

Upper Triassic conodont biostratigraphy and phylogeny in the Tethyan realm



**ELENA ZANOLA**

*L. Capraro, P. Ferretti, A. Di Stefano*

Timing, mode and tempo of the major climatic transitions of the Early Pleistocene: a central Mediterranean perspective





**ELEONORA BENÀ**

*R. Sassi, G. Ciotoli, E. Spagnuolo*  
Tectonic control on enhanced geogenic radon as a first order factor in radon hazard assessment



**LINDSAY CAPITO**

*S. Bizzi, N. Surian*  
Geomorphic responses to sediment connectivity at the river network scale



**MARIA ELENA GASTALDELLO**

*C. Agnini, L. Alegret*  
The latest Miocene-early Pliocene biogenic bloom: duration, causes and paleoceanographic implications



**MASSIMO DOMENICO NOVELLINO**

*A. Fontana, C. Ravazzi*  
Landscape evolution in northern Adriatic regions in the late Pleistocene



**MIRKO PAVONI**

*J. Boaga*  
Electrical and electromagnetic geophysical surveys in rock glacier environments



**SILVIA PULIERO**

*M. Floris, F. Catani*  
Detection and monitoring of slope instabilities through satellite SAR data in areas affected by extreme climate events



**LUKAS RETTIG**

*P. Mozzi, G. Monegato, M. Spagnolo*  
The equilibrium line altitude (ELA) in the southern fringe of the Alps during the Last Glacial Maximum



**MICHELA SIMONATO**

*E. Fornaciari, S. Gardin, L. Giusberti*  
Calcareous nanofossil evolution during upper Cretaceous paleoenvironmental stress. Testing the impact of oceanic anoxic event (OAE2) and the Late Turonian Events on the synchronism of biohorizons



**ANDREA BOSCAINI**

*A. Marzoli, N. Preto, J. Davis*  
Geochronology, geochemistry, and modelling of large magmatic events and global climate changes



**GIANLUCA CADELANO**

*A. Galgaro, A. Bernardi, G. Dalla Santa*  
Innovative solutions for ground heat exchangers



**PIETRO CARPANESE**

*F. da Porto*  
Seismic risk assessment on a territorial scale based on bayesian approaches and machine learning



**OLIVER CHRIST**

*F. Nestola, F.E. Brenker*  
Extraterrestrial diamonds in ureilites and meteorites



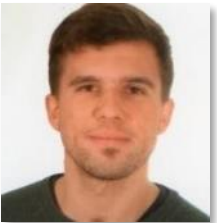
**WEI FENG**

*G. Di Toro*  
Investigation of seismic slip in experimental faults under hydrothermal conditions



**YIKAI LIU**

*G. Artioli, L. Valentini, M. Dalconi*  
Studies on the ionic transports in soil-binder systems



**LUDOVICO MASCARIN**

*L. Valentini*  
Classical and alternative cement binders: New Approaches to investigate the reaction kinetics



**SIMONE MASOCH**

*G. Di Toro, J. Cembrano, G. Pennacchioni*  
Structure, evolution and deformation mechanisms of large displacement seismogenic faults in the continental crust



**ALICE PUPPINI**

*A. D'Alpaos, M. Marani*

Marsh biomorphodynamics under natural and anthropogenic changes through field observations and their modelling interpretation



**APSARA SHARMA DHAKAL**

*L. Boschi, I. Molinari*

Constraining the source of earthquake using time reversal seismic data



**PAWEL MICHAL SLUPSKI**

*B. Cesare, O. Bartoli, J. Majka*

Former melt inclusions from (U)HP gneisses of the Scandinavian Caledonides



**TOFFOL GIOVANNI**

*G. Pennacchioni, L. Menegon, A. Camacho*

Interaction between coseismic brittle deformation and ductile flow in the lithosphere



**ILARIA TOMASI**

*M. Massironi, C. Meyzen, F. Sauro*

Formation processes and evolution of large size lava tubes



**ALBERTO ZONTA**

*F. da Porto*

Development of seismic isolation systems for industrial racks



# XXXIV series (defended their dissertation in 2022)



**ELENA BELLIZIA**

*M. Ghinassi, A. D'Alpaos*

Sedimentary facies variability along fluvial and tidal meanders: examples from the Holocene Venetian Plain



**VALERIA CASCONI**

*J. Boaga, L. Boschi*

Ground motion seismic monitoring by the use of distributed low-cost sensors



**LUCA DEL RIO**

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Mechanism of formation of slip surfaces in carbonate-built rocks: seismic faulting vs. deep seated gravitational slope deformation



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Geodynamic and seismological modelling of the central-western Mediterranean mid-late Cenozoic dynamics and structure



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Advanced analytical diagnostics applied to human osteological remains

# XXXIV series (defended their dissertation in 2022)



**ALLYSON VIGANO'**

*C. Agnini*

Are calcareous phytoplankton affected by the onset of the Antarctica Ice-Sheet at the Eocene – Oligocene transition?



**YANG ZHICHENG**

*A. D'Alpaos, M. Marani, S. Silvestri*

Analysis of the eco-geomorphodynamic evolution of the Venice Lagoon through remote sensing observations and ancillary field surveys

*Joint degree with China University of Geosciences, Beijing (PRC)*



**XUE CHEN**

*M. Floris*

Testing multi-temporal InSAR techniques for geohazards analysis and assessment in different geological and geomorphological environments



**Our commitment  
beyond the Department**

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National Science Center, Poland	Project evaluator	Bernardo Cesare
University of Otago's Staffing Advisory Committee	Referee	Bernardo Cesare
Indian Institute of Technology Kanpur, India	Evaluator	Bernardo Cesare
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European Association for Earthquake Engineering	Chair - EAEE-WG10 "Seismic aspects of monuments preservation"	Francesca da Porto
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Accademia Nazionale dei Lincei (Italy)	Member of the Commission Environment and Natural Hazards & Risks of the National Academy of Lincei	Giulio Di Toro
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AISA Associazione Italiana per lo Studio delle Argille	Member of the directive commission of the national group AISA (Italian Association for the study of Clays)	Lara Maritan
INGV	evaluator of projects presented to the INGV on cultural heritage	Lara Maritan
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UNIPD	(2020-present) Executive Board Interdepartmental Center for Research in History and Philosophy of Science, University of Padova (Consiglio Direttivo Centro Interdipartimentale di Ricerca in Storia e Filosofia della Scienza, CISFIS)	Raffaele Sassi
UNIPD	Member of the Board of Directors of the Ing. Aldo Gini Foundation	Raffaele Sassi
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# Projects and funding



## **PROJECTS AND FUNDING**

*by M. Ghinassi*

Research activities carried at the department in 2022 spread over different projects. Consolidation of research activities focusing on classical Earth Science research themes has been carried out in parallel with focusing on new research fields, e.g. planetary geoscience, and increasing of work in the frame of applied research. Research work was carried out both in north-eastern Italy, e.g. Dolomites, Venetian and Friulian Plain, Venice Lagoon, and also in areas hosting the most geologically relevant site around the world (Africa, Asia, North and South America, Australia and Antarctica) and on other planets (Mars and Mercury). A wide range of fundings supports our studies, with economical support coming from the European Commission (e.g. ERC projects, collaborative H2020 projects, Marie Skłodowska-Curie Individual Fellowships), the Italian Ministry of University and Research (e.g. PRIN projects, PNRA projects dealing with Antarctica), the University of Padova, public institutions and agencies, private foundations and companies. The staff of the department is involved in several international projects, highlighting that the department is successful and attractive for ambitious projects, such as ERC grants and MSCA fellowships, and show the department staff has established solid research networks at the national and international levels. Several research activities funded or supported by private companies, e.g. Mapei SpA, and foundations (e.g. Cariparo Foundation) highlight the occurrence of solid collaborations in the frame of applied research and studies on regional development. The University of Padova provides an annual economic support to the Department providing BIRD research funds. In 2022 these funds allowed the Department to support basic science studies and research activities. These funds were used to both provide per capita economical support to researchers and to open two internal calls for research projects, which allowed applicants to consolidate their research themes or to develop new ones. In 2022, the Department worked to conclude the 'Project for the Development of the department (2018–2022)', that was funded by the University of Padova. This project placed great emphasis on the role of geosciences in the Anthropocene period and on the link between science and society, and allowed several laboratories of the Department to be implemented to reach excellent quality standards.

PROJECT NAME	HANDLER	FUNDING BODY
NEw Window inTO Earth's iNterior - NEWTON	Manuele Faccenda	EXCELLENT SCIENCE - European Research Council (ERC)
GEOarchaeology of DAily Practices: extracting bronze age lifeways from the domestic stratigraphic record - GEODAP	Cristiano Nicosia	EXCELLENT SCIENCE - European Research Council (ERC)
Geophysical Roots Observation for Water savING in arboriculture, viticulture and agronomy - GROWING	Benjamin Mary	EXCELLENT SCIENCE - Marie Skłodowska-Curie Actions
Fluid-Rock InteraCTION at hydrothermal conditions during the seismic cycle	Rodrigo Gomila Olmos de Aguilera	EXCELLENT SCIENCE - Marie Skłodowska-Curie Actions
multi-hAzard monitoring and early wARning systeM - ALARM	Nicola Surian	H2020
Satellite-borne and IN-situ Observations to Predict The Initiation of Convection for ATM - SINOPTICA	Nicola Surian	H2020
Il ciclo profondo dell'ossigeno terrestre studiato attraverso gli isotopi stabili del ferro	Davide Novella	Programma per Giovani Ricercatori "Rita Levi Montalcini" 2018
Crustal anatexis up to ultra-high temperature conditions in Antarctica	Bruna Borges Carvahlo	PNRA 2018
Carbon minerals in Frontier Mountain ureilites of the Museo Nazionale dell'Antartide, Siena, Italy (COMMANDER)	Fabrizio Nestola	PNRA 2018
SourcE and impact of greeNhouSE gasses in AntarctiCA (SENECA)	Raffaele Sassi	PNRA 2018
Mineral reactivity, a key to understand large-scale processes: from rock forming environments to solid waste recovering/lithification	Gilberto Artioli	PRIN 2017
The Dynamic Mass Transfer from Slabs to Arcs - Dynastars	Bernardo Cesare	PRIN 2017
A new global volcanic-driven carbon cycle perturbation at the Norian/Rhaetian Boundary, Late Triassic	Manuel Rigo	PRIN 2017

Intraplate deformation, magmatism and topographic evolution of a diffuse collisional belt: Insights into the geodynamics of the Arabia-Eurasia collisional zones	Massimiliano Zattin	PRIN 2017
Most Easy, Efficient and Low-Cost Geothermal Systems for Retrofitting Civil and Historical Buildings - Geo4civhic	Antonio Galgaro	H2020
Development of a Decision Support System for Improved Resilience & Sustainable Reconstruction of historic areas to cope with Climate Change & Extreme Events based on Novel Sensors and Modelling Tools	Claudio Mazzoli	H2020
Europlanet 2024 Research Infrastructure - EPN 2024-RI	Matteo Massironi	H2020
Deep U-tube heat exchanger breakthrough: combining laser and cryogenic gas for geothermal energy exploitation	Eloisa Di Sipio	HORIZON EUROPE
Climate change risk to underwater cultural heritage in stone	Luigi Germinario	EXCELLENT SCIENCE - Marie Skłodowska-Curie Actions
CLOsing the loop: building Circular sKILLS on the entire value chain	Silvia Gross	EIT RAW Materials
Reviewing and integrating methods for the Conservation of European architectural finishes in urban hEritage townsCapes	Isolina Del Pino Diaz Ramos	EXCELLENT SCIENCE - Marie Skłodowska-Curie Actions
Piattaforma per la valutazione del rischio: innovazione insurtech per la stima di perdite economiche PERIL	Francesca Da Porto	UNI-IMPRESA 2021
Tidal network dynamics as drivers for ecomorphodynamics of low-lying coastal regions (TiDyLLy)	Alvise Finotello	STARS Grants Call 2021
Slow To Instantaneous Fracture sealing by chemically-active Fluids: the damage-recovery cycle in fault zones – (STIFF)	Michele Fondriest	STARS Grants Call 2021
DIRt AND Excrements: Integrating high-resolution sediment analysis and advanced biomolecular archaeology DIANE	Cristiano Nicosia	Progetto FARE Ricerca in Italia: Framework per l'attrazione ed il rafforzamento delle eccellenze per la Ricerca in Italia – III edizione
High-stress earTHquakes by fAuLting in dEep dry rockS (THALES)	Giorgio Pennacchioni	PRIN 2020

Rome aux siècles "obscur". Les lumières de la communication visuelle, Ve-XIe siècles ( <a href="http://p3.snf.ch/project-192854#">http://p3.snf.ch/project-192854#</a> ).	A. Silvestri	Suisse National Science Foundation (SNSF)
Satellite-borne and IN-situ Observations to Predict The Initiation of Convection for ATM (SINOPTICA)	R. Biondi	EU – H2020.3.4.7 SESAR Programme
Source and impact of greenhouse gasses in Antarctica (SENECA)	C. Mazzoli	MUR – PNRA
SPICE (Seismic wave propagation and imaging in complex media: a European network)	L. Boschi	EU
Study of Ornithogenic Soils to investigating the Palaeoenvironmental Evolution after the Last Glacial Maximum in Victoria Land (Antarctica)	L. Maritan	PNRA
Water mixing in the critical Zone: observations and predictions under environmental changes – WATZON	G. Cassiani	PRIN





Laboratories



## **LABORATORY FACILITIES** *by S. Monari*

A relevant addition to the facilities of the Department is the Laboratory of Micromorphology for the production of soil and sediment thin sections. This laboratory will be fully operational in 2023 and has been realized with the funding provided by the ERC Consolidator project GEODAP (Geoarchaeology of Daily Practices) and by the FARE – Ricerca in Italia project DIANE (Dirt and Excrements). Thanks to the funding provided by the development plan of the Department, new equipment and instruments have been acquired to improve the efficiency of our laboratories. At the beginning of 2022, a new high-performance XRF spectrometer (sequential WDS Malvern Panalytical Zetium) was installed in the X-ray Fluorescence Spectroscopy Laboratory. The Laboratory of Applied Petrography has been equipped with the portable optical profilometer NANOVEA Jr-25, the ArgoLab TCF200 Plus oven, an FDM climate chamber and a new 20 L autoclave customized by FDM. Since 2021, the ROTary Shear Apparatus (ROSA) of the Rock Mechanics Laboratory has been equipped with the hydrothermal vessel HYDROS. The laboratory also hosts an electromechanical universal tester, installed in 2022. Moreover, a laser diffraction particle size analyser Malvern Panalytical Mastersizer 3000 has been installed in the Geological Sample Preparation Laboratory. By the end of 2022, the technical staff of Geosciences Department was composed of 11 technicians operating in 25 laboratories. Operational activities in other ten laboratories were supported by researchers and temporary staff.

## MICROMORPHOLOGY LABORATORY

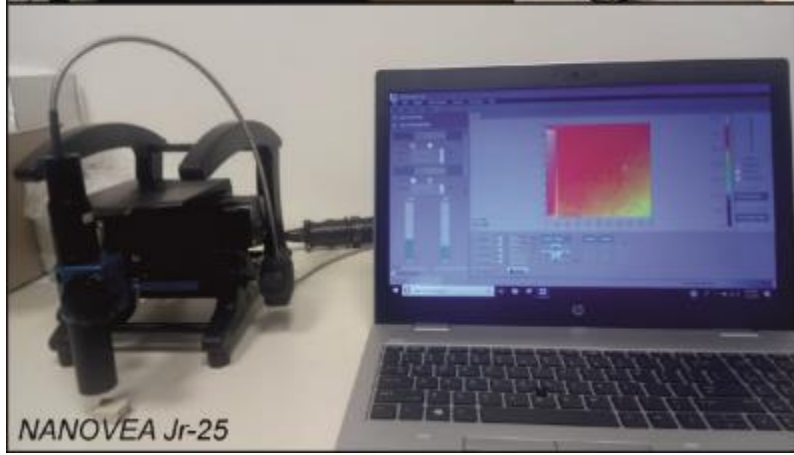
This laboratory is particularly intended for archaeological studies. It produces 60x90 mm thin sections, significantly larger than standard petrographic slides. Another difference with petrography is that, unlike rocks, archaeological sediments, soils, and other unconsolidated earth materials are very loose and friable. As such, they require consolidation before they can be transformed in 30  $\mu\text{m}$ -thick thin sections. Given that in this lab health and safety are priorities, consolidation is done with VOC- and diluent-free epoxy resins instead of hazardous polyester resins that are normally diluted with acetone or styrene. The choice of epoxy resin has been done after testing several products and trying different recipes. Total fume evacuation and dust trapping are assured throughout all the steps of the thin section production process. The laboratory relies on a large Memmert lab oven for preliminary sample drying. Consolidation with epoxy is done in a vacuum oven positioned within a fume cupboard, vacuum being necessary for resin to deep into the sample. With the proper combination of epoxy and vacuum the laboratory is capable of consolidating samples containing clay, peat, organic matter, "spongy" charcoal fragments, or heterogeneous archaeological materials like bone, metals or ceramic. Once the blocks are cured they are first cut with a Remet RT100 L diamond blade saw and trimmed down with a Logitech GTS-1 saw.

This machine is also used to cut off the excess sample after the chips are glued to the glass. Lapping can be done with loose abrasives using a Logitech LP70 lapping machine or with a diamond grinding wheel on a BROTH multiplate grinder. The laboratory is run by a dedicated laboratory technician, and as such is fully equipped to deliver, in a few weeks time, high-quality thin sections of archaeological soils and sediments for the GEODAP and DIANE projects.



## LABORATORY OF APPLIED PETROGRAPHY

A series of new facilities have been acquired and installed in the Laboratory of Applied Petrography. The first one is a NANOVEA Jr-25 portable optical profilometer. Based on chromatic confocal optical technology (axial chromatism), with the specific optical pen that we acquired, this equipment allows mapping surface topography over areas up to 25 x 25 mm, with vertical measuring range up to 1.1 mm and vertical resolution of 4 nm, providing the following standard surface measurement parameters: 3D and 2D mean roughness ( $R_a$ ,  $S_a$ ), root mean square roughness ( $R_q$ ,  $S_q$ ), maximum height ( $R_z$ ,  $S_z$ ), maximum pit height ( $R_v$ ,  $S_v$ ), skewness ( $R_{sk}$ ,  $S_{sk}$ ), kurtosis ( $R_{ku}$ ,  $S_{ku}$ ), and many more. This instrument is used to measure the surface topography of many different geological materials, e.g. to determine the recession of carbonate stones used in the cultural heritage. In the same Laboratory, an ArgoLab TCF200 Plus oven and an FDM climate chamber has been installed. The latter equipment allows controlling and programming relative humidity in the range 20-98% and temperature between  $-20^{\circ}\text{C}$  and  $+70^{\circ}\text{C}$ , with a net internal volume of 130 L, and is used to conduct accelerating aging tests on stones and other materials. Furthermore, a new 20 L autoclave has been installed in the same laboratory, customized by FDM in order to provide possible temperatures in the range  $0-100^{\circ}\text{C}$  and pressure up to 10 bars. By controlling the flux of  $\text{CO}_2$  and monitoring pH of water inside the chamber, it is possible to simulate the environmental conditions of underwater cultural heritage according to different ICPP scenarios, and evaluate their deterioration rate.





## XRF SPECTROMETRY LABORATORY

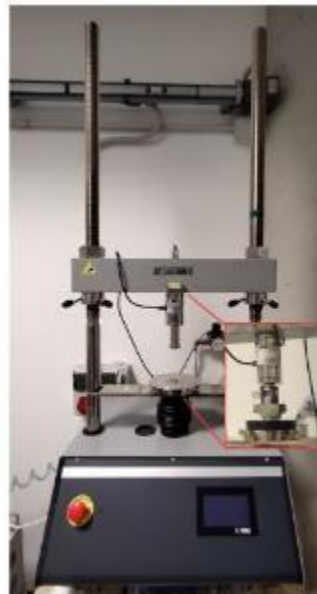
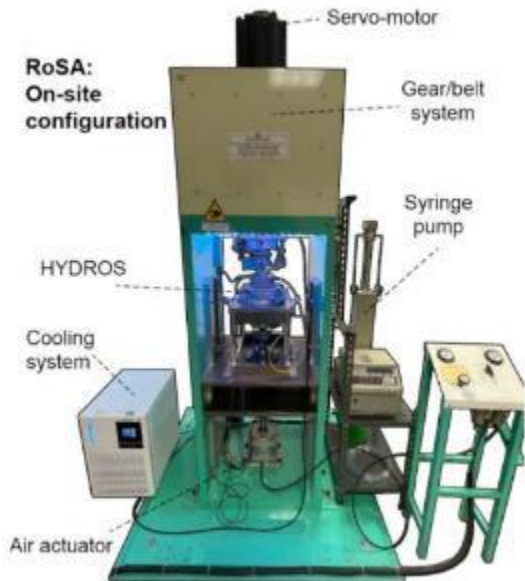
The new X-ray fluorescence spectrometer installed in this laboratory is a sequential WDS Malvern Panalytical Zetium operating in vacuum conditions. The instrument is equipped with a 2.4 kW Rh X-ray tube, 5 analyzer crystals (LiF220, LiF200, Ge, PE, PX1), 3 detectors (gas flow proportional counter, scintillator and sealed Xe), 2 collimators (150  $\mu\text{m}$  and 550  $\mu\text{m}$ ), 4 filters (Al 200  $\mu\text{m}$ , Al 750  $\mu\text{m}$ , Brass 100  $\mu\text{m}$  and Brass 400  $\mu\text{m}$ ) and a sample changer for 16 sample holders. For calibration, geological international standards were used (Geostandards Newsletter, Vol.

XVIII, Special Issue, July 1994, K. Govindaraju, ed.) to measure the following major, minor and trace element: Si, Ti, Al, Fe, Mn, Mg, Ca, Na, K e P (expressed in oxide %), and Sc, V, Cr, Co, Ni, Cu, Zn, Ga, Rb, Sr, Y, Zr, Nb, Ba, La, Ce, Nd, Pb, Th e U (expressed in part per million ppm). Measurements are normally performed on beads, prepared using the sample calcined powder diluted with di-lithium tetraborate flux ( $\text{Li}_2\text{B}_4\text{O}_7$ ) with a ratio of 1:10, using a Claisse Eagon 2 fusion instrument (running at a maximum temperature of 1150°C). Analysis can be also performed on pressed powder pellets when beads cannot be prepared from the original sample. During the first months of work of the laboratory, various materials have been analyzed, such as rocks, clays, ceramics.



## ROCK MECHANICS LABORATORY

In this laboratory is installed a ROtary Shear Apparatus (ROSA) equipped with an hydrothermal vessel (HYDROS) designed to study the seismic cycle in experimental faults in the presence of hot and pressurized fluids (H<sub>2</sub>O in vapor, liquid and supercritical conditions). These experiments are of interest for the safe exploitation of medium- and high-enthalpy (100-450°C) geothermal fields, for subsurface fluid storage, but also for understanding seismic sequences in volcanic environments (Campi Flegrei, etc.) and their relationships with eruptive activity. ROSA & HYDROS will be also dedicated to the study of the seismic cycle at deeper crustal levels (e.g., mechanics of slow slip events, seismicity in fluid-rich environments). The electromechanical universal tester (Controls Uniframe series) hosted in this laboratory is equipped with 100 kN and 25 kN load cells. The multipurpose frame is mainly used to perform uniaxial compression tests on cement, mortar and rock samples. Thanks to a specifically designed apparatus (designed by E. Garbin) specimens with dimension of 1,5 x 1,5 x 6 cm<sup>3</sup> can be tested complying to requirements of standard EN 196:1 (2005).



## GRAPHIC AND PHOTOGRAPHY LABORATORY

By the beginning of 2021, the new drone DJI Phantom 4 rtk has reached full operational activity. The drone is a complete aerial imaging solution mainly used for photogrammetric monitoring and geomorphological mapping. It is integrated with a Gps RTK system offering centimeter-level accurate location coordinates. It has been extensively used in tracking riverbed morphology, in collecting data for mapping rock walls in quarries. The obtained aerial images are elaborated into 3D digital data by using photogrammetric softwares as Metashape and 3DFZephyr.



# LIST OF LABORATORIES AT THE DEPARTMENT OF GEOSCIENCES, YEAR 2021

1	Applied Mineralogy	18	Micromorphology
2	Applied Petrography	19	Micropaleontology
3	Catodoluminescence and fluid inclusions	20	Micro-Raman Spectroscopy
4	Cleanroom- sample preparation for isotopic analyses	21	Micro-Tomography
5	Confocal Optical Microscope	22	Mineral Resources
6	Dual beam FIB-FE-SEM	23	Mineral separation
7	Exeperimental Petrology and Geochemistry	24	Palynology
8	Fitoplancton	25	Rock mechanics
9	Geochemical Preparation laboratory	26	Scanning Electron Microscopy
10	Geological sample preparations	27	Sedimentology
11	Geophysics	28	Rock Crushing
12	Graphic and photography	29	Thermal lab
13	Hydrogeology	30	Thermocronology
14	Hyperspectral analysis	31	Thin section preparation
15	Fluid and melt Inclusions	32	X-ray Fluorescence Spectroscopy (maintenance in 2021)
16	Macropaleontology	33	X-Ray Powder Diffraction
17	Mass Spectrometry - IRMS	34	X-Ray Single Crystal Diffraction



Museums



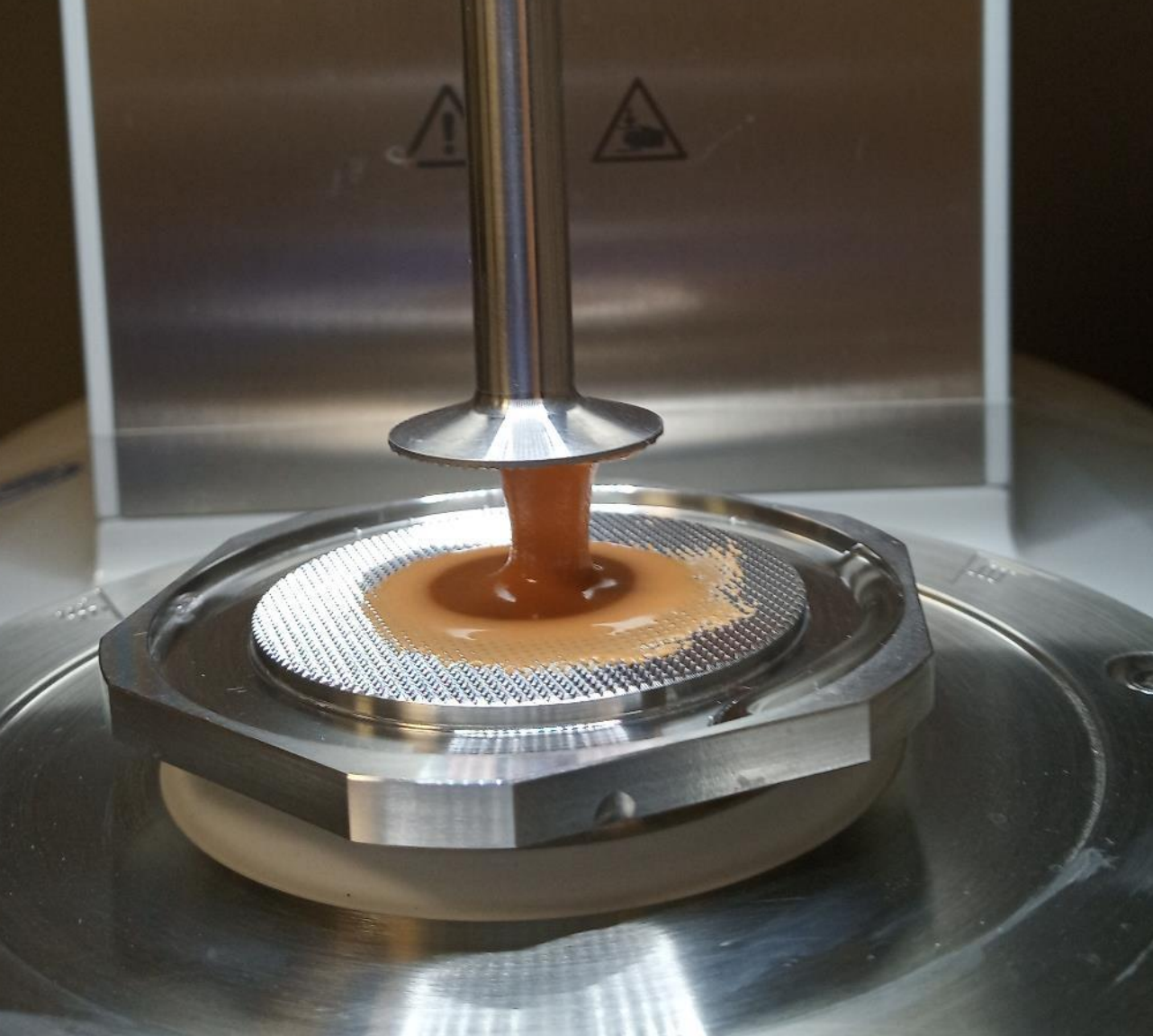
## MUSEUMS

*by L. Giusberti*

The Department of Geosciences owns extensive collections of Italian and foreign rocks, fossils and minerals housed at "Palazzo Cavalli" in the Museum of Geology and Paleontology, and in the Museum of Mineralogy. Such huge scientific and cultural heritage has its roots in the old collections of the Natural History Museum of the University of Padova, founded in 1733 thanks to the donation by Antonio Vallisneri Jr.

Besides the scientific activities, carried out by Italian and foreign researchers from all over the world, the Museum's staff, coordinated by CAM (Centro Ateneo Musei), carries on an intense activity of public engagement with the fruitful support of the Department's researchers. In 2020-2021, museums' activities were strongly reduced due to COVID-19 pandemic.

Nevertheless, is currently underway at Palazzo Cavalli the completion of the "Museum of Nature and Humankind" that will include the former Department's collections along with the University collections of Zoology and Anthropology. Since 2017, several Departments' researchers are strongly involved in such ambitious project. The new Museum will finally open in June 2023.



CIRCE

# **CIRCe – Centre for the Investigation of cement materials**

*by G. Artioli*

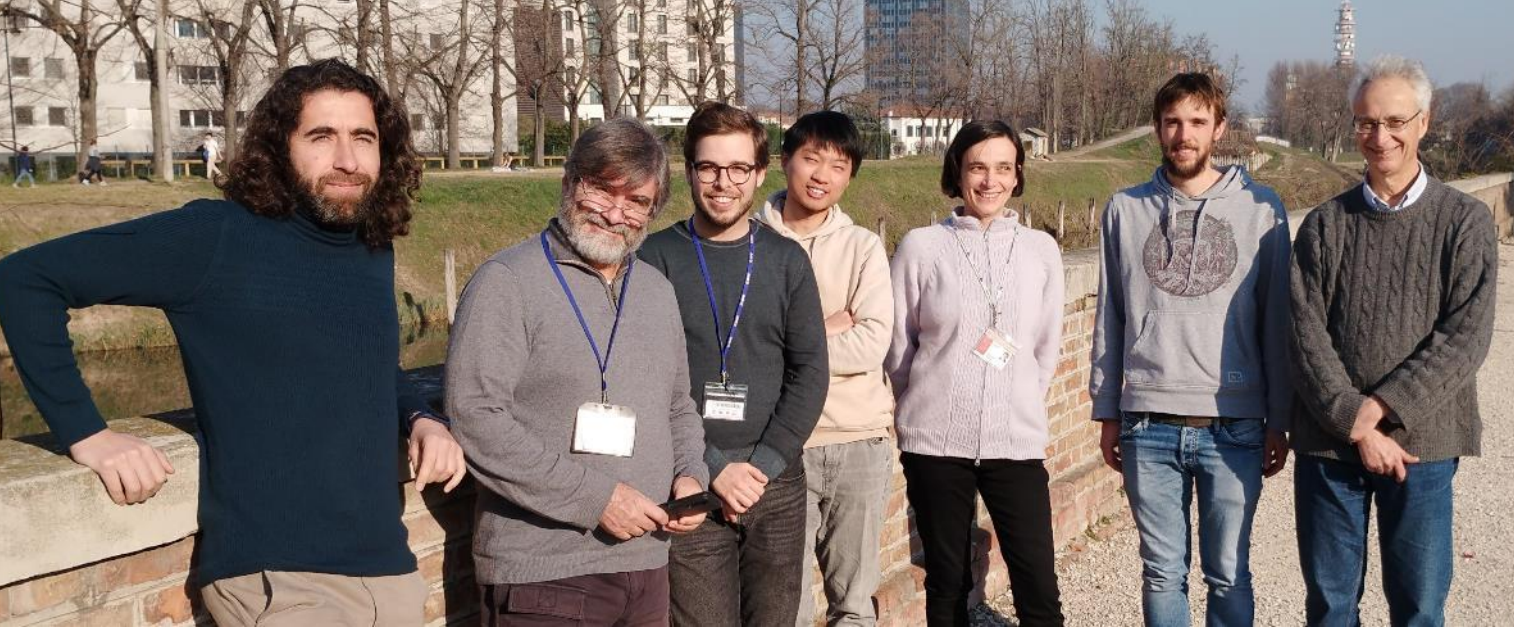
CIRCe is an interdepartmental centre devoted to the promotion and development of scientific research activities on cement and cement-based materials, aiming at integrate fundamental research, applied research and industrial research in the field of building materials. The centre initially started as a collaboration between the Department of Geosciences and the Department of Civil, Construction and Environmental Engineering (ICEA) to answer the need expressed by several companies to coordinate research in the field of building materials. The centre subsequently welcomed the Department of Cultural Heritage (DBC) and the Department of Industrial Engineering (DII) who also joined the project. The Centre acts as research support and partner for a number of Institutions and private Companies and between them MAPEI s.r.l. has covered an important role for financial support and research collaboration. CIRCe is a corporate member of RILEM (International Union of Laboratories and Experts in construction Materials, Systems and Structures).

2022 marked 12 years of cement research here at CIRCe – Department of Geoscience, and an essential part of Circe's activity has continued to be the study of cement hydration under the influence of admixtures. A research activity that has been realized thanks to the prolonged collaboration with personnel of Mapei R&D laboratory and researchers of IGG-CNR of Padua.

Our industrial and applied research has been enhanced throughout 2022 with active collaborations between personnel of Circe group at the Department of Geosciences and OPIGEO, a spin-off company of Unipd, providing support and research for the efficient use and recycling of industrial by-products in building industry. An important piece of research was also devoted to deep our knowledge on the mechanisms controlling retention of heavy metals (lead) in soils stabilized through solidification/stabilization process using different cementitious binders.

The consultancy and research activities with private companies extended through agreements assisted by UNISMART and involving important industrial companies as Piazzetta Group and Industrie Cotto Possagno S.p.A.. As part of projects involving restoration of the architectural heritage, the centre prolonged its ongoing research with various superintendences and museums in the field of archaeometric investigations of ancient building materials.





From left to right: Luca, Gilberto, Riccardo, Yikai, Chiara, Alessandro, Maurizio.



DIPARTIMENTO  
DI GEOSCIENZE

**dbc**

*CIRCe*

Centre for the investigation of cement materials

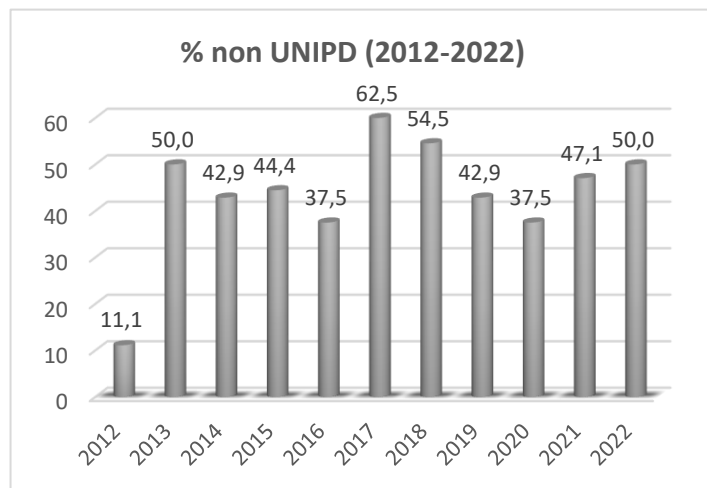
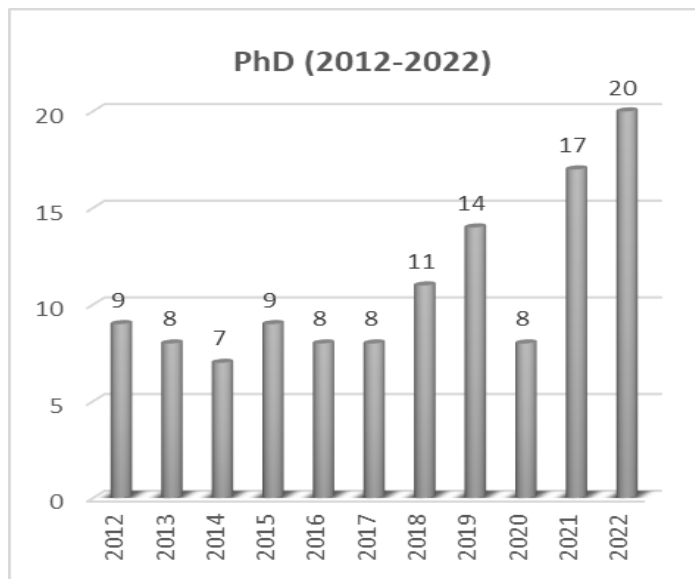




PhD programme

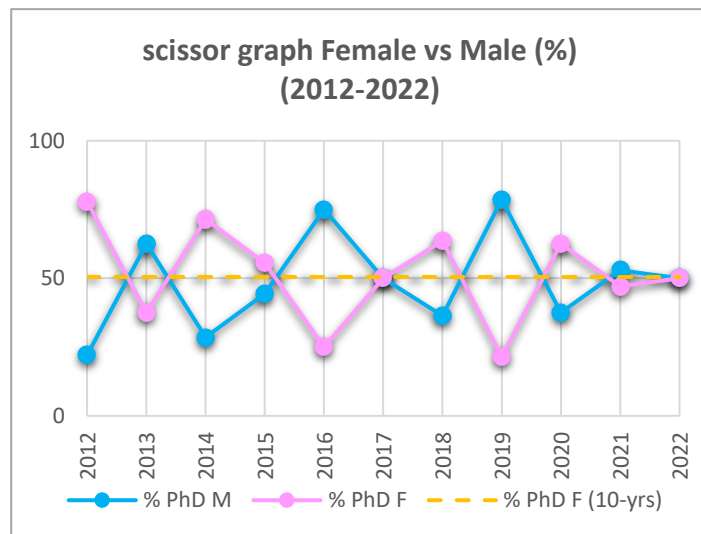
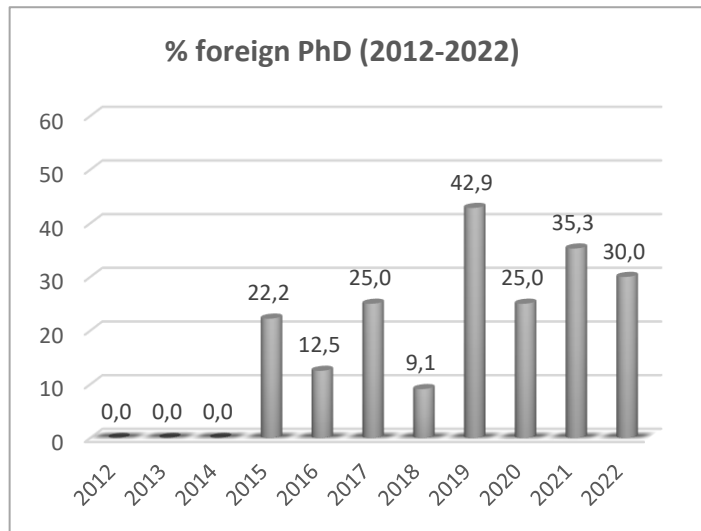
## PhD PROGRAMME *by C. Agnini*

The governing body of the Doctoral course in Geosciences is the PhD Board, which includes a total 52 members: 38 faculty staff of the University of Padua, 13 high-reputation foreign researchers and one Italian external member (INGV – Rome). The representatives of doctoral students, whose number is equal to 15% of the total members of the board, are also part of the governing body (<https://www.geoscienze.unipd.it/corsi/phd-course/phd-board>). In 2022, the active series were XXXV, XXV, XXXVI and XXXVII, with XXXV series officially finishing on September 30th and XXXVII series starting from October 1st. Due to the COVID-19 pandemic, PhD candidates enrolled in the XXXV can ask for 3 to 6 months extensions to conclude their research projects effectively. The total number of PhD candidates was 59 (Figure 1). The active research projects cover all the disciplines of the geosciences spanning from pure research topics aiming to implement our understanding of Earth's system and applied research projects, which focus on natural and human-induced hazards in order to address ongoing geological, societal, economic challenges and risks. Among the 20 scholarships available for 2022 (XXXVIII series), a new record after the record set last year, five are funded by the University of Padova, one is funded by UNIPhD - a MSCA-COFUND Doctoral Programme - and two are granted by



National Research Institutes (i.e., INGV). Four scholarships are granted by Departmental projects and 3 by private company, two of them co-funded by CARIPARO-UniSMART. In the second part of the year, new funds related to PNRR (Piano Nazionale di Ripresa e Resilienza), which is part of Next Generation EU (NGEU) programme to contrast the COVID-19 pandemic, have become available and two dedicated calls were open to recruit 5 additional PhD candidates (DM 351, DM 352, PNRR PE & EI).

In the last 10 years, we have had a total of 119 PhD students, the number of scholarships has increased through time with an average of fourteen scholarships/year in the last 5 years. Analyzing the composition of the cohorts from 2012 to 2022, it can be seen that the percentage of international doctoral students has become significant starting from 2015 with an average value of 33.3 % in the last four years (Figure 2). Our active PhD candidates come from all 5 continents (Europe, Africa, America, Asia and Australia), and from different countries as well (i.e., USA, Germany, China, Costa Rica, New Zealand, Cameron, Colombia, Costa Rica, Taiwan, Iran and India) and this creates a cutting-edge environment where Italian and international students can interact in a positive mode that always respects each other's cultural background and identity. Overall, our doctoral project is attractive for students who have not earned their Master's degree in Padua (Figure 3) and, in the last five years, they represent about half (47%) of the PhD students.



Geosciences is part of the so-called STEM (science, technology, engineering and mathematics) disciplines, which generally show a gender gap among Master's degree students. Geosciences confirm this pattern with ca. 70% male and 30% female students.

The percentage of female at PhD level increases up to 50% both at national and local (Padua) level. In the last 10 years, the scissor graph calculated for our program (Figure 4) highlights a pretty high variance essentially due to the relatively low number of the PhD positions. By contrast, the mean value of the same parameter, calculated on a 10-years time window (2012-2022) shows a substantial equality (49.6% female and 50.4.5% male) that, unluckily, dramatic changes in favor of males as one's career advances.

We wish all the PhD students who are carrying out their research project to be able to develop it in a serene and stimulating environment and to obtain the results they aspire to with constant and hard work. We wish the PhD students who defended their thesis in 2022 (XXXV series) a bright future. Knock them dead!





Collaborations

## **COLLABORATIONS** *by L. Valentini*

The Department of Geosciences strives to continuously expand its international network of partner institutions, increasing its international reputation and attractiveness to foreign lecturers and students. Currently, international staff members at the Department of the Geosciences include: 3 assistant professors, 6 post-doctoral researchers and 9 PhD students. Two Master's degree programmes are delivered in English, and one new Bachelor's degree programme, to be taught in English, has been approved in 2022 and is scheduled to begin in 2023. Other than offering courses in English, a wide choice of destinations for student and/or staff exchange programmes is available, with: 14 Erasmus+ agreements with EU universities; one Erasmus+ KA107 agreement with a university based in Kenya; one agreement within the Swiss European Mobility Programme. In 2022, memoranda of understanding were active with the following universities: Lanzhou University (China), the University of South Carolina (USA), George Mason University (USA), University of British Columbia (Canada). A broad range of multidisciplinary research topics is covered within the scope of these collaborations, through which the Department of Geosciences aims at sharing knowledge and foster global partnership, in line with Sustainable Development Goal 17 of the United Nations.

# ITALY

University of Bari, Department of Earth and Geoenvironmental Sciences

University of Bologna, Department of Chemistry "Giacomo Ciamician"

University of Bologna, Department of Cultural Heritage

University of Bologna, Department of Industrial Engineering, Laboratory of radioprotection

University of Bozen

University of Catania

University of Chieti-Pescara "D'Annunzio"

University of Ferrara

University of Modena and Reggio Emilia

University of Naples "Federico II", Department of Civil and Environmental Engineering

University of Pavia

University of Rome "La Sapienza"

University of Salento, Department of Antiquity Sciences

University of Siena

University of Turin, Department of Earth Sciences

University of Tuscia, Department of Ecological and Biological Sciences

University of Venice "Cà Foscari", Department of Environmental Sciences, Informatics and Statistics

University of Venice "Cà Foscari", Department of Human Studies

University of Venice IUAV

University of Campania "L. Vanvitelli", Department of Environmental, Biological and Pharmaceutical Sciences and Technologies

Polytechnic of Milan

CNR-IGAG, Institute of Environmental Geology and Geo-Engineering, Milan

CNR-IGAG, Institute of Environmental Geology and Geo-Engineering, Rome

CNR-IGG, Institute of Geosciences and Georesources, Firenze

CNR-IGG, Institute of Geosciences and Georesources, Padova

CNR-IGG, Institute of Geosciences and Georesources, Pavia

CNR-IRPI, Institute for Geo-Hydrological Protection, Padova

CNR ISAC, Bologna

CNR-IRSA, Water Research Institute, Bari

ENEA - SSPT, Department for Sustainability, La Spezia

NAF - Osservatorio Astronomico di Padova (OAPD), Padova

INAF - Istituto di Astrofisica e Planetologia Spaziali (IAPS), Rome



INGV - National Institute of Geophysics and Volcanology, Rome  
INGV - National Institute of Geophysics and Volcanology, Bologna  
ITT - Centre for Cultural Heritage Technology, Venice  
IUSS, Pavia  
OGS - National Institute Experimental Geophysical observatory, Trieste  
Regione del Veneto  
Soprintendenza Archeologica di Verona  
Soprintendenza dei Beni culturali ed ambientali di Palermo  
MUSE, Museo geologico delle Dolomiti di Predazzo, Trento  
Museo di Storia Naturale di Verona  
Museo Regionale della Sicilia – Galleria di Palazzo Abatellis  
Centro Studi Sudanese e Sub-Sahariani, Treviso  
Eni SpA  
MAPEI Spa, Milan  
Geomatics Research & Development (GReD) srl, Italia  
CIMA Research Foundation, Savona

## **EUROPE**

Austria, Technical University of Vienna  
Austria, University of Vienna  
Belgium, Royal Belgian Institute for Space Aeronomy (BIRA-IASB)  
Czech Republic, Czech Advanced Technology and Research Institute  
Denmark, University of Copenhagen  
France, BioSP, INRAE, Avignon  
France, Institut de Physique du Globe, Paris  
France, Université Bourgogne Franche-Comté, Laboratoire Biogéosciences  
France, Université de Bretagne Occidentale  
France, Université Sorbonne, Institut des Sciences de la Terre de Paris  
France, Université Claude Bernard Lyon 1  
France, CNRS/Université de Strasbourg, Laboratoire Image Ville Environnement (UMR 7362)  
France, UFR Sciences of Nantes and Angers, Laboratory of Planetology and Geosciences  
Germany, Federal Institute for Geosciences and Natural Resources BGR  
Germany, Fraunhofer Research Institution for Additive Manufacturing Technologies IAPT

Germany, German Aerospace Center DLR  
Germany, Helmholtz Centre Potsdam, GFZ German Research Centre for Geosciences, Telegrafenberg  
Germany, University of Aachen  
Germany, University Bremen Germany, University of Bonn  
Germany, Friedrich Alexander University Erlangen Nuernberg, GeoZentrum  
Germany, University of Frankfurt  
Germany, University of Göttingen, Department Physical Geography  
Germany, Westfaelische Wilhelms-Universitaet Muenster, Institut für Planetologie  
Germany, Deutsches Zentrum für Luft- und Raumfahrt DLR  
Germany, Deutscher Wetterdienst (DWD)  
Greece, School of Rural & Surveying Engineering, National Technical University of Athens, Athens  
Greece, Centre for Renewable Energy Sources and Saving (CRESES), Athens  
Hungary, Eötvös Loránd University, Budapest, Fac. of Science Lithosphere Fluid Research Lab, Res. and Industrial Relations Center  
Hungary, Hungarian Natural History Museum, Budapest, Department of Palaeontology and Geology  
Ireland, Trinity College Dublin, Department of Geology  
Luxembourg, Musée National d'Histoire Naturelle  
Norway, University of Oslo, Centre for Earth Evolution and Dynamics  
Norway, Oslo Metropolitan University, Department of Civil Engineering and Energy Technology  
Poland, Centrum Badań Kosmicznych Polskiej Akademii Nauk, Space Research Centre  
Romania, University of Bucarest  
Spain, Universitat Autònoma de Barcelona, Departament of Geology  
Spain, Universidad Carlos III de Madrid  
Spain, University of Granada, Department of Mineralogy and Petrology  
Spain, University of Granada, Department of Mechanics, Structures and Hydraulics  
Spain, Universitat Politecnica de Valencia  
Spain, University of Zaragoza  
Spain, Tecnalia Research & Innovation  
Sweden, Uppsala University, Department of Earth Sciences  
Switzerland, ETHZ, Zurich  
Switzerland, University of Lausanne  
Switzerland, WSL Institute for Snow and Avalanche Research SLF, Davos  
The Netherlands, University of Twente, Faculty of ITC  
The Netherlands, TU Delft  
The Netherlands, Utrecht University  
UK, University of Aberdeen, Department of Geography and Environment

UK, University of Bristol, School of Chemistry, Organic Geochemistry Unit  
UK, University of Durham  
UK, University of Durham, Geography Department  
UK, University of Glasgow  
UK, University of Lancaster  
UK, University of Leeds, School of Earth and Environment  
UK, University College of London UCL, Institute of Archaeology  
UK, University College of London UCL, Earth Science Department  
UK, University of Newcastle upon Tyne, School of History Classics and Archaeology

## GLOBAL

Australia, Australian National University, Research School of Earth Sciences, Canberra  
Australia, Curtin University, School of Earth and Planetary Science, Perth  
Australia, Macquarie University, Department of Earth and Environmental Sciences, Sidney  
Australia, Queensland University of Technology  
Australia, University of Adelaide, Department of Earth Sciences  
Australia, University of Melbourne  
Australia, The University of Western Australia, Oceans Graduate School & Oceans Institute, Perth  
Australia, ARC Centre of Excellence in Coral Reef Studies, Perth  
Canada, University of Alberta, Department of Earth and Atmospheric Sciences, Edmonton  
Canada, University of Victoria, School of Earth and Ocean Sciences, Victoria  
Canada, Polytechnique Montréal  
China, China University of Geoscience, Beijing  
China, China University of Geosciences, Wuhan  
China, Chinese Academy of Geological Sciences, Beijing  
China, Chinese Academy of Sciences, State Key Laboratory of Isotope Geochemistry, Guangzhou Institute of Geochemistry  
China, China Earthquake Administration, Beijing  
China, Guangzhou University, Institute of Geochemistry, State Key Laboratory of Isotope Geochemistry  
China, Nanjing University  
China, Northwest University of Xi'an, Department of Geology  
China, Chengdu University of Technology, Institute of Sedimentary Geology  
Ghana, Council for Scientific and Industrial Research, Building and Road Research Institute  
India, Indian Institute of Technology, Kanpur  
Iran, Art University of Isfahan, Department of Art Conservation and Archaeometry  
Israel, Geological Survey of Israel, Jerusalem

Israel, Hebrew University of Jerusalem, Institute of Earth Sciences  
Israel, Israel Antiquity Authority, Jerusalem  
Israel, Geological Survey of Israel  
Jamaica, International Seabed Authority  
Japan, Kyushu University, Department of Earth & Planetary Sciences, Fukuoka  
Japan, Niigata University, Faculty of Science  
Japan, Senshu University  
Kenya, Meru University of Science and Technology  
Russia, Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow  
South Korea, Kangwon National University  
South Korea, Sejong University, Seoul  
Turkey, Istanbul Technical University, Department Geophysical Engineering  
USA Berkeley University, California, Lawrence Berkeley National Lab  
USA, Brown University  
USA, Getty Conservation Institute, Los Angeles  
USA, Kansas State University  
USA, Lawrence Berkeley National Laboratory, Berkeley, California  
USA, Rutgers University, Department of Earth and Planetary Sciences, Piscataway, New Jersey  
USA, Rutgers University, Department of Civil & Environmental Engineering  
USA, Smithsonian Institution, National Natural History Museum, Department of Mineral Sciences  
USA, University of Chicago Marine Biological Laboratory, Woods Hole  
USA, University of Minnesota  
USA, University of Oregon, Department of Earth Sciences  
USA, University of South Carolina, Department of Geography

# VISITING SCIENTISTS

During the 2022 the possibility of travelling again, despite with some limitations, allowed to return to a kind of normality, so that we could clearly see an increase on the outgoing and incoming of scholars, especially of PhD and post-doc.

## OUTGOING

USA, Massachusetts Institute of Technology

Switzerland, WSL Institute for Snow and Avalanche Research SLF

Switzerland, ETH Zurich

The Netherlands, TU Delft University

Chile, Pontificia Universidad Catolica de Chile, Santiago, Departamento de Ingenieria Structural y Geotecnica

USA, Lawrence Berkeley National Laboratory

Denmark, University of Aarhus

The Netherlands, University of Twente

China, Changdu University of Technology, SKLGP Lab

## INCOMING

China, Chinese Academy of Geological Sciences, Beijing, Institute of Geology

France, Grenoble University

France, Institut de Physique du Globe, Paris

France, Université Claude Bernard Lyon 1

Germany, University of Frankfurt

Ghana, Building and Road Research Institute

Switzerland, University of Lausanne, Faculty of Letters- Section of Art History

Tunisia, University of Gabes



# International Degree programme

# INTERNATIONAL DEGREE PROGRAMME

*by M. Zattin*

Over the past few years, the University of Padua has spent a lot of effort on the internalization of its research and didactic activities. In this framework, in 2020 the Department launched a couple of new projects that should be able to significantly increase the number of incoming foreign students, especially regarding the master's degree courses. A very innovative agreement (named the '3+1+1 Programme') was signed with the University of Lanzhou and the Northwestern University of Xi'an. The above-mentioned programme will offer the opportunity for 10 students who have completed the first three years curriculum of undergraduate level courses to spend up to one academic year at the University of Padua as exchange students, attending course units within the Geology and Technical Geology second cycle degree course. At the end of the first year as exchange students, selected students may apply to pursue their studies as degree-seeking students within the Geology and Technical Geology degree course, following an evaluation by the academic board responsible for the regular admission. The first four students from the University of Lanzhou were enrolled in 2020 and are currently completing their MSc. Due to the pandemic crisis, only one student enrolled in 2022 but the recent new regulations in China about travelling give hope for a renewed interest in the program. A further agreement has been signed with Goethe University of Frankfurt with the specific aim to implement a two-year International Master Programme in Geosciences. The proposed programme (named 'Earth Dynamics') will consist of a first year at the home university, the third semester spent at the host university and a jointly supervised master's project in the fourth semester. Upon successful completion of the International Master Programme, students shall be awarded a degree by their respective home university. The main objective is to train students in the field of geosciences with a multidisciplinary approach and focus on active and fossil orogeneses and coupling processes from mantle to atmosphere. Moreover, it aims to endow students with the ability to tackle advanced problems using state-of-the-art theoretical and analytical tools. Students will benefit from a specific grant given by the Department that will supplement the ERASMUS+ mobility programme. The first couple of students obtained their MSc degree in 2022.



# Seminars



## **SEMINARS** *By A. Fontana*

Along the semesters the Department is organizing several specific seminars mainly dedicated to master and PhD students, grant holders, but also open to the members of the department and external people. Generally the speakers are selected among scholars that are a reference for their field of investigations and present the state of the art of a discipline. One of the aims is also to introduce the new tendencies and future perspectives in that branch of science. Some of the seminars are also devoted to show the students their possible future career, spacing between geologists and geoscientists working as employees or consultants for private companies, industries and public administrations.

In 2022 the seminars were not affected by the anti-Covid19 restrictions, thus, all the meetings were in presence, allowing the students and in general the audience to directly interact with the speakers. Seminars were planned in the Tuesday afternoon during the first semester and in Thursday during the second one. Generally the speaker gives a presentation of about 45 minutes and 10 to 15 minutes for question & answer time were available.

DATE	SPEAKER	AFFILIATION	TITLE
13/03/2022	Giorgio Spada	Università di Bologna - Dipartimento di Fisica e Astronomia	Secular sea-level rise: the role of solid Earth
22/03/2022	Paolo Sossi	ETH, Department of Earth Sciences, Zürich	Building planetary atmospheres from magma oceans
29/03/2022	Simone Bizzi	Università di Padova - Dipartimento di Geoscienze	Looking at rivers in a data rich era
05/04/2022	Giorgio Giacchetti	Ordine dei Geologi del Veneto	Opere di protezione in ambiente montano: le barriere paramassi
12/04/2022	Paola Baccheschi	INGV – Istituto Nazionale di Geofisica e Vulcanologia, Roma	Peeking inside the deep structure of Italy
26/04/2022	Francesco Marra	CNR-ISAC, Istituto di Scienze dell'Atmosfera e del Clima, Bologna	Extreme rainfall in a changing climate: occurrence probability and geomorphological impacts
03/05/2022	Leonardo Mason	ARPAV - Agenzia Regionale per la Prevenzione e Protezione Ambientale	Bonifiche ambientali
10/05/2022	Anna Van Yperen	Univresity of Oslo - Department of Geosciences	Improving predictability of changes in tide-influenced channel morphology – can we take previously established concepts one step further?
11/05/2022	Claudia Gasparrini	RFX Consortium – Imperial College London	Energia nucleare per il pianeta
17/05/2022	Cees Passchier	University of Mainz - Institute of Geosciences	Aspects of Geoarcheology
21/09/2022	Francesca Pianosi	University of Bristol - Water & Environmental Engineering	Towards more robust evaluation and use of environmental models against climate uncertainty
13/10/2022	Eleonora Rivalta	Università di Bologna - Dipartimento di Fisica e Astronomia	Understanding and forecasting magma pathways and the location of eruptive vents
03/11/2022	Carlos Pirmez	Weather Water Sand Srl, Genova	Turbidity currents and seabed infrastructures: insights from numerical models
10/11/2022	Michelini Alberto	IDS GeoRadar s.r.l., Pisa	Ground-based radar interferometry Principles, applications and future developments
24/11/2022	Gianluca Gola	CNR - Institute of Geosciences and Earth Resources, Pisa	Geothermal energy for energy transition: numerical modelling of hydrothermal systems and deep heat exchangers
01/12/2022	Chris Marone	Università Roma La Sapienza - Dipartimento di Scienze della Terra	Machine Learning, Artificial Intelligence and earthquake forecasting
15/12/2022	Elisa SalerPietro Carpanese	Università di Padova - Dipartimento di Geoscienze LARES – Sezione Operativa Veneto	LARES - Unione nazionale laureati esperti in Protezione Civile



# Orientation and Tutoring

## **ORIENTATION AND TUTORING** *by A. Breda*

The school-university transition represents a decisive moment in the life of a student. The choice of the degree program is a decision which should be taken carefully, as it will affect his/her whole life. At the same time, the beginning of university life is the time a student reach autonomy and independence, but like many situations of transition and growth, can bring about uncertainties and/or difficulties. In this context, the peer-to-peer approach is particularly successful. For this reason, the Department of Geosciences in the last year added to the teaching tutoring traditionally offered to the first-year students in specific subjects on particularly critical exams (Math and Physics), also an informative tutoring, providing organizational support to first-year students, international students and dual career "student-athletes", as well as informative support in guidance initiatives addressed to high-school seniors who must choose their bachelor's degree program. Tutors are students enrolled in master's degrees and doctoral degrees, acting as facilitators and mediators and they receive special training so that they can perform their role effectively.

During the 2022 spring term, the Department of Geosciences proposed for the first time the "Venerdì delle Geoscienze", a series of open days on demand offered to the future undergraduate students, with orientation activities and visits to the places of the Department (i.e. teaching rooms, study halls, library and laboratories). This new project, led by a tutor, increased the visibility of our bachelor's degree program and had a notable success.

During the 2022 fall term, thanks to PNRR funds, it was possible to implement both the teaching tutoring, with teaching support not only on Math and Physics but also on Chemistry, and the informative tutoring, with increase in the number of tutors involved on guidance initiatives addressed to high-school seniors and assistance to first-year bachelor's degree students, and a tutor completely dedicated to master's degree international students, supporting them to deal with any organizational difficulties, in facing administrative requests, in taking advantage of all of the services the university makes available to them, in compiling their study programs, etc.

Orientation activities addressed to high-school students have been conducted also by the faculty staff, with thematic seminars as well as lab and field experiences held both during the spring and the fall terms.



Teaching

## **BACHELOR'S DEGREE IN GEOLOGICAL SCIENCES**

## **MASTER'S DEGREES IN ENVIRONMENTAL GEOLOGY AND EARTH DYNAMICS**

*by P. Mozzi*

The professorial and research faculty of the Department of Geosciences covers a wide array of topics, ranging from paleontology and stratigraphy to sedimentology, structural geology, geomorphology, physical geography, engineering geology, mineralogy, petrology, geochemistry, georesources, planetary geology and geophysics of the solid Earth and the atmosphere. Faculty members are active scientists in their field of expertise and their effort is to transfer groundbreaking scientific and professional knowledge and skills to students. This allows the department to offer a thorough, high-standard education cycle in the geosciences, entirely hosted in a modern and comfortable building where classrooms are adjacent to laboratories and research facilities. In Academic Year 2022/2023, 197 students are enrolled in the Bachelor's Degree (Laurea Triennale) in Geological Sciences and 69 students in the Master's Degrees in Environmental Geology and Earth Dynamics.

The Bachelor's Degree in Geological Sciences provides sound basis for understanding the main processes that control the evolution of the deep Earth as well as the Earth's surface dynamics. Particular attention is devoted to field activities and laboratories, in order to provide students with challenging, hands-on experience. The aim is to allow the students to develop specific expertise in the observation and monitoring of geological processes, in geological mapping and in the analysis of rocks and minerals, challenging them to develop autonomous critical thinking. Students participate in several field trips and two field camps at the end of the second and third years, each lasting 7 – 10 days, in selected sites in Italy and abroad.

The Master's Degree in Environmental Geology and Earth Dynamics represents the ideal prosecution of geological studies at UniPD. The aim of the Degree course is to form geologists who can start and develop successful professional careers as freelance geologists or in private companies, public agencies and research institutions. Highly specialized classes, field activities and laboratories introduce the students to the multi-facet application of geological techniques and modelling. The experimental thesis work and traineeship occupy the whole last semester and allow focusing on specific topics of interest in the vast realm of the geosciences. The Master's Degree in Environmental Geology and Earth Dynamics is organized in two study tracks. Earth Dynamics study track is entirely in English and combines solid fundamental knowledge on the Earth's processes and history with the application of cutting-

edge geological techniques and data processing. Through applied research-oriented teaching, field activities and laboratories, the program offers advanced education and training in the geosciences, with a focus on diverse issues that are crucial for future society, such as the prevention and mitigation of geohazards, land planning and environmental management, climate change, the prospection and sustainable exploitation of georesources, geomaterials, cultural heritage protection, geological mapping and planetary exploration. An agreement with the Goethe University Frankfurt allows a selection of the most meritorious students to spend a semester in Frankfurt.

The study track in *Geologia Applicata alla Difesa del Suolo e dell'Ambiente* firmly keeps the focus on the formation of professional geologists dedicated to engineering geology, landslide monitoring and remediation, hydrogeology. This is a strategic need in Italy, given the fragility of the national territory in terms of geohazards, water resources and environmental protection. The courses of this study track focus on the most advanced techniques in data acquisition and processing, meeting the needs of evolving environmental problems and hazard prevention and protection.

To consolidate the international experience of our students and enhance their opportunities in the European and worldwide professional and research market, the Department of Geosciences is enthusiastically committed in the Erasmus+ Program and SEMP – Swiss European Mobility Program. Several grants have been available in 2022 for our best students to spend one or two semesters in a choice of European universities in Norway, Finland, Denmark, Germany, France, Poland, Hungary, Spain, and Switzerland.

The recognition of the overall effectiveness of the didactics is provided by the students' opinion of both Bachelor's and Master's programs, which in the last years has been scoring above 8 on a scale 0-10, at the top among all programs of the School of Science of the University of Padova.

# **MASTER'S COURSE IN GEOPHYSICS FOR NATURAL RISKS AND RESOURCES**

*by G. Cassiani*

In October 2020, the Department activated the Master's course in Geophysics for Natural Risks and Resources. The Master has the main goal of educating professionals and researchers capable of approaching in a multi-disciplinary manner the theory and applications of physical methodologies for the exploration and characterization of the subsoil. This exploration can take place at different spatial scales, from meters to hundreds of kilometers, with aims spanning a large number of applications and theoretical areas where the knowledge of soil and subsoil is crucial, such as: - Search for mining and energy resources; - Subsoil characterization for renewable energies such as geothermal energy; - Non-invasive techniques for civil and environmental engineering, including geotechnical applications: - Engineering geology characterization with specific attention to hillslope stability and hydrological risks in general; - Characterization for seismic risk both at global (fault presence and nature) and local (amplification mechanisms) scales; - Application to built structures, with specific reference to the historical buildings, foundations and soil-structure interactions. - Applied Geodesy to study Earth's dynamics.

The courses on offer have been selected with two goals in mind: (i) educate professionals in the geophysical sector with a wide and solid quantitative background, thus capable of accessing a number of careers in industry and research; (ii) attract students from different backgrounds and produce graduates with a fluid interaction within the international geophysical community. In order to satisfy the requirements of the job environment, three majors (albeit informal) are foreseen: (a) a computational specialization, directed towards large scale geophysical applications (e.g. 3D and 4D seismics) with a predominant role in mining and energy subsoil exploration, (b) a field specialization, with applications directed towards the management of natural resources and risks in the environmental and engineering areas, with the aim of educating independent professionals, (c) a large scale solid earth specialization, for students interested in understanding Earth as a whole and progressing mainly in a research career. The Master's course has had a growing success, from about 15 students in the first year (affected by heavy COVID restrictions) to over 35 in the second year and some 60 students enrolled in the third year. A vast majority of international students have chosen the course, coming from 30 different countries.



CANDIDATE		SUPERVISOR	THESIS TITLE
ANTOLINI	TOMMASO	Anna Breda	Geological itinerary along the southern slopes of the Catinaccio Group
BACCARIN	MARTA	Anna Breda	Geological survey at the 1:10,000 scale of the Passo Oclini area (western Dolomites) with focus on the Triassic stratigraphic succession
BERGANTINO	GIANLUCA	Claudio Mazzoli	Effect of microclimate conditions on the deterioration of rocks used in the cultural heritage
BONAZZI	GLORIA	Matteo Massironi	The Deep-Seated Gravitational Slope Deformation of Vigo di Fassa: comparison with similar phenomena in the Dolomites.
CREAZZO	GIORGIO	Matteo Massironi	Geological mapping of the area surrounding the Mare Ingenii skylight
DAL MOLIN	GIORGIA	Anna Breda	Geological survey at the 1: 10.000 scale of the western slope of the Moena basin (western Dolomites)
DALCONI	ILARIA	Paolo Mozzi	Geological survey on a scale of 1: 10,000 of the Corno Bianco area with in-depth analysis of gravitational phenomena
DE MARCHI	SILVIA	Eloisa Di Sipio	Applications of non-destructive diagnostic methods to characterize and compare physical-mechanical and thermal properties of lithic materials
FIORENTINO	ETTORE	Leonardo Piccinini	Recession analysis of two karst springs in Dolomiti Bellunesi National Park
FONTANA	DENIS	Stefano Monari	The gastropods of the lower Bajocian (Middle Jurassic) deposits southern Luxembourg (eastern edge of Paris Basin): systematics and palaeobiogeographical significance.
FRACCARO	MARCO	Nereo Preto	Geology of Cima Carega (Piccole Dolomiti, Northern Italy)
FRASNELLI	MANUEL	Davide Novella	Genesis of Strombolian basalts: the importance of volatile elements
GALIE'	MATILDE	Davide Novella	Formation of Fe oxides in the deep mantle: evidences from Super Deep Diamonds
GANT	FEDERICO	Dario Zampieri	Deformation analysis of glaciogenic sediments in the Astico Valley (Vicenza)
LAGO	ANNA	Matteo Massironi	Geological mapping of Bletterbach gorge (Bz) and comparison between the gypsum veins of Arenarie della Val Gardena formation and the ones found in Gale Crater on Mars
MARANGONI	FABIO	Omar Bartoli	Application of the Ti-in-Amphibole thermometer to the mafic rocks of the Ivrea-Verbano Zone

MARCCER	MASSIMO	Paolo Mozzi	Palaeohydrography of the Cordevole River in the Belluno Valley
MENON	SIMONE	Manuel Rigo	Carbon isotope investigations from organic matter across the Triassic/Jurassic boundary of the Monte Volturino section
NARDI	LETIZIA	Davide Novella	Investigating the shock level of olivine crystals in Antarctic Urelites using single crystal X-ray diffraction
NOVENTA	RICCARDO	Luca Capraro	The Minoan Warm Period
PETTINATI	FILIPPO	Paolo Nimis	Definition of a protocol for the chemical analysis of chrome diopsides with the Tescan Solaris SEM for thermobarometric purposes
PRATI	GIANLUCA	Manuel Rigo	New procedure to extract microfossils from chert by using sodium hydroxide
PUTELLI	RICCARDO	Dario Zampieri	Kinematic analysis of the northern sector of the Schio-Vicenza Fault System (Passo Borcola, Southern Italian Alps)
RIGON	BARBARA	Matteo Massironi	Large Gravitational phenomena at Vigo di Fassa and surroundings (Trentino Alto Adige)
RIZZO	DANIELE	Paolo Mozzi	Geomorphology and stratigraphy of the southern sector of the Lamon fluvial terrace (BL)
ROSSETTO	TAMARA	Mario Floris	The potential of a multi-temporal geodatabase for the analysis of landslide susceptibility in the Alpage area (North Eastern pre-Alps)
SALVETTI	SIMONA	Jacopo Boaga	Geophysical characterisation of the Lazaun rock glacier (Val Senales, Bozen)
SARACINO	RICCARDO	Antonio Galgaro	Geoelectrical monitoring test by using an experimental device for the study of the thermal exchange processes between ground and heat exchanger probes
SAVEGNAGO	ALBERTO	Telemaco Tesei	Fault rocks and structural analysis in the Carbonare-Nosellari area (Val d'Astico)
SCATTOLON	FRANCESCO	Paolo Mozzi	The glacial deposits of Chiesa Nuova S. Luigi, Seren Valley (BL)
SOTTANI	PIETRO	Leonardo Piccinini	Analysis of the hydrogeological regime of the unconfined aquifer in the Leogra Stream basin and its river-aquifer interaction (Schio,VI)
TOLIN	ELISABETTA	Leonardo Piccinini	Environmental verifications in the subsoil on which there is a landfill for municipal waste in post management (Municipality of Asiago - VI)
TURCATO	MARCO	Luca Giusberti	Study of a historical specimen of lamniform shark from the Cretaceous of Veneto region
VINANTE	PIERPAOLO	Telemaco Tesei	Geological Survey of the Upper Val d'Astico between Nosellari and Forte Belvedere
VORLICEK	LUCIA	Stefano Monari	Paleontological analysis of some gasteropods from the Lower Jurassic of Veneto



What we do

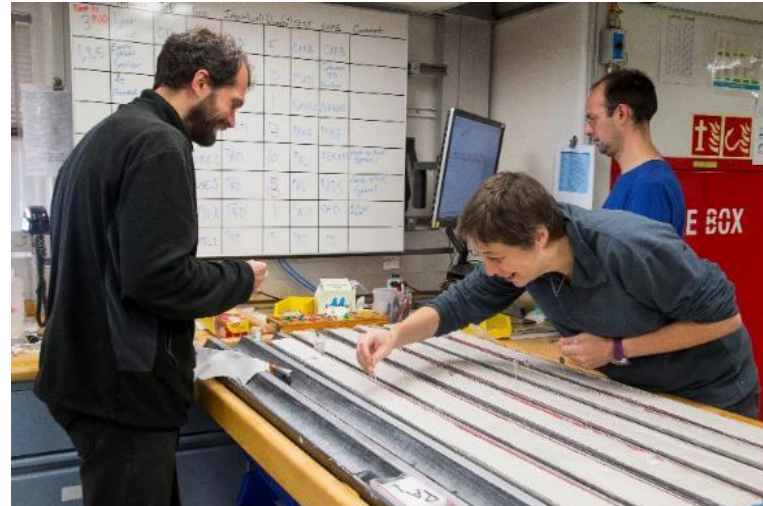


## UNRAVELLING THE SECRETS OF PAST OCEANS

*Claudia Agnini*

My research interests lie in micropaleontology and paleoclimatology. I am a specialist in calcareous nannoplankton, which I use as the primary tool to build integrated age models that are essential for understanding the geological climate changes, and for comprehending not only their impact on the biosphere but also the global mechanisms that were active before, during, and after extreme climate events. These dramatic perturbations represent unique experiments that cannot be reproduced in any scientific laboratory, as they can provide scenarios of ongoing climate changes, especially in the perspective provided in the latest IPCC report, which speaks of the urgency to secure a livable sustainable future for all.

In my research, I consider the oceans and the marine sediments deposited on seabed to be a privileged archive that is available to the scientific community thanks to the drilling, recovery, and conservation guaranteed by the IODP project, in which I am proud to have participated/continue to participate.





## THE SCIENCE OF GEOMATERIALS, INDUSTRIAL PRODUCTS, AND CULTURAL HERITAGE

*Gilberto Artioli*

A major strategy adopted by ongoing research is the application of state-of-the-art integrated techniques to complex problems involving materials. It is often the case that complex materials and problems cannot be solved using one technique alone. Therefore, several techniques are being used to integrate and complement laboratory measurements, including advanced sources at large-scale facilities i.e. spallation neutron sources, synchrotron radiation). Applications are mainly focussed towards the following goals: (1) development and optimisation of industrial products, mostly relevant to the building and ceramics industry; (2) development of innovative stabilisation/solidification techniques involving contaminated soils; (3) CO<sub>2</sub> storage in stable mineral products; (4) solution of materials-based problems in cultural heritage (archaeology, art history, authentication and restoration). The research group is very active and involves researchers from the Department of Geosciences, CIRCe and the affiliated departments, local CNR, and the OPIGEO spin-off. It is now a well-known reference group at the national and international levels. On the industrial side, collaborating companies include ENI SpA and Mapei SpA. On the cultural heritage side, active collaborations include the Getty Conservation Institute, the C2RMF at the Louvre, and the Israel Antiquity Authority.





## ACTIVE AND PASSIVE SEISMIC FOR THE NEAR SURFACE CHARACTERIZATION AT DIFFERENT SCALES

*Ilaria Barone*

My research focuses on the study of seismic waves, including ambient noise, in order to characterize the subsurface. I work at different scales and on different applications, such as environmental studies, archaeological prospection and exploration of natural resources. During the last years I have been working on surface wave tomography and on the integration of active and passive measures to retrieve detailed near-surface velocity models. My late focus is on geothermal energy, and in particular on the exploration and monitoring of geothermal reservoirs.





## **HOT ROCKS**

*Omar Bartoli*

The overall goal of my research is the investigation of mechanisms and dynamics of high-temperature processes in the deep continental crust, applying innovative methodologies to the study of crustal melting and granite petrogenesis. My research is mostly devoted to define new analytical and experimental protocols to investigate melt inclusions, providing exciting new avenues to make these small data repositories talk, obtaining a wealth of new information on melting of the orogenic crust.





## **ATMOSPHERIC EXTREME EVENTS, FROM VOLCANIC ERUPTIONS TO HURRICANES**

*Riccardo Biondi*

My work is focused on two different topics: extreme weather events and volcanic clouds. I use different remote sensing techniques to detect, monitor and forecast thunderstorms and tropical cyclones, and I detect and characterize volcanic clouds by using ground based and satellite sensors.







## RIVER MAPPING FROM SPACE

*Simone Bizzi*

Prof. Simone Bizzi main research interest concerns fluvial systems. Specifically, he studies the dynamical interaction of hydrological and geomorphological processes that shape the morphodynamic evolution of rivers. His research spans different countries (Italy, USA, France, UK, Australia, Vietnam), interacting with a range of research groups which has led to a multi-disciplinary approach. His principal research goal is to develop new theories concerning river behaviour that exploit novel quantitative methods, including simulation modelling, geospatial analysis, and advances in earth observation. He published several papers in the top ranked peer reviewed international journals and he is an associated editor of the journal *Water Resources Research*. His research has been supported by a wide range of competitive grants funded by the EU Life, FP7, 2020 programmes, the Vietnamese Government and a range of Italian Government departments.





## **CATCHING THE CHANGING: GEOPHYSICAL CHARACTERISATION OF A DYNAMIC EARTH**

*Jacopo Boaga*

Applied geophysics for environment and engineering. Seismic, Electrical and electro-magnetic methods applied for extreme environments threatened by climate changes: wetlands and high mountains landforms. Low cost distributed seismic sensors for earthquake detections: seismic hazard, local response and soil building interactions.





## INVESTIGATING THE ORIGIN OF HIGHLY SILICIC MAGMAS

*Bruna Borges Carvalho*

I investigate migmatites and granulites to understand anatexis and fluid regime of the deep continental crust and their impact on granite magmatism and crustal differentiation. My main interest lies on how crustal magmas are formed and how their composition (major, trace and volatile elements) may change before segregation from the source to form granites. At the moment I am working on melt and fluid inclusions in peritectic garnet from ultrahigh temperature granulites and also on highly silicic volcanic rocks to probe their origin and volatile budget.

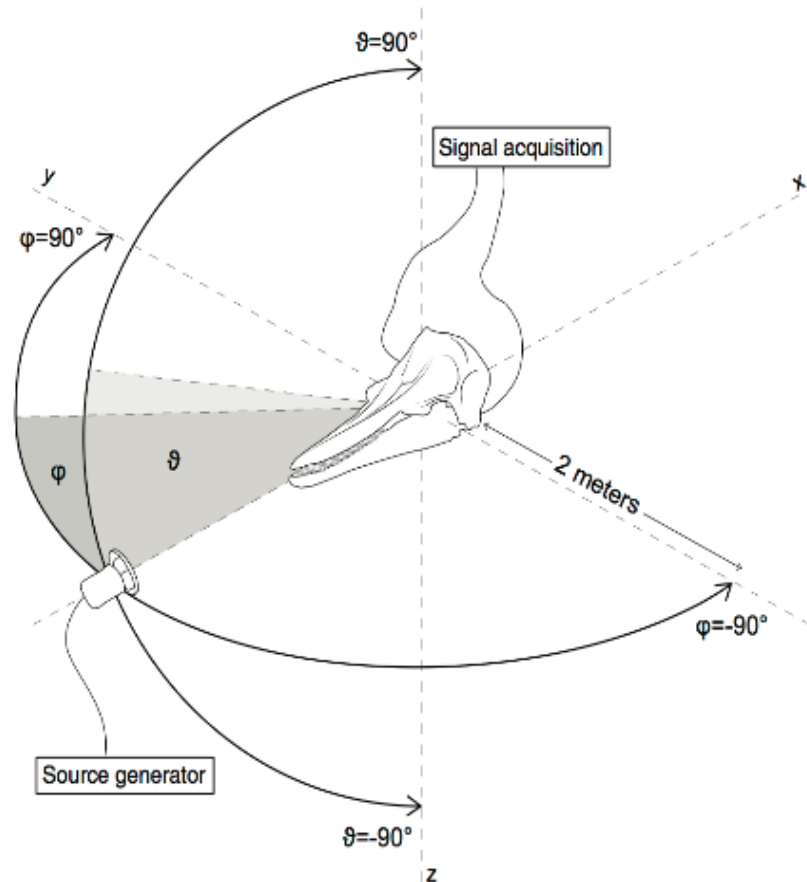




## SEISMOLOGY AND ACOUSTICS

*Lapo Boschi*

Lapo Boschi is a physicist, specialized in geophysics and seismology, who studies the propagation of waves in complex media. He applies those competences to topics in the geosciences (the structure and dynamics of the earth) and acoustics (acoustic time reversal, the dolphin's biosonar, etc.).





## SEDIMENTATION AND PAST CLIMATES IN THE CENTRAL MEDITERRANEAN

*Luca Capraro*

My research is centered on the stratigraphic and paleoclimatic study of Pliocene to Pleistocene sediments of the central Mediterranean. More specifically, I am committed in reconstructing the regional climatic evolution during the Early Pleistocene (ca. 2.6-0.8 Ma) by analyzing the expanded stratigraphic succession of recently uplifted, open-marine sediments that are spectacularly exposed along the coastlines of Southern Italy and Sicily. Our working group involves colleagues from national institutions such as the INGV of Rome, CNR-IAS, CNR-IGG, the Universities of Bologna, Catania, Chieti, Palermo, Urbino and Venezia, as well as specialists from foreign research centers such as CNRS (France), University of Missouri (USA) and Lisbon (Portugal), the Xi'an AMS center (PRC), and others. This manifold expertise allows for a multidisciplinary approach based on diverse tools such as physical stratigraphy, stable O and C isotopes, calcareous plankton biostratigraphy, paleomagnetism, and beyond.





## NEAR-SURFACE GEOPHYSICS

*Giorgio Cassiani*

Most geological investigations face the obvious problem that soil and earth are (obviously) not transparent to visible light. Therefore, many reconstructions of the subsurface structure and processes are based on extrapolation of punctual data (from the surface or in boreholes) supported by assumptions. Luckily, exploration geophysics has long helped mankind to 'see' the subsurface for a number of practical and less practical purposes: from mining exploration to the general understanding of Earth's systems. If I had to give myself a research mission, it would be to remind all that without geophysics, there would be no sound knowledge of the earth. In particular, as the system is highly heterogeneous, as set in place by dynamic processes within the solid and fluid parts of the planet, we cannot rely upon assumptions of 'continuity', 'homogeneity' and interpolation. More specifically, my research work has been focussed, over the past 20 years, on the investigation of the structure and the dynamics of the shallow subsurface, where most engineering geology and environmental processes take place. In particular, I like: a) geophysical methods for environmental applications, with particular regard to the characterisation of hydrological systems and contaminated sites from the geological, hydrological and contamination viewpoints. The methods of choice are Electrical Resistivity Tomography (ERT) and Ground Penetrating Radar (GPR), especially in borehole and cross-borehole configuration. Novel Spectral Induced Polarisation (SIP) and microgravimetric time-lapse methods are currently under development; b) seismological micro-scale zoning and other soil dynamics use exploration geophysics, with particular reference to surface wave methods (MASW, MOPA); c) integration of hydrological modelling with evidence from geophysical methods and from classical hydrological measurements, both in the vadose zone and in the saturated zone, with the aim of calibrating the hydraulic and hydrological parameters of relevant geological formations; d) integration of invasive and non-invasive techniques for site characterisation, with particular reference to geostatistical techniques; and geomechanical issues related to the control of subsidence caused by the extraction of fluids from the subsurface, with particular regard to petrophysical and modelling aspects, including the geomechanical effects on 4D seismics.



## **TOWARDS GLOBAL LANDSLIDE MODELS - UPSCALING HAZARD FORECASTS IN SPACE AND TIME UNDER CLIMATE CHANGE FORCING**

*Filippo Catani*

Landslide hazard, machine learning applied to geohazards, monitoring and modelling of basin-scale surface processes, natural hazards, applications of remote sensing to landslide studies, oil & gas environmental impact and risk, surface monitoring in open-pit mines, scaling processes in geomorphology.





## PROBING THE DEEP CRUST

*Bernardo Cesare*

In the ACME (Advances in Crustal Melting) research group, including Profs O Bartoli and B Borges Carvalho and PhD candidate P Slupski, we study the how (processes) and the what (products) of partial melting of the deep crust. This is probably the main process that shapes the upper layer of our planet, which determines its geochemical differentiation and promotes its dynamic behaviour through the formation of granitic magmas. Using samples of worldwide provenance, but recently focussed on rocks from Antarctica, the Alps and the Swedish Caledonides, we apply the most innovative approach to the characterisation of natural crustal melts, i.e., the study of 'nanogranitoid' inclusions in peritectic minerals such as garnet. This novel approach, developed by our research group, utilises a series of analytical techniques ranging from conventional petrography to experimental petrology.







## **SUSTAINABILITY & CULTURAL HERITAGE**

*Chiara Coletti*

My research interests mainly include the characterization of natural and artificial rocks applied in built heritage, the radon occurrence and the archaeometry, with focus on the following topics: Optimization of new mix designs reusing inorganic and organic waste and by-products for a sustainable brick production in a concept of circular economy; Radon occurrence in rocks, soils and constructions (radon mapping and exhalation, geogenic sources, and radioactivity from the use of NORM in building materials); Archaeometric studies for provenance and productive technology assessment of artifacts from the Kerman province of Jiroft in Iran and from the UNESCO site of Aquileia in Italy; Stones deterioration and geomaterials (mainly ceramics and plasters) vulnerability in indoor and outdoor microclimate conditions (decay products and surface changes in relation to the environment, e.g. relative humidity, light doses, temperature, pollutant gases and particles).

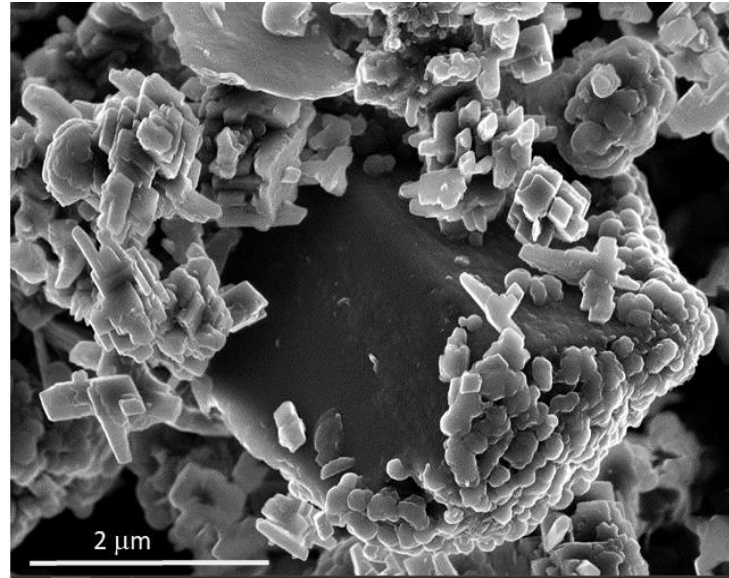




## MINERALOGY APPLIED TO THE STUDY OF CEMENT

*Maria Chiara Dalconi*

Cement is the most used industrial material, considering the enormous volumes produced and consumed yearly worldwide. It is generally considered a simple and cheap material; actually, it is a highly engineered material that has been optimised since the beginning of the 20th century. Cement is still the subject of extensive research and its technological content is increasing. The challenge of the present day is to make cement more sustainable, reducing the environmental impact related to its production. Academic research can make a valuable contribution to achieving these goals. My research activity is focussed on understanding the process involved in cement hydration, how cement composition impacts final mechanical properties, on elucidating the elusive structural details of C-S-H (the main product in hardened cement paste), and on how we can safely use industrial byproducts (waste) as cementitious materials and reduce the consumption of natural raw materials. A research activity that is feasible only thanks to collaboration with colleagues of the Geoscience Department, IGGC-CNR researchers and in cooperation with industrial partner Mapei SpA and an OPIGEO spin-off.

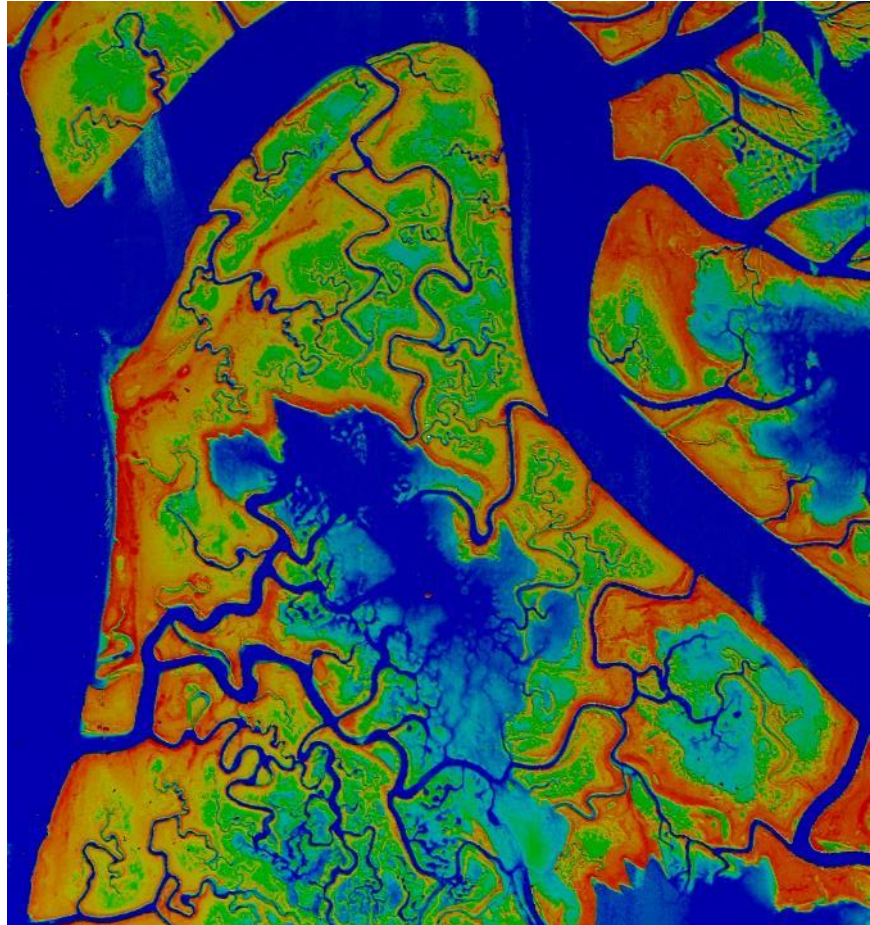




## ESTUARINE AND FLUVIAL ECO-MORPHODYNAMICS

*Andrea D'Alpaos*

D'Alpaos' research focuses on the mutual interactions and adjustments between physical and biological processes in coastal landscapes. His research on the biomorphodynamic evolution of coastal landscapes includes understanding, through field observations, laboratory experiments, and modeling, how biogeomorphic feedbacks contribute to shaping these landscapes and how they drive system response to changes in the environmental forcing and human interferences.





## GEOTHERMAL ENERGY AND THERMAL PROPERTIES OF ROCKS

*Eloisa Di Sipio*

Currently, as coordinator of the European project DeepU (G.A. 101046937), "Deep U-tube heat exchanger breakthrough: combining laser and cryogenic gas for geothermal energy exploitation (DeepU)", I am leading a research field devoted to unveil the thermal effects of laser beam and cryogenic gas combined actions on different type of rocks, analyzed by petrographic and geophysical techniques. In addition, my research field concerns other topics as (i) detecting the urban thermal footprint in metropolitan and rural areas to develop a multi-scale approach for future geothermal utilization and management; (ii) the applications of non-destructive diagnostic techniques both in laboratory and on field for geothermal purposes for the thermo-physical-mechanical properties characterization of rock materials, (iii) the possibility to reuse abandoned/exhausted O&G wells for geothermal purposes, (iv) the potential and feasibility of both underground thermal energy storage systems and shallow geothermal systems.

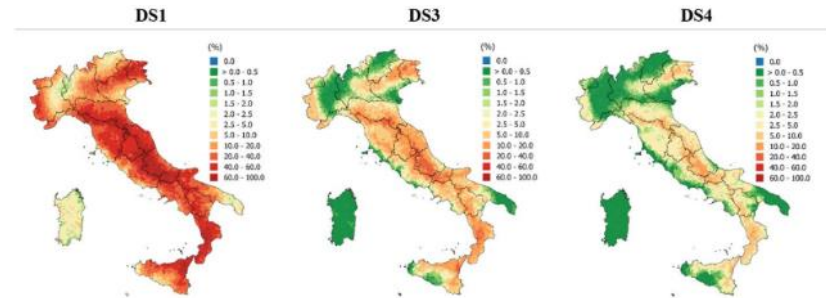




## SEISMIC VULNERABILITY OF STRUCTURES AND SEISMIC RISK

*Francesca Da Porto*

Earthquakes represent a major threat for the built environment and for the safety of people. My research activities focus on understanding the seismic vulnerability of structures, to propose new design procedures and develop mitigation strategies for existing constructions, in particular Cultural Heritage buildings. To this end, I carry out on-site tests with several non- and minor-destructive techniques, including tests for the dynamic identification of buildings. I use monitoring systems, both traditional on-site SHM and satellite MT-InSAR techniques, for assessing the health condition of buildings and monuments. These results are used to calibrate numerical models for the analysis of structural behavior and the assessment of seismic vulnerability. I also work on developing and evaluating the effectiveness of techniques aimed at reducing seismic vulnerability. Starting from the seismic response analyses of single and clustered buildings, I moved to the seismic vulnerability assessment of urban centres and, more recently, to the seismic risk assessment at a territorial scale. In this field, I actively contributed to the first "National Risk Assessment" delivered by the Department of Civil Protection in 2018, and I am working on the subsequent three-year updates of the same document. In my work, I have many collaborations with the DPC, as well as ReLUIIS, the Ministry of Culture, and many other public administrations and private companies. I also have many collaborations with research institutions abroad, in particular in Israel and in China.



National Seismic Risk Assessment. Unconditional damage map of masonry buildings at 50 yrs.



## **MECHANICS OF NATURAL AND HUMAN-INDUCED EARTHQUAKES**

*Giulio Di Toro*

Mankind has been a victim of earthquakes for millennia and is now able, often accidentally, to cause them. In my research, I study the earthquake engine (the fault zone) by conducting (1) field studies of faults exposed at the surface and of fault rocks from deep drilling projects, (2) laboratory experiments that reproduce deformation conditions during the earthquake cycle, and (3) microanalytical studies of natural and experimental fault rocks to answer the following questions

- What is the structure of a seismogenic fault?
- What are the deformation mechanisms active during the seismic cycle?
- How are seismic ruptures nucleated, propagated, and stopped?
- Why do some faults slip almost silently and others rupture in damaging earthquakes?
- Why do many earthquakes remain small and only some become large?
- How are tsunamigenic earthquakes generated?
- Why does the slow creep of a landslide evolve into a catastrophic collapse?



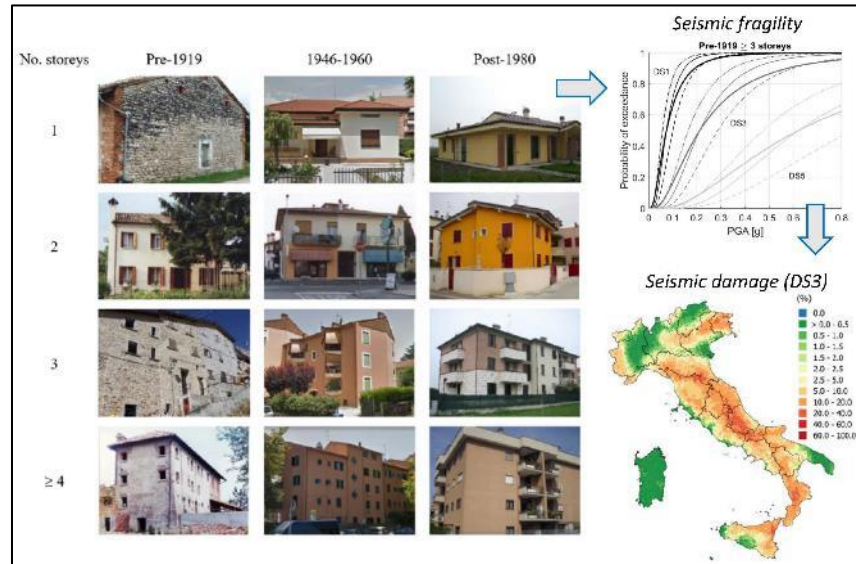


# SEISMIC RISK ASSESSMENT AND MITIGATION OF BUILT STRUCTURES

Marco Donà

Main research interests include:

- inter-storey seismic isolation and the definition of approaches for its optimal design, particularly for seismic retrofit applications through elevation;
- new passive control techniques, based on mass damping, to mitigate seismic effects on industrial racks;
- experimental and numerical characterization of isolation systems for structural content (lightweight structures) protection;
- seismic behaviour of load-bearing masonry walls, with focus on evaluation of second-order effects;
- experimental and numerical evaluation of the seismic behavior of reinforced concrete infilled frames, and the combined in-plane and out-of-plane seismic response of various infill panels;
- definition of mechanics-based fragility models for classes of residential buildings, estimation of related seismic risk, and cost-effectiveness assessment of seismic retrofit interventions at the national scale;
- characterization of building and bridge stocks, and their prioritization based on simplified seismic vulnerability assessments.

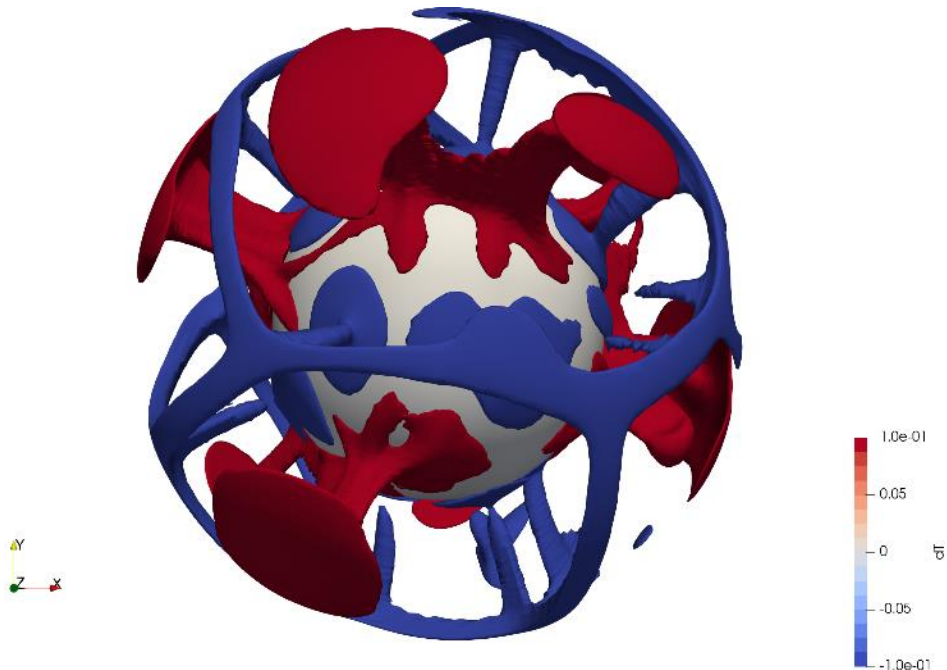




## STUDY OF THE DEEP EARTH'S INTERIOR

*Manuele Faccenda*

Numerical modelling of seismological, petrological, and thermo-mechanical processes, such as grain- and rock-scale structural fabrics development, regional-scale evolution of active tectonic settings, and global scale simulations of planetary interiors. Deep and long-term volatiles cycle. Seismological forward and inverse problems. Scientific software development and optimisation.







## FLUVIAL AND TIDAL ECOMORPHODYNAMICS

*Alvis Finotello*

Combining field surveys, remote sensing analyses, numerical modeling, and physical laboratory experiments, Alvis investigates the morphodynamic evolution of tidal channels and tidal channel networks in tidally-influenced estuarine and fluvio-deltaic environments, as well as the intertwined ecogeomorphological feedbacks between tidal currents, sea-level changes, wind waves, and vegetation dynamics and their effects on the long term evolution of tidal salt-marshes. In addition, he is also interested in understanding the ecomorphodynamic evolution of meandering streamflows in distinct environmental and climatic settings - from tropical forests to deserts to Arctic environments - a relevant topic with global implications for stream and wetland restoration, land management, infrastructure design, oil exploration and production, carbon sequestration, flood-risk mitigation, and planetary paleoenvironmental reconstructions.





## **GEOHAZARD EVALUATION AND MITIGATION**

*Mario Floris*

I am part of the Engineering Geology group of the Department. The group is composed by one full professor, three assistant professors, four PhD students, two visiting PhD students from China and me. In the last year, we have developed a Machine Intelligence laboratory dedicated to the analysis and assessment of geohazards using the most recent Artificial Intelligence (AI) techniques. Currently we are carrying out surveys on landslide hazard affecting the Belluno Province (NE Italian Alps), financially and technically supported by the Veneto Region, and in collaboration with researchers from the Department of Land, Environment, Agriculture and Forestry of the University of Padua and the National Research Council. We are analyzing the effects of extreme meteorological events on the variation in the susceptibility to landslides in the study area. To this end, we are performing field geological and geomorphological surveys, GIS-based landslide hazard analyses, SAR satellite data processing, detection, and characterization of landslides through Machine Learning techniques applied to high-resolution optical data. Of particular interest is the VAIA windstorm that hit the Northeast Italian Alps in 2018 and caused huge damage to environmental and anthropic elements.

Due to recent climate changes, this kind of dangerous phenomena seems to have become more frequent in the last year, therefore great attention must be paid to the short- and long-term effects on the stability of slopes and, consequently, on the elements at risk, such as anthropic structures and infrastructures. Our group is establishing and consolidating relationships with numerous foreign academic and governmental institutions located in Europe, Central America, and East Asia, to realize a scientific network dedicated to geohazard risk assessment and mitigation, and to explore the possibility of finding common strategies and solutions for human resilience at a global level, within a climate change context.





## **THE INTERNAL STRUCTURE AND MECHANICAL PROPERTIES OF SEISMOGENIC FAULT ZONES: FROM THE FIELD TO THE LABORATORY SCALE**

*Michele Fondriest*

My research focus is the study of the internal structure and mechanics of fault zones. I tackled this topic at first, as structural geologist, based on robust field structural surveys of exhumed fault zones and microanalytical studies of natural fault zone rocks. I also conduct rock-deformation experiments to investigate the mechanical behavior of rocks under a wide range of ambient and loading conditions. More recently, I have begun to study (i) fluid rock-interaction and fluid-flow within fractured rocks, and (ii) the elastic properties of fault zone rocks at different length scales: from ultrasonic velocity measurements to near-surface seismic surveys within fault zones.





## CENOZOIC AND LATE CRETACEOUS CALCAREOUS NANNOFOSSIL BIOSTRATIGRAPHY AND PALEOECOLOGY

*Eliana Fornaciari*

Information on past climate changes and their interactions with the Biota is vital, as it provides clues on the present and future evolution of our planet. In Earth History, a few geologically brief intervals have been identified that were characterized by anomalous high temperatures (e.g., Paleogene hyperthermal events, Late Cretaceous OAE) and may represent analogues of the current climatic stress. Understanding of their triggering mechanisms, development and recovery phases involve many disciplines of Earth Sciences. I contribute to this task via the study and quantitative counting of calcareous nannoplankton assemblages, to establish: (1) the age and timing of these “warming episodes”; (2) changes within the fossil communities in terms of abundance and biodiversity before, during and after these episodes; (3) sensitivity to dissolution and presence of heavy metals. My studies benefit from active collaborations with colleagues from others University (Urbino, Chieti, Ferrara, Modena) and Research Institutions (Italian and French CNR).





## SYSTEMATIC PALAEOONTOLOGY AS A KEY TO UNDERSTAND THE TRIASSIC-JURASSIC EVOLUTIONARY HISTORY OF THE WESTERN TETHYAN GASTROPODS

*Roberto Gatto*

My current research focuses on the taxonomy of gastropod faunas from Hettangian and Aalenian strata of continental Europe, in order to elucidate the faunal recovery in the aftermath of both end-Triassic and Lower Toarcian extinction events. I also study crinoids from Italian Paleogene deposits.





## **SEDIMENTOLOGY AND MORPHODYNAMICS OF FLUVIAL AND TIDAL MEANDERING CHANNELS**

*Massimiliano Ghinassi*

My research work mainly focuses on linking morphodynamic processes of clastic depositional environments with related sedimentary products, with a particular focus on fluvial and tidal systems. I developed my background applying principles of facies analyses on outcrop exposures, and investigating sedimentary successions spanning in age from Precambrian to late Cenozoic. I recently moved my interest on modern meandering channels draining coastal areas, and on their Holocene deposits. In times of noteworthy environmental changes, management of lowland and coastal areas is tightly linked to the understanding of evolution of these sinuous channels, both to live by their side and to manage the landscape, which they chiseled over the past millennia. I currently investigate deposits of fluvial, fluvio-tidal and tidal channels through integration of remote sensing, numerical modelling and sedimentological approaches in collaboration with my colleagues Andrea D'Alpaos and Alvisé Finotello. I recently started applying principles of sedimentary facies analyses to predict distribution of microplastics in riverine environments.





## THE CRETACEOUS-PALEOGENE FOSSIL RECORD OF NORTHERN ITALY

*Luca Giusberti*

My main research field is the study of Meso-Cenozoic benthic foraminifera, which I employ as proxies of the environmental conditions at the seafloor and for paleodepth estimates. I am specifically interested in investigating the climatic and biotic perturbations of the Paleogene that are well exposed in the on-land marine successions of the northern Veneto region, such as the Cretaceous/Paleogene (K/Pg) transition, early Eocene hyperthermals, the Early Eocene Climatic Optimum (EECO) and the Middle Eocene Climatic Optimum (MECO). I am also actively involved in a multidisciplinary study of the classic Fossil-Lagerstätte of the Veneto region, such as the famous UNESCO-candidate Eocene site of Bolca (Verona province), and other fossil sites of northeastern Italy. In this context, I deal with geological and stratigraphic reconstructions as well as the nomenclatural and historical revision of the fossils found at the sites of relevance, which are mainly housed in scientific museums. My work benefits from tight collaborations with the Universities of Vienna, Modena, Ferrara and Turin, the CNR-Institute of Geosciences and Georesources of Padua, the University of Lyon and various museums in northern Italy (Natural History Museum of Verona, Natural History Museum of Venice, Museo Friulano di Storia Naturale).





## **PETROLOGY OF CULTURAL HERITAGE MATERIALS: DISCLOSING THEIR PROVENANCE AND THE PRODUCTION TECHNOLOGY**

*Lara Maritan*

My research couples mineralogical, geochemical, isotopic and petrographic analysis to disclose the provenance, the production technology and the alteration state of ancient artifacts, particularly of ceramics, mortars, pigments and stones, from various regions and dated back till the Paleolithic. In addition to laboratory analyses, field activities contribute to properly sample the ancient artifacts, as well as studying the environment in which they laid down for century or millennia, or the possible geological area from which the raw materials used were supplied. The use of standard analytical procedures and the application of advanced methods (also non-conventional) to better solve specific problems, represents an important aspect of my activity, as well as to explore the limits that these methods have in archeological and history of art materials. Moreover, in order to better interpret the ancient records, experimental reproductions of past technology or alteration process in laboratory, under controlled conditions, are fundamental.







## HYDROMETEOROLOGICAL EXTREMES AND HAZARDS

*Francesco Marra*

My research interests lie in the interface between atmospheric processes, climate and global change, hydrology, and geomorphology. I combine these disciplines using state-of-the-art observational datasets (weather radars, satellites), model simulations, and advanced statistical approaches. I am particularly interested in the statistical description of extreme events, and I have a special focus on hydro-meteorological extremes and related hazards and geomorphic processes such as floods (including flash floods and urban floods), landslides, debris flows, droughts, windstorms, etc.

Current research topics include: identification of quantitative relations linking basic physical principles and empirical observations with the emerging statistical description of extremes; land-atmosphere interactions and feedbacks (how land use impacts precipitation on both weather and climate timescales, as well as how precipitation regimes impact geomorphology); climate change impact on extreme precipitation and the related hazards (mainly flash floods, urban floods, landslides and debris flows); compound and cascading processes and the related hazards.

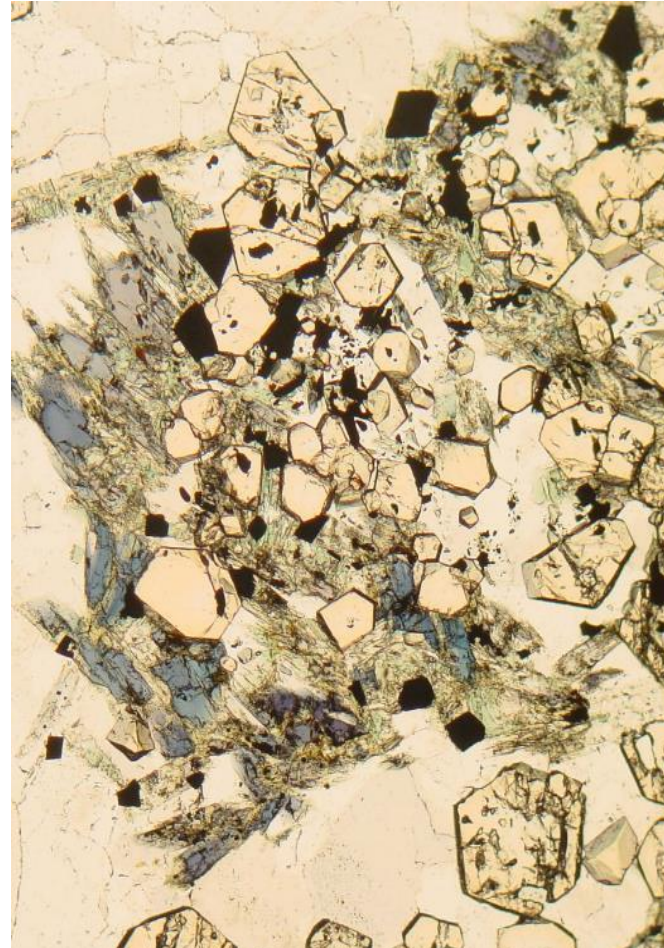




## ALPINE GEOLOGY

*Silvana Martin*

My research interest is directed to (1) mineralogical and petrological studies of the Mn mineralizations in the Western Alps; (2) geological mapping in the Alps (1:50.000 Sheet Borgo Valsugana) and (3) dating of landslides in the Brenta Group-Lake Garda region with cosmogenic  $^{36}\text{Cl}$  isotope.

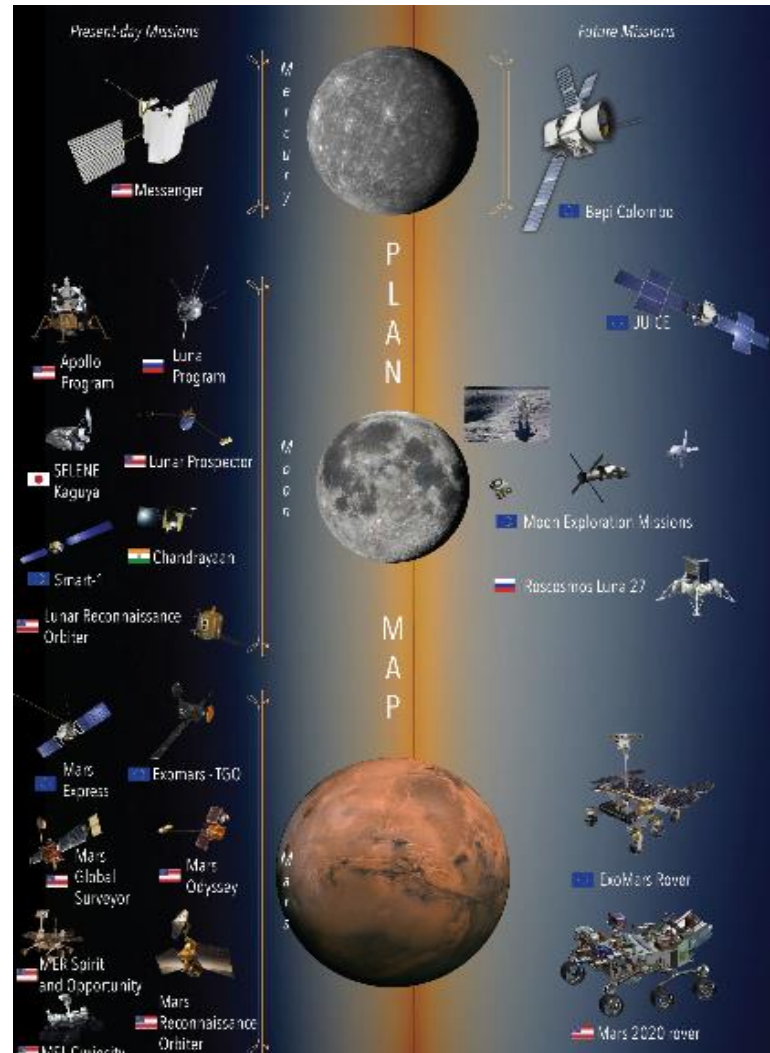




## GEO-MAPPING OTHER WORLDS

*Matteo Massironi*

In the last years we have witnessed an exponential increase of space missions to diverse planetary bodies of the Solar System, including in situ robotic and crewed explorations led by different National Space Agencies. This trend is going to further increase in the years to come and is consequently leading to an urgency in the production of planetary geological maps to define observational strategies of orbital missions, assuring safe landing and fruitful traverses of robotic and human missions and scientifically exploiting the retrieved data. My research activity aims at producing geological maps and 3D geological models to sustain future planetary exploration on the Moon, Mars, Mercury and Jupiter's satellites. To correctly interpret the geology of planetary surfaces is, however, essential to refer to earth analogues in diverse geodynamic contexts, which are studied through field analysis, remote sensing and geomodelling.





## **APPLIED PETROGRAPHY IN THE STUDY OF CLIMATE CHANGE EFFECTS ON MATERIALS AND THE ENVIRONMENT**

*Claudio Mazzoli*

One of the major challenges in humanity is to tackle the effects of climate change through mitigation and adaptation actions and strategies. Most of us are now aware of the risks we are increasingly facing, although the effects of climate change remain somehow intangible and most noticeable impacts are still too far from our daily lives. Adequate risk management and effective policy decisions require thorough understanding of climate change, knowledge and quantifying the effects. This represents the main goal of all my research interests, which brings me from historic cities to Antarctica. My main research interest focus on understanding weathering processes and rates of decay of stones and the assessment of cultural heritage vulnerability under future climate scenarios.



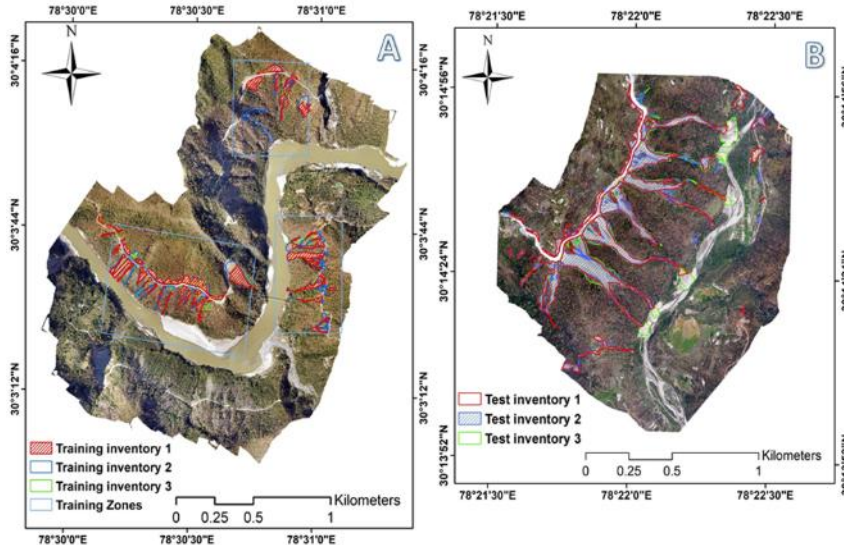


# APPLICATION OF ARTIFICIAL INTELLIGENCE TO LANDSLIDE RISK MANAGEMENT FRAMEWORK, FROM DATA MINING TO RISK ASSESSMENT

*Sansar Raj Meena*

Specialized in the use of Remote Sensing and Geographic Information Systems for natural hazard and risk assessment with focus on landslide problems. PhD in Applied Geoinformatics from Paris Lodron University of Salzburg, with research on “Rapid generation of landslide inventory and susceptibility assessment using state of the art approaches”. Also, working as a visiting scientist in the department of Earth Systems Analysis, ITC and contributes to the research theme 4D-Earth, specifically to Natural Hazards and Disaster Risk Management with supervision of Prof. Dr. Cees van Westen.

Expertise in use of Artificial Intelligence and spatial information for landslide detection and hazard assessment, remote sensing and GIS for flood hazard assessment, technological hazard assessment, and multi-hazard assessment.





## **MANTLE EVOLUTION, DYNAMICS AND GEOCHEMISTRY; CRUSTAL GROWTH AND LITHOSPHERIC DYNAMICS**

*Christine Meyzen*

My research builds on the isotopic and elemental composition of lavas paired with petrology in a variety of environments to gain insight into the evolution and dynamics of the Earth's mantle, mantle geochemistry, crustal growth and lithospheric dynamics. My research interests so far have focused on mantle dynamics, tectonic, hydrothermalism and magmatism in the Indian Ocean; physical and chemical interactions between mantle plumes and mid-ocean ridges and their effects on seafloor geological processes; morphology; structure, and spatial scales of magmatism at mid-ocean ridges; origin and length scale of heterogeneities in the mantle; emplacement dynamics of subaerial lava flows at oceanic islands; studies of eruption sequence and evolution of lava chemistry during volcano growth; Large Igneous Province (LIP) -forming mechanisms; origin of volcanism at isolated seamounts and rises; seafloor massive sulfide resources along mid-ocean ridges.



## SYSTEMATIC PALAEOONTOLOGY AS A KEY TO UNDERSTAND THE TRIASSIC-JURASSIC EVOLUTIONARY HISTORY OF THE WESTERN TETHYAN GASTROPODS

*Stefano Monari*

Mollusks are an important component of the past and living benthic communities with a history of evolutionary vivacity and of intense ecological diversification that makes the study of this group a good target to recognize faunal crises at a different scale and to outline the trajectories of recovery. My researches are mainly directed to identify the changes of the taxonomic and ecological diversity of the benthic mollusks of the European shelf and intra-Tethyan region during the Triassic and Jurassic. Combining these events with the changes of biogeographical distributions permits to evaluate the effect of the articulated palaeogeographical and paleoenvironmental history of the western Tethys and to frame the evolution of this group in a comprehensive geodynamical context.





## DEEP EARTH, TERRESTRIAL AND EXTRATERRESTRIAL DIAMONDS

*Fabrizio Nestola*

My ongoing research activities mainly focus on mineral physics, diamond research, meteorites and new minerals discovery using cutting-edge analytical techniques in X-ray diffraction, micro-Raman spectroscopy, and scanning electron microscopy. My main target is the use of mineralogy and crystallography to solve geological unsolved problems at small and large scale. My main contributions are about the development of elastic geobarometry applied to the diamond-inclusion systems to determine the depth of diamond formation and to the investigation of the temporal growth relationships between diamond and its mineral inclusions with the final aim to comprehend under which geological environment diamond crystallised. More recently, I also focussed my research on meteorites and more in detail on extra-terrestrial diamonds to understand the space processes at the base of extra-terrestrial diamond formation. The research outputs in 2022 resulted in 18 peer-reviewed papers. Since one year, I am involved in a few research projects in the field of environmental mineralogy.







## ARCHAEOLOGY MEETS EARTH SCIENCES

*Cristiano Nicosia*

I am the PI of the ERC Consolidator project 'GEODAP' (Geoarchaeology of Daily Practices), which focuses on the reconstruction of daily lives during the Bronze Age (2nd millennium BCE). The project involves an interplay of analytical techniques (soils/sediment micromorphology, palaeobotany, organic chemistry) on a set of selected archaeological sites spanning NE Italy, the Balkans, and the Carpatho-Danubian Basin. The project began in October 2021 and will last until 2026. In the framework of GEODAP I direct the excavations at the middle bronze age site of LA Muraiola di Povegliano (Verona, NE Italy. Since 2022 I am also the PI of the DIANE project (DIRT AND Excrements), funded by FARE call of the Italian Ministry of Research (MIUR). A new laboratory for the production of soil/sediment thin sections has been built at the Department of Geosciences. The GEODAP team consists of three PhD students, two postdocs (a palaeobotanist and an organic chemist beginning in April and October 2022 respectively) and a laboratory technician. My remaining research activity concerns bronze age pile dwellings and, more generally, wetland and peat bog geoarchaeology. I participated in a Brown University (USA) mission in Petra (Jordan) focusing on ancient agricultural terraces and to geoarchaeological campaigns in Sardinia with the same University. Since 2019, I have carried out palaeoenvironmental research in the Berici Hill area (Vicenza), and excavated the Neolithic site of Molino Casarotto in 2022.





## RESOURCES FOR GEOLOGY - GEOLOGY FOR RESOURCES

*Paolo Nimis*

The current activity is characterised by an interdisciplinary approach, which conjugates the themes and methods of mineralogy, ore geology, petrology and geochemistry to unravel minerogenic processes in mafic and ultramafic environments. The main recent research lines are (a) the geochemistry, mineralogy and thermobarometry of mantle rocks and inclusions in diamonds, with implications on the interpretation of the genesis and distribution of diamonds on the diamond potential of kimberlitic rocks; (b) the study of massive sulphide deposits (Cu, Zn, Co, Ni) in mafic-ultramafic complexes, with particular attention to the interpretation of their metallogenic variability and their comparison with present-day seafloor sulfide deposits; (c) copper metallogeny and trace and isotope geochemistry of copper deposits in the Alpine belt (and neighbour areas), with archeometric implications on the provenancing of ancient copper artifacts.





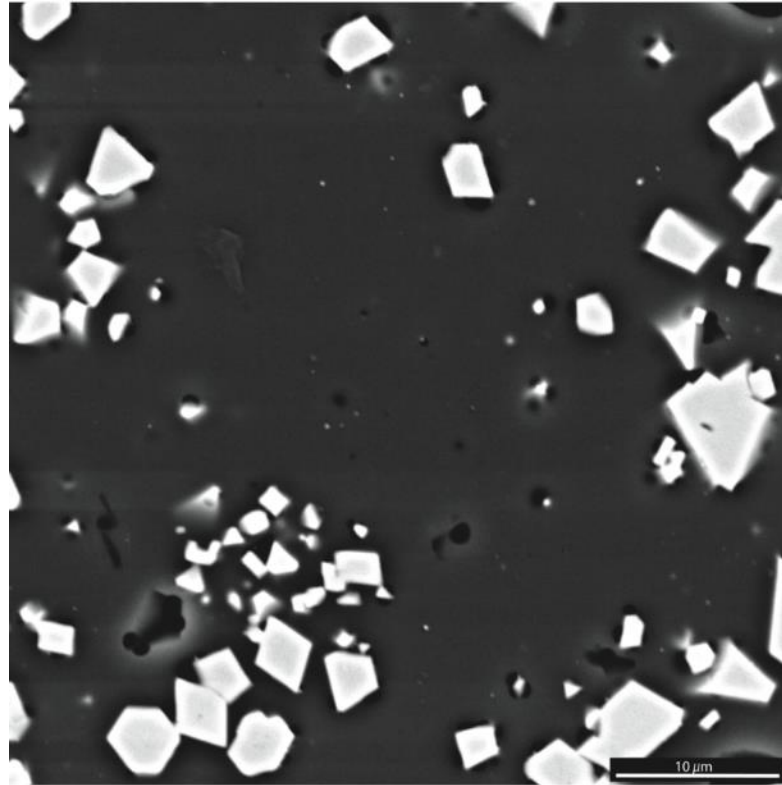
## DEEP EARTH GEOCHEMISTRY

*Davide Novella*

My research focuses on understanding Earth's dynamics and evolution into a habitable planet. I am interested in global geochemical cycles and magmatic processes occurring in the Earth's interior, and particularly in the behavior of volatile elements (COH) and stable isotopes (e.g., Fe).

To gain direct insights into the inaccessible deep Earth, I study rare and unique natural samples that form at extreme depths within the Earth's mantle, such as inclusion bearing diamonds. Alongside, I conduct high-pressure/high-temperature laboratory experiments to reproduce the geological processes occurring at such extreme conditions and interpret natural observations. These approaches are coupled with analytical and theoretical tools to constrain the melting processes differentiating our planet.

Current research projects include the development of experimental protocols to constrain Fe isotope fractionation in the mantle, the distribution of H and C between minerals and melts in the deep Earth, and the origin and evolution of diamonds and their inclusions.



## POLAR GEOLOGICAL AND LANDSCAPE EVOLUTION THROUGH AN ENHANCED GLACIAL FORCING

*Valerio Olivetti*

During the late Cenozoic, the climate of the earth recorded a constant descent towards colder condition. The consequent growth of large continental ice volumes deeply shaped the topography of high latitude and mountain regions, producing deep valleys and fjords that characterise the present polar and mountain landscape. In my research, I trace the provenance of sediment in marine sequences to detect episodes of continental ice volume changes and variation of mechanism of transport. Provenance of sediment is constrained using a multi-methodology dating that allows the location of the area of source

and the elevation. Marine sediments collected in front of the Greenland coasts allowed us to detect a progressive increase in elevation of the focussed erosion, in response to increase of the periglacial erosion processes during the last 6 Myr. In Antarctica, the provenance of sediments sheds light on a glaciation event during the mid-Miocene period. Collaboration with the Trinity College laboratory of Dublin allowed us to improve the multi-methodology approach to provenance analysis consisting of a coupled fission track, U-Pb and geochemical analysis.



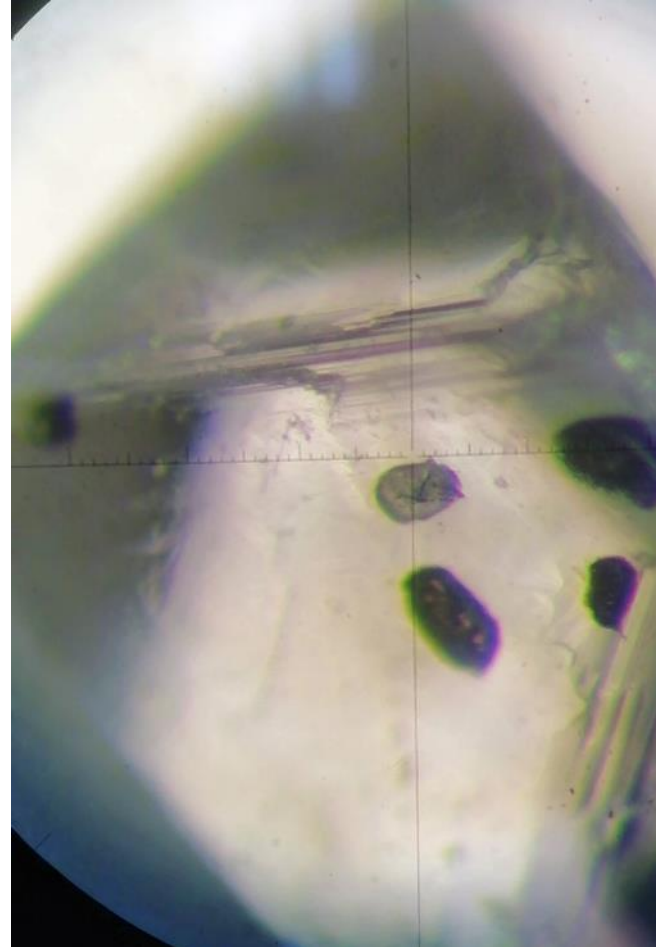


## DIAMONDS, DEEP EARTH AND THE ORIGIN OF EARTH'S WATER

*Martha Pamato*

I am a mineralogist trained in mineral physics but with a wide geological background. My research goal is to determine the physical and chemical properties of Earth materials to understand the structure and composition of the Earth and its evolution into a habitable planet. My research is multidisciplinary and falls into the fields of petrology and geochemistry. I conduct laboratory experiments to simulate the conditions of the Earth's mantle, that are beyond reach. Recently, I have been applying my know-how to the study of natural samples from the very deep mantle, such as diamonds.

In 2021, I obtained an ERC Starting grant for the project INHERIT, which aims to determine Earth's primordial hydrogen isotopic signature and content of a unique set of worldwide, natural diamonds dating from 3.5 to 0.09 billion years. The new results will be fundamental to pinpoint Earth's water origin with long-term implications for understanding planet habitability, in our Solar System and beyond.





## UNDERSTANDING DEFORMATION PROCESSES IN THE EARTH'S INTERIOR FROM EXHUMED ROCKS - ZOOMING FROM THE REGIONAL TO THE SUB-GRAIN SCALE

*Giorgio Pennacchioni*

My main research interest is understanding the deformation processes occurring at depth in the earth's lithosphere. These processes include either the abrupt brittle yielding of rocks, which may cause earthquakes, or the slow creep of rocks at high temperatures flowing like highly viscous fluids. My studies are strongly based on field work and quantitative mapping of rocks tectonically exhumed to the earth's surface from deep structural levels (inaccessible to direct investigation). To understand the mechanisms at the grain/subgrain scale underneath deformation, I analyse samples using different techniques of scanning electron microscopy. Specific topics addressed in my recent research are: (i) nucleation and growth of ductile shear zones and interplay between brittle and ductile processes under metamorphic conditions, and (ii) origin of seismicity at mid-lower levels in the continental crust and of intermediate-depth subduction earthquakes in dry oceanic slabs. For the study of fossil earthquakes, I investigate unique fault rocks (pseudotachylytes) representing quenched frictional melts produced during the seismic slip of a fault. To address these topics, I work in several areas worldwide with some of the most spectacular exposures of structures, e.g. deglaciated areas of the European Alps; desert regions in the Musgrave Ranges, central Australia, and Atacama Desert in northern Chile; Lofoten Islands, Norway; Sierra Nevada cordillera, California.





## RENEWABILITY ASSESSMENT OF GEOTHERMAL SYSTEMS

*Leonardo Piccinini*

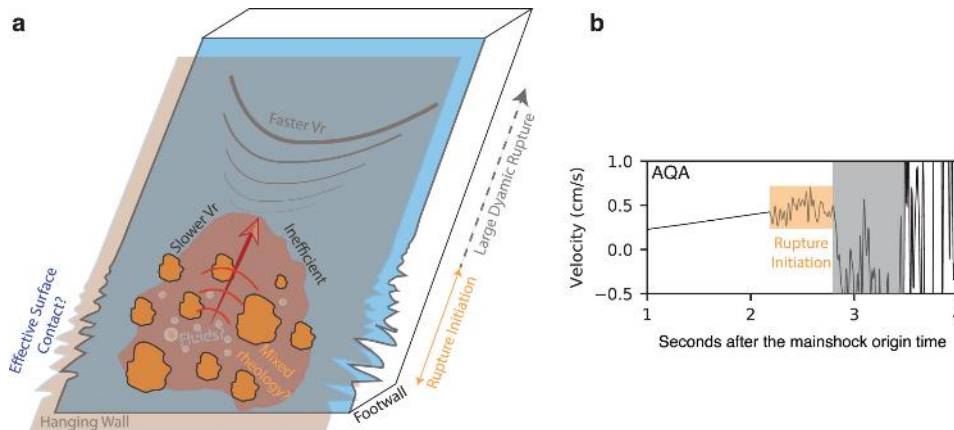
Renewable natural resources are strategic in reducing greenhouse gas emissions and reducing the human footprint. The renewability of these resources is a crucial aspect that should be evaluated in the use of scenario planning. In this context, geothermal resources are one of the most profitable and environmentally friendly sources of energy supply, but their renewability is strictly related to the physical and geological processes that favour water circulation and heating. In the Veneto region, the thermal waters of the Euganean Geothermal System (EuGS) are a typical case study, and its evaluation of renewability involves the evaluation of fluid and heat recharges, regional and local geological settings, and physical processes controlling the development of the system. In particular, its renewability assessment aims to define both the importance of such components and the amount of water that can be exploited without compromising future preservation. In fact, in the second part of the twentieth century, the EuGS was threatened by server overexploitation, which caused a sharp decrease in the potentiometric level of the thermal aquifers. Consequently, a right balance between regulation and exploitation is fundamental for managing these peculiar systems. The research activities developed in recent years have been devoted to hydrogeological/geothermal characterisation and numerical simulation of the EuGS. In the former case, potentiometric surveys, pumping tests, thermal logs, and geochemical investigations were carried out with the aim of defining a conceptual geothermal/hydrogeological model. In the next step, numerical simulations of fluid flow and heat transport were based on a detailed hydrogeological reconstruction that reproduced the main regional geological heterogeneities through a 3D unstructured mesh, while a heterogeneous permeability field was used to reproduce the local fracturing of the thermal aquifers. Future goals are focussed on the downscaling of the numerical simulation from the whole system (EuGS) to the local extraction field (EuGF), with the scope of implementing a management tool for the exploitation of the thermal water.



# OBSERVATIONAL SEISMOLOGY FOR EARTHQUAKES AND EARTH'S STRUCTURE

Piero Poli

I am an observational seismologist with experience in both earthquake source physics, and seismic tomography and imaging using the seismic ambient noise. My research is based on analysis of seismic data to understand the earthquake sources and the structure of the Earth. I am particularly interested in exploring seismological data to retrieve signals which can inform us about the physics of faulting deep inside the crust. In particular, I study microseismicity as swarms of earthquakes, to understand how the stress is released at plate boundary, and to resolve the fault rheology at depth. I further focus on understanding how large and devastating earthquakes start, by analysing data from a few seconds to many years before the rupture initiation. In my work I like to merge the seismological view of deformation with the geodetic one to provide a comprehensive view of the deformation budget. I am also interested in detection and analysis of exostic seismological signals generated by landslides, water or glacial movements, or human activity. Moreover, I work on utilizing ambient seismic noise, generated by human activities or oceanic storms, to provide high resolution images of the deep Earth.







## CARBONATES AND PALEOCLIMATE RECONSTRUCTIONS; GEOHERITAGE

*Nereo Preto*

The study of carbonates can be applied to geological mapping. As the Geological Map of Italy has been funded again, I work in contributing to mapping of carbonate successions of the pre-alps.

I apply carbonate petrography and geochemistry to study the Carnian Pluvial Episode. Earth ecosystems were turned upside down some 230 Ma, but causes and effects of this episode of climate change are far from being understood. I am working especially on the disruption of carbonate depositional systems at the CPE.

Finally, there is geoheritage. A conundrum with sustainable development is to ensure economic growth, while preserving natural environments and biodiversity – but preserving geodiversity is important as well. My work on this topic involves maintaining the list of geosites of the Veneto region, other ongoing projects deal with the management of geoheritage in northern Italy.

I am managing the Isotope ratio mass spectrometer lab, along with Profs. Agnini and Rigo.





## INTEGRATED STRATIGRAPHY TO DECIPHER THE EVOLUTION AND DYNAMIC OF THE PLANET EARTH

*Manuel Rigo*

My key areas of research interest encompass the fields of stratigraphy, geochemistry and palaeontology, including palaeoclimatology and palaeoceanography. My approach to geological problems is both field-and lab-oriented, and multidisciplinary at the same time, tackling problems in climate changes at geological timescales and the relative feedbacks in ancient biosphere, and facing early Mesozoic geochronology and palaeoreconstructions by using integrated stratigraphy and innovative methodologies. My stratigraphical, geochemical and palaeontological expertise has yielded a new understanding of the interrelationships between the role of oceanic processes in global climate change, geological processes, and biological events (extinctions, radiations and biotic turnover) during important periods in Earth history, such as early Mesozoic. I have recently focussed my studies on protracted intervals of carbon cycle instability during Late Triassic and Early Jurassic, in particular the Carnian Pluvial Event (CPE) and the late Norian to Rhaetian interval, both characterised by huge carbon isotope excursions and mass extinctions, associated with oscillations in the biological pump efficacy and/or in ocean stratification, a possible newly identified OAE. Recently, I have documented the geochemical evidence (Os and PGE) of meteorite impact events in sedimentary rocks. Other research projects employ a suite of geochemical proxies to deconvolve seawater chemistry from modern and fossil biogenic carbonate and phosphates to better understand ocean environmental change and system processes on modern and geological timescales. I also studied the isotopic composition (C and N) of early Medioeval human bones and teeth for palaeodiet investigations.

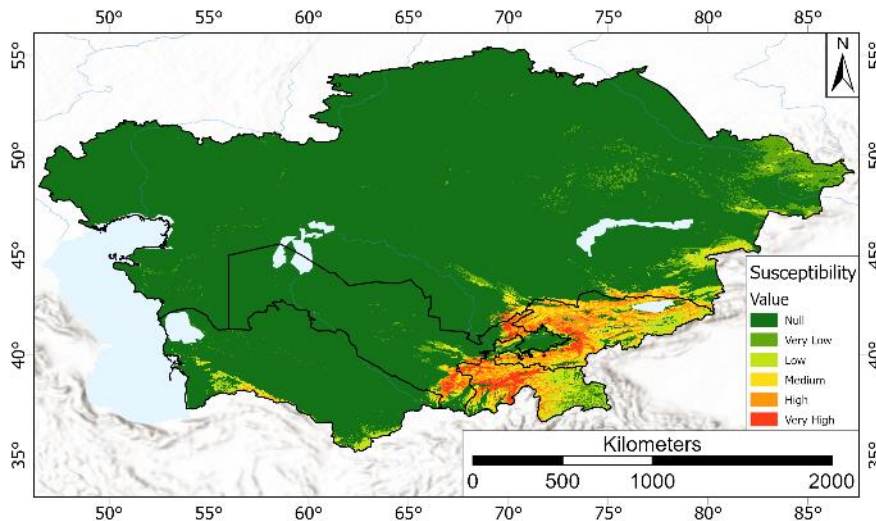




# MULTI-SCALE LANDSLIDE HAZARD ASSESSMENT

*Ascanio Rosi*

My research activities are mainly focused on landslide hazard forecasting from both a temporal and spatial points of view. I study the application of statistical approaches to the topics of my research, as well as the use of remote sensing data, artificial intelligence approaches to solve complex tasks and numerical modelling. I am part of the Machine Intelligence and Slope Stability (MISSLab) group at the Department of Geosciences, collaborating with Filippo Catani, Mario Floris, Sansar Meena and our PhD students on the evaluation of landslide hazard at different scales, by the use of different kinds of data and approaches, from GIS and numerical modelling to pattern recognition and neural networks. I'm chair associate of the UNESCO Chair on the Prevention and Sustainable Management of Geo-Hydrological Hazards, promoting new tools and approaches for landside risk reduction.





## TIME, SEDIMENTS AND MORPHOLOGIES

*Sandro Rossato*

In my research, I focus on highlighting the connections and mutual influences between different systems. I dealt with glacier advances, alluvial plain evolution, landslides and flood reconstruction. Field surveys and remote sensing are pivotal approaches, along with the dating of sediments and geological events. To reconstruct the evolution of sedimentary systems and to unveil the chronology of geological events, or phases, is of utmost interest to me. How can the occurrence or development of a specific phenomenon in the mountain sector affect the subtended alluvial plain? In what amount of time? Of course, answers to such questions require a wide range of expertise and knowledge, and collaboration with other experts is required. During the years, I worked with many other researchers from the Department of Geosciences, especially geomorphologists and Quaternary geologists. The interaction with structural geologists, sedimentologists, geochronologists, archaeologists and engineers is also very fruitful.

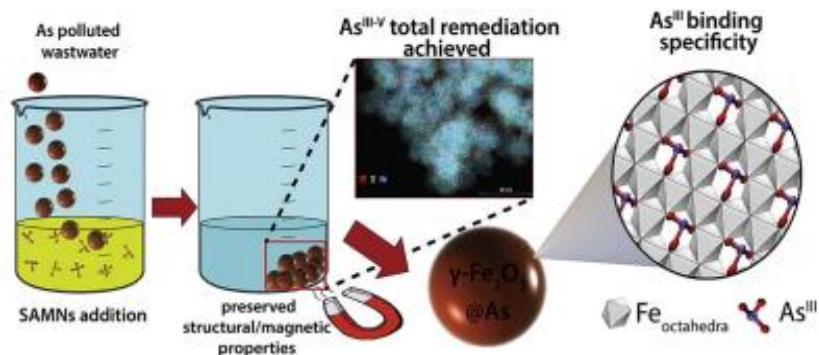




## NANOMATERIALS: A KEY ROLE FOR SUSTAINABLE WATER REMEDIATION APPROACH

*Gabriella Salviulo*

The sustainable management of polluted groundwater is one of the most actual widespread environmental issues. The nanotechnology research has opened the way to new opportunities for the use of engineered nanomaterials aimed at rapid and effective water remediation due to the high selectivity, adsorption capacity, low toxicity and the possibility to couple remediation with the recovery and recycling of critical metals. Magnetic nanomaterials have gained interest for their high selectivity and adsorption capacity due to the possibility of easy manipulation under the influence of a magnetic field. Recent results demonstrated that a novel and green synthetic approach, followed by a deep structural and chemical characterisation, led to the implementation of naked colloidal maghemite nanoparticles for the remediation of water contaminated by heavy metals. The high performance as a sorbent material and the opportunity to magnetically recover the bound metal make this nanomaterial an attractive and economically sustainable option for moving to large-scale applications.



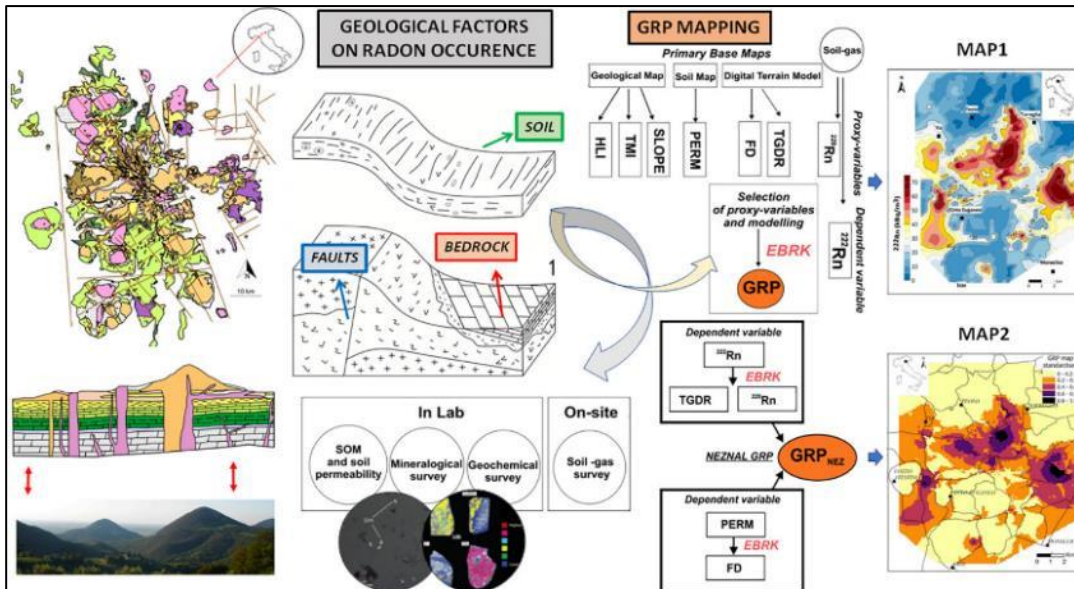


# RADON AND GEOLOGY

Raffaele Sassi

My research activity has developed on several topics, including petrologic studies on some south-European (Alpine-Dinaric-Carpathian) and extra-European basements, metamorphic petrology; petro-physical properties of the rocks, petrologic meaning of the chemical-physical changes of sheet silicates, applied petrography and geological mapping of crystalline basements.

In recent years, my research has primarily focused on radon occurrence and natural radioactivity as a function of geology i.s., specifically investigating the effect of grain size on radon exhalation, the role of faults as preferential pathways for soil gases, and rock damage control on radon mobility in fault zones through an experimental approach to study radon mobility conditions.



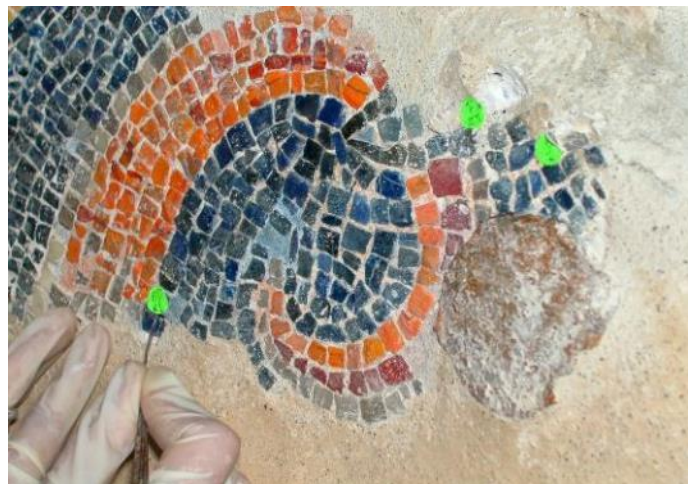


## ONCE UPON A GLASS: ARCHAEOMETRIC STUDIES ON A NEVER-ENDING MATERIAL

*Alberta Silvestri*

The research activity of Alberta Silvestri falls within mineralogical-petrographical applications for cultural heritage, with a focus on archaeometric study of glass and other vitreous materials. As ancient glass results from the melting of natural raw materials and commonly show signs of deterioration due to prolonged environmental exposure, the scientific background of Earth Sciences appears to be the most suitable to solve archaeometric problems related to source, type and provenance of raw materials, to the reconstruction of production technologies, and to alteration processes. In detail, the following research topics are carrying out by Alberta Silvestri:

- a) Archaeometric characterisation of archaeological and historical-artistic glass (objects, windows, beads).
- b) Archaeometric characterisation of glass mosaic tesserae and chemical-mineralogical study of the crystalline phases identified within.
- c) Chemical-mineralogical characterisation of ancient glass raw materials.
- d) Geochemical-isotopic study on glass and possible raw materials.
- e) Parameterization of glass alteration processes in various conservation environments.

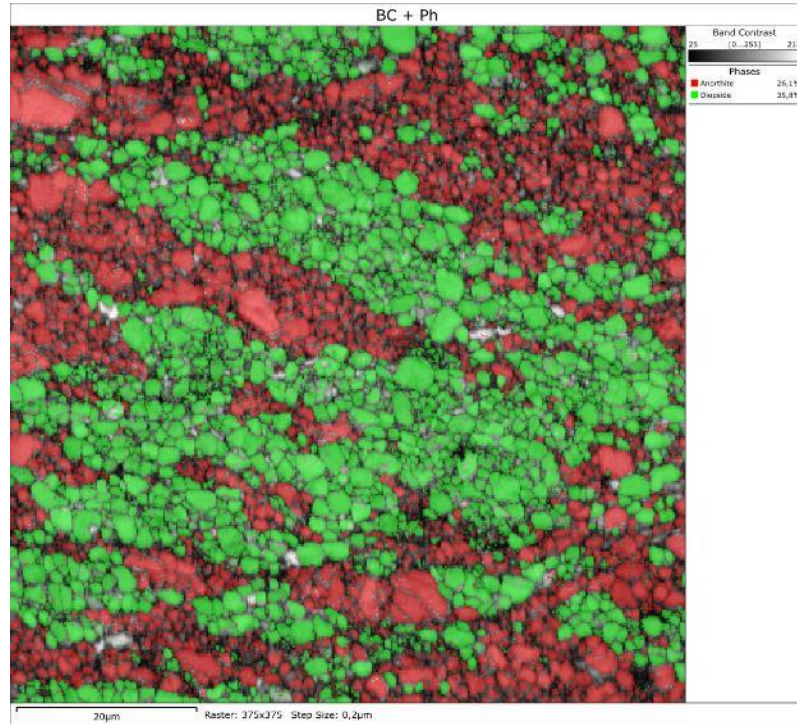




# UNDERSTANDING ROCK MICROSTRUCTURES AND EXOTIC MINERAL PHASES USING SEM BASED ANALYTICAL TECHNIQUES

*Richard Spiess*

My primary research activity focuses on the understanding of deformation-, recrystallisation- and growth mechanisms within rocks and rock analogues of the Earth, and of extra-terrestrial material. Key point of my scientific approach is the application of SEM-based analytical techniques, and in particular EBSD analysis. The principal topics investigated during the last years span from the detection of exotic mineral phases within micro- to mini-meteorites, microstructures within diamond, thermal controlled modification of garnet inclusions, ductile deformation of granites during extensional exhumation, detection of olivine growth rates, plagioclase deformation within volcanic plumbing systems, analysis of experimentally deformed gabbro-analogues and of silicon samples, identification of the phase relationships within the upper-lower mantle transition zone within analogues produced with multi-anvil apparatus. Furthermore, since years I am involved in a multidisciplinary study group that focuses on a detailed analysis of the tectonic and metamorphic evolution of the Calabrian basement in the Serre Massive.







## FLOOD HAZARD AND EXTREME EVENTS IN MOUNTAIN STREAMS

*Nicola Surian*

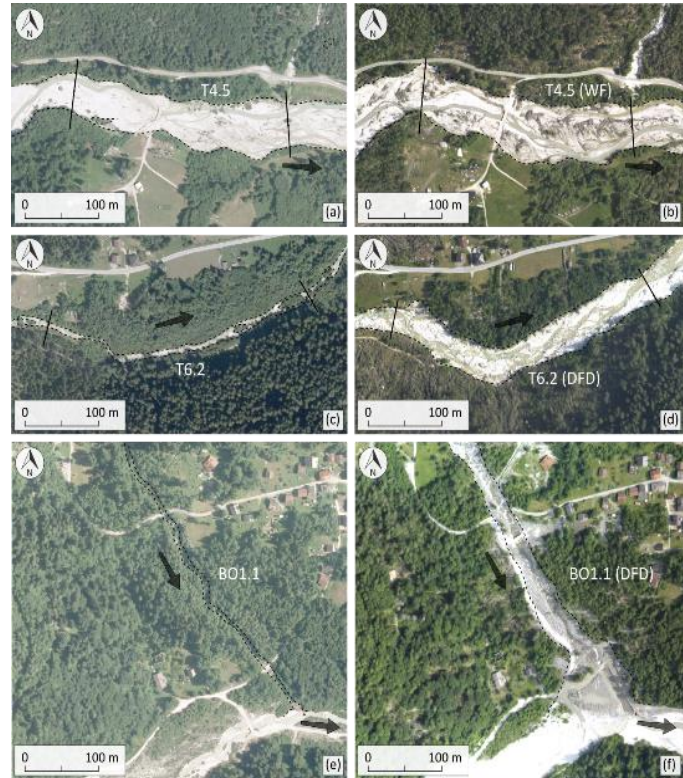
My research is focused on rivers, spanning from river processes (e.g. sediment transport) to river management (e.g. flood hazard). My main research topics are:

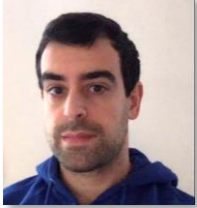
Floods: (i) channel response to floods of different magnitude, and in particular to extreme floods; (ii) occurrence and prediction of debris floods; (iii) hazard assessment, specifically to improve our capability of predicting geomorphic effects of floods.

Sediments: (i) estimate of bedload transport, in particular in large gravel-bed rivers; (ii) sediment dynamics and fluxes at catchment scale.

Channel adjustments: evolutionary trajectory and prediction of future scenarios, in particular in relation to human disturbances.

At present I am working on different rivers: mountain streams and large braided rivers in the Alps (Italy); the Po River (Italy); rivers in volcanic environment in Costa Rica.

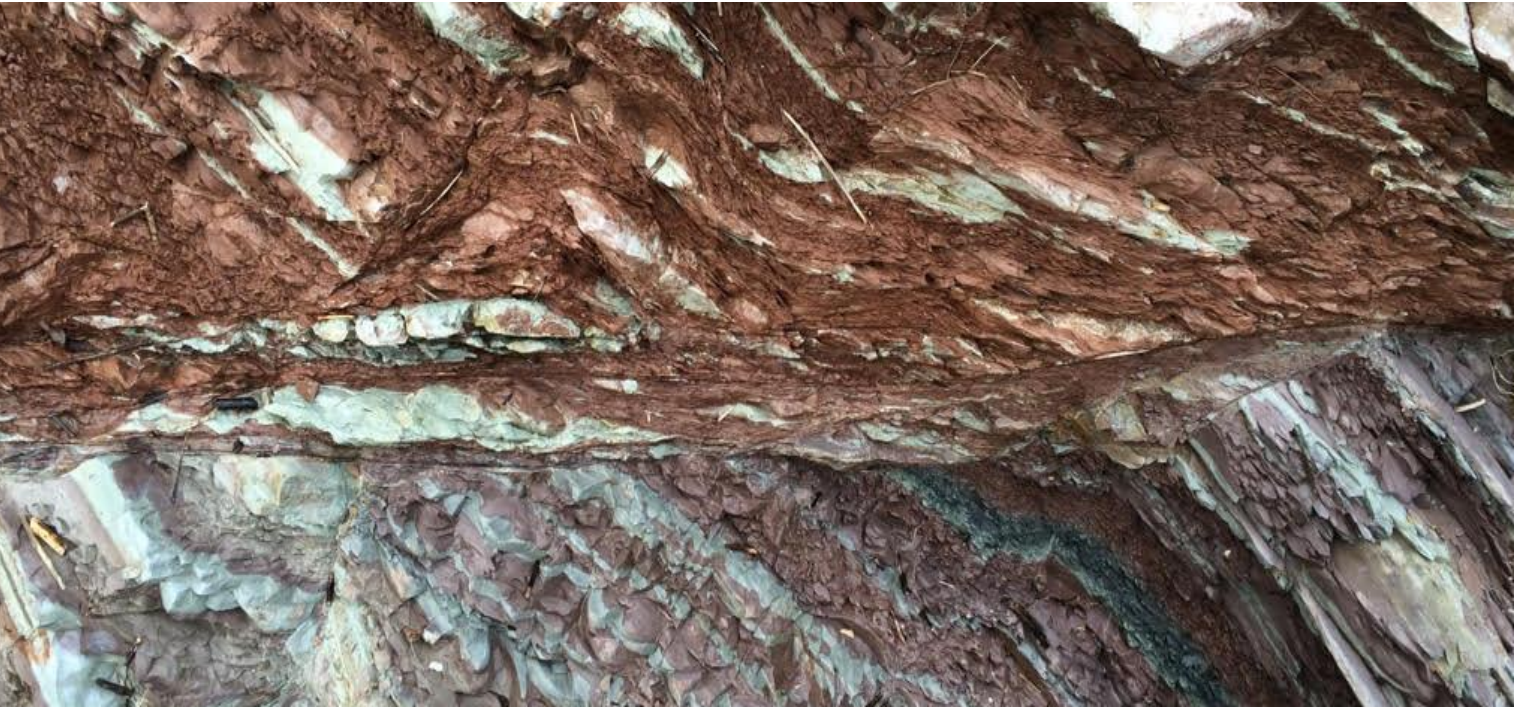




## **FAULT PROCESSES AND THE SEISMIC CYCLE**

*Telemaco Tesei*

I study the physics of earthquakes and faulting combining structural geology in the field with laboratory experiments of rock mechanics complemented by microscopy and analytical data. In particular, I study how fault strength evolve through the seismic cycle and how slow deformation processes may lead to rock failure. I use a combination of field observations of the structure of some major tectonic faults and laboratory friction experiments to understand the mechanical behaviour of rocks.





## GEOSCIENCE FOR THE SUSTAINABLE BUILT ENVIRONMENT

*Luca Valentini*

“Development Minerals” are defined as “minerals and materials that are mined, processed, manufactured and used domestically in industries such as construction, manufacturing, and agriculture” (United Nations Development Minerals Programme). Such local industrial minerals will play a relevant role in those region of the world with a fast pace of demographic and urban growth, hence having a high demand for building materials, needed to sustain infrastructural and economic growth, and to provide affordable housing. Out of an overall stock of about 100 billion tonnes of materials extracted each year, such development minerals represent nearly 40% of the material flow, and they are mostly incorporated within the construction industry. From this standpoint, mineralogical sciences can play a relevant role in the deployment of strategies aimed at fostering a transition towards a sustainable supply chain in the construction sector. Locally sourced materials such as clay and carbonates of primary and secondary origin, as well as waste materials enriched in Si and Al, can be utilized for the manufacturing of mineral binders for construction, with reduced environmental footprint. A detailed knowledge of the small-scale processes at the mineral-water interface, occurring when such mineral binders are dissolved in aqueous solutions, is of fundamental importance for optimizing the cohesive properties and environmental performance of such binders.





# THE DEVELOPMENT OF LANDSCAPES THROUGH THE STUDY OF NATURAL AND ANTHROPOGENIC PROCESSES: SETTLEMENT PATTERNS, HUMAN IMPACT AND ENVIRONMENTAL CHANGE

*Giacomo Vinci*

My research interests mainly focus on the evolution of landscapes, with a particular focus on late prehistoric periods. I developed my background applying remote sensing techniques, GIS-based spatial analyses, and fieldwork (in particular through stratigraphic excavations, corings and surveys) to investigate settlement patterns and dynamics in the past. Since my PhD and thanks to study periods and postdocs in Italy and abroad, I expanded the analysis of paleo-environments by combining the study of anthropogenic features and processes with the analysis of geomorphological landforms. Recently, I have integrated this geo-archaeological approach with the study of vegetation history and human impact, mainly based on the pollen analyses. I recently joined the Dept. of Geosciences at Padua and currently investigate the long-term interaction between humans and environments in the coastal sector of the northern Adriatic in collaboration with my colleagues Alessandro Fontana, Paolo Mozzi and Cristiano Nicosia.





## SOCIETAL IMPORTANCE OF FAULTS

*Dario Zampieri*

Faults are intriguing structures representing challenges associated with several practical issues, such as fluid migrations in the brittle crust leading to mineral deposition, oil and gas trapping and hot water surface spill. They also control slope stability and its suitability for waste repositories and tunnel operations. Active faults are closely associated with earthquakes and seismic hazards. Although faults are usually portrayed on geological maps and sections as single lines, in detail, they are complex structures. Typically, they consist of a volume of rocks containing several structural elements and they are segmented with various geometric arrangements, producing local contraction or extension zones. In populated areas such as the Veneto plain and Fore-Alpine valleys, the study of the subsurface structural setting and of palaeo- and active faults is therefore essential. Any infrastructural design can not regardless the accurate assessment of the subsurface faults. Therefore, faults have economic and societal significance. The study of these structures is conducted in cooperation with the INGV (Rome) to upgrade the database of Italian seismogenic sources (DISS). Cooperation with hydrogeologists and geophysicists is devoted to improving the knowledge of the potentiality of the fault-controlled EuGS.





## **MOUNTAIN BUILDING AND CLIMATE CHANGE**

*Massimiliano Zattin*

Several studies in the past few years support the idea of strong feedback between the growth of mountain ranges and spatial and temporal variations in climate. More specifically, mountain building in cordilleran-type orogens like the Andes is controlled by various processes that include (i) continental shortening, (ii) accretion of oceanic materials, (iii) dynamic topography, (v) crustal weakening and deformation related to mantle plumes, (vi) forearc coastal uplift due to co-seismic and post-seismic lithospheric stretching, and (vii) isostatic rebound related to the retirement of ice masses. This line of my research aims to study different sectors of the Andes through the integration of different methodologies such as structural geology, tectonic geomorphology, low temperature thermochronology, and thermal and geodynamic modelling. The interdisciplinary research group involves PhD students and researchers from Italy, France and Latino-American countries. The work is based on annual field campaigns and laboratory activities.





Dissemination  
and outreach

## **DISSEMINATION & OUTREACH** by J. Boaga

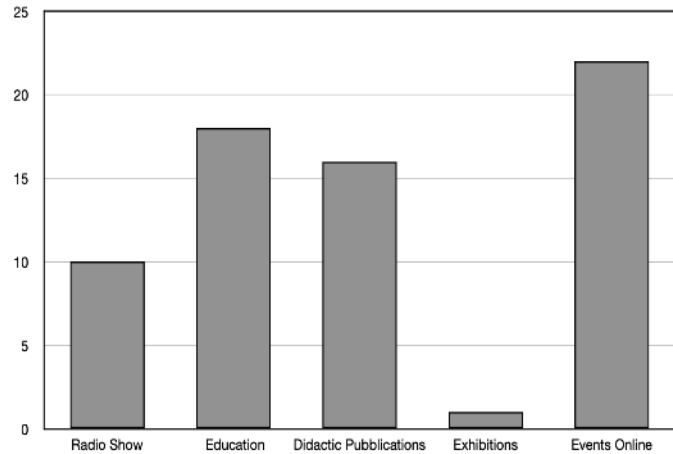
The Department of Geosciences is always actively committed in promoting and offering dissemination and divulgation of the scientific knowledge. It is nowadays agreed that a pervasive and effective outreach of the Research is as important as the usual scientific dissemination. This goes beyond the scientific dissemination, that regards the theoretical and experimental results on specialistic journals and congresses, and it is often far from the public involvement. Knowledge must be shared not only in the restricted scientific community, bringing this information to the interested citizenship and not specialists. Therefore, the Department of Geosciences promotes the sharing of the scientific knowledge to a broader audience through divulgation and dissemination activities. We are aware that public visibility and reputation nowadays is based not only on our research and teaching ability, but also on communication to the public. In this respect, TV coverage, radio broadcasts, printed and online documents, video and digital contents (as interviews and documentaries) on social media are exceptionally efficient. For these reasons, the Department of Geosciences has considerably increased in the last years its commitment in social media with new social accounts in the most used platforms available. We promote public events, exhibitions, and educational activities, as well as the distribution of publications specifically addressed to a generic audience.



*Frames from some of the Department of Geosciences 2022 dissemination videos.*



Specifically, our researchers were hosted in 10 radio/TV interviews to explain their research topics, ranging from national news broadcasts to local radio stations. One exhibit for generic audience were organized about seismic hazard and earthquakes, with a great success of public. Dozens of events with schools and educational institutions took place. In total, more than 30 events aimed at promoting and presenting scientific results to the public community were organized. Among them, the Department of Geoscience participated actively to the week of the Research 2022 event. Webinars and online experiments for the wide publics were promoted, from lab experiences dedicated to generic audience to topic seminar of our activities. The Department has enrolled Dr. Barbara Paknazar as head of the communication technology team.



*Summary of the 2022 Department Dissemination and Divulgation activities.*



*Dr. Barbara Paknazar,  
Head of the  
Department team for  
communication and  
outreach.*



New social accounts on the main used platforms as Instagram, Facebook, Twitter, YouTube were specifically developed to share with large audience the science we build during our everyday work. We have now hundreds of 'like' and followers of our Instagram profile, with thousands of visualizations of the videos there promoted. In this framework, the Department of Geosciences website was deeply re-designed, becoming our main external façade, especially during the forced social distance period imposed by the pandemic. News about events, publications, discoveries and activities were constantly updated, don't miss them! Keep serving science, keep serving our community, at our best.



*Hands-on experiments during the exhibition on earthquakes and seismicity in Italy hosted at the Department in 2022.*



*Frames from some of the Department of Geosciences 2022 dissemination videos.*



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**2022**

**A year in a  
nutshell**

**at the Department of Geosciences**





PROF. MARTHA PAMATO

WON AN ERC  
STARTING GRANT

January

Dr. **Martha Pamato** was awarded an ERC Starting Grant for her research on diamonds



# February

After a spectacular top-down delivery operation, the new XRF Spectrometer arrived at the Department

The Department of Geosciences took part to a new campaign on the Calderone ice, the southernmost glacial body in Europe, in the framework of Ice Memory project



Claudia Fabiola Benvegnù, student of the B.Sc Degree in Geological Sciences, won the **Italian Championship of Canoe**, in the women's specialty of the marathon





# March

The Department of Geosciences welcomes

**Luca Valentini**

Associate Professor in Applied mineralogy



**April**

**The Department of Geosciences welcomes**

**Jacopo Nava**

as Technician of the SEM Laboratory



## Elena Bellizia

PhD student at the  
Department of Geosciences

WAS AWARDED  
DURING THE 10TH  
INTERNATIONAL CONGRESS OF  
TIDAL SEDIMENTOLOGY

as early career scientist for her talk "Ontogeny of a  
subtidal point bar in the microtidal Venice Lagoon  
(Italy) revealed by  
3D architectural analyses"



DIPARTIMENTO  
DI GEOSCIENZE



# May



## Premio "Smart Communication 2022"

assegnato a

*Università degli Studi di Padova*

per

*il progetto Mapfly: un WebGIS per consultare la cartografia  
dell'Università di Padova*



# MapFly



**May**

**The Department of Geosciences welcomes**

**Claudia Agnini**

**Full Professor in Paleontology**



**May**

**The Department of Geosciences welcomes**

**Paolo Nimis**

**Full Professor in Mineralogy**





**May**

**The Department of Geosciences welcomes**

**Anna Di Muro**

as a new member of the Technical and  
Administrative staff

# June



ACCADEMIA NAZIONALE  
DEI LINCEI

AWARDS

THE INTERNATIONAL  
"PROFESSOR LUIGI TARTUFARI  
PRIZE" FOR GEOSCIENCES TO  
PROF. GIORGIO PENNACCHONI

# July



The fourth AIAr School and several sessions of the conference “The sustainability in Cultural Heritage” took part at the Department of Geosciences

# August



PROFESSORS BERNARDO CESARE AND  
GIORGIO PENNACCHIONI  
ARE APPOINTED  
CORRESPONDING FELLOWS  
OF THE ACCADEMIA ITALIANA DEI LINCEI





The Department of Geosciences organized a joint seminar with the Université de Lausanne about cascading processes

September



# September

The Department of Geosciences welcomes

**Simone Bizzi**

Associate Professor in Geomorphology



# September

The Department of Geosciences welcomes

**Irene Bertulli**

as a new member of the Technical and  
Administrative staff



October

Prof. **Nicola Surian** is the new Head of the Department of Geosciences. He succeeded Prof. **Fabrizio Nestola**, who led the Department in the previous four years



# October



Ten researchers from the Department of Geosciences in the **"World's 2% top scientists"** list, published by the Stanford University



# October

The Department of Geosciences welcomes

**Martha Pamato**

Associate Professor in Mineralogy



# October

The Department of Geosciences welcomes

**Telemaco Tesei**

Associate Professor in Structural Geology



## Dr. Pietro Carpanese

Ph.D. student at the  
Department of Geosciences

WAS AWARDED  
THE PRIZE



DIPARTIMENTO  
DI GEOSCIENZE

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**GeoPlaNet**

Co-funded by the  
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of the European Union

**SCHOOL ON PLANETARY GEOLOGICAL MAPPING  
AND PLANETARY ANALOGUES**

Pescara, 26 September - 1 October 2022  
Predazzo, 2-8 October 2022

**Nantes Université** **UNIVERSIDADE DE COIMBRA** **UNIVERSITÀ POLITECNICA DI TORINO** **M&S** **GEOPARC Bletterbach**

# October

# October



Prof. **Alessandro Caporali**  
and Prof. **Dario Zampieri**  
retired



The Department of Geosciences thanks them for their precious work in the past years



November

The Department inaugurates a new laboratory named in memory of Dr. **Lorenzo Petronio**, after his untimely passing



# December

The Department of Geosciences hosts the temporary exhibition "Earthquakes: beware of the elements" which involved nearly 700 students from several schools of Veneto Region.



# December

The Department of Geosciences is among the 11 **Unipd Departments of Excellence** for the 2023-2027 period. The funded project is titled "The Geosciences for Sustainable Development"





# December

The Department mourns for the tragic passing of our dear friend and colleague **Alessandro Guastoni**, former Curator of the Museum of Mineralogy



Coordination, data collection and integration,  
graphic design, editing and publication by

*Massimiliano Ghinassi*

*Luca Capraro*

*Stefano Castelli*

*Elisa Facciolo*

*Barbara Paknazar*

*Telemaco Tesei*

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contributed to the realization of this volume.