



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

DEPARTMENT
OF GEOSCIENCES

PROGRAMME 4 **SELF-ASSESSMENT**

coordinator: R. Genevois

	PROGRAMME 4
4.1	Title
	Geological and hydrogeological hazards Coordinator: Rinaldo Genevois
4.2	Objectives and aims
	The program focuses on studying and monitoring surface and subsurface geological and hydrogeological processes that may cause risks to the inhabitants of the Italian northern-eastern regions. Natural risks cannot be avoided, but their consequences may be decreased by both a deeper knowledge of triggering and development mechanisms of natural phenomena and the implementation of reduction strategies of the intrinsic hazard degree. Maximum concern refers, then, to the triggering causes of the hazards and to the effects they will have on the territory in order to trace physically based models allowing to reliably forecast spatial and temporal probabilities of occurrence. Different hazards show themselves in different manner and do have different characteristic parameters, but the basic structure of related researches is essentially similar, that is basically: (i) mechanics of the event; (ii) evaluation of the occurrence probability; (iii) dynamics of the event, spreading over the ground surface or into the subsoil; (iv) evaluation of the hazard. Researches are focused mainly on the following hazards: 1. landsliding processes; 2. snow avalanches; 3. groundwater processes and aquifer vulnerability; 4. soil contamination assessment; Then, distinct aspects of the researches include: • the geological, geomorphological, hydrogeological and physico-mechanical characterization of areas and soils potentially involved by hazards through geological, hydrogeological and engineering-geological methods and techniques; • hydrogeophysical techniques for and application to the hydrological characterization of slopes; • the identification of contaminants in the subsoil by geophysical methods; • the field monitoring of the main parameters characteristics of a phenomenon; • the physical and numerical modeling of a phenomenon; • the evaluation of the occurrence probability of different phenomena; • the application of geophysical methods for environmental purposes (aquifers and volcanoes); • the implementation of an open database. As a consequence of different natural hazards studied, the research program presents three different projects. 1) <u>Dynamics of gravitational processes</u> Researches focused on: the study of gravitational movements (debris flows, rock and snow avalanches); the development of procedures and methods for a reliable quantitative assessment of mass movements hazards, and on the evaluation of parameters needed for design of remedial works and decision making. 2) <u>Characterization, evaluation and protection of groundwater resources</u> This project is concerned with the hydrogeological characteristics, the protection and

	the exploitation situation of the principal aquifers located in NE Italy. The aim is to identify the hydrodynamic processes controlling the recharge and ground water flow paths. The aquifers are defined in their hydrostratigraphical structure, spatial geometry, water budget, flow velocity, transmissivity, permeability and storability. Hydrogeological interests also concentrate on the monitoring of the aquifer potentiometric level changes caused by exploitation for industrial and agricultural purposes. Attention has been given also on <u>coastal aquifer</u> problems related to saltwater ingression. Final goal is to provide at the decision support level some fundamental operational conditions. 3) <u>Near surface geophysics</u> The key objective of the project is to develop or improve techniques for the characterization of the shallow subsurface, with the specific aim of contributing towards a more in-depth understanding of the environment and its dynamics. Such detailed characterization provides key information to many end users, having practical, technical and scientific problems of very different nature, such as: hydraulic engineers and hydrogeologists; volcanologists, geotechnical engineers and applied geologists; meteorologists; soil physicists and agronomists.
4.3	Projects
4.3.1	Project 1: Dynamics of gravitational processes (Coordinator: Rinaldo Genevois)
	Researches focused on: the study of gravitational movements (debris flows, rock and snow avalanches); the development of procedures and methods for a reliable quantitative assessment of mass movements hazards, and on the evaluation of parameters needed for design of remedial works and decision making. The main aim of the project is to increase the knowledge of gravitational processes concerning the earth surface, particularly those involving the North-Eastern Italian territory. In the long term the aim is the development of procedures and methods for a reliable quantitative assessment of mass movements hazard. The evaluation of the main parameters needed for design of remedial works and decision making will represent the last social-economic objective of the project. Researches concerned the geological and geomorphological setting of involved slopes and the studies on static and dynamics of the phenomena. Mass movements have been investigated through: (i) detailed in situ geological and geomorphological surveys; (ii) data collection from monitoring stations; (iii) results of laboratory tests; (iv) numerical analyses, and (iv) small scale simulations. New techniques have been employed for the evaluation of displacement fields of slow landslide phenomena (terrestrial laser scanning). The acquired knowledge has been the base for the comprehension of the rheology of processes and for the evaluation of parameters necessary in the numerical analyses using 2D and 3D finite and distinct elements codes. Studied hazards include: (i) slow and fast mass wasting (shallow and deep landslides); (ii) Granular flows (rock and snow avalanches); Deep Seated Gravitational Slope Deformations (DSGSD) Line 1) Slope instability [refs. 4, 7, 12, 16, 18, 19, 23, 24, 29] The main purpose of the research line is the analysis of landslide events related to

different areas of the Alps and the Apennines with the aim to identify existing triggering and unfavourable factors at their origin and to provide, besides the mechanical characterization of soil or rocks, information concerning the mechanisms of initiation and mobilization, as well as the propagation and deposition of displaced materials. To get this objective it was considered essential: (i) to improve the understanding of predisposition factors; (ii) to assess potential landslide scenarios, related to different environmental characteristics, material properties and behaviour; (iii) to improve the existing numerical simulation models and compare the results of their application in different areas; (iv) to provide new tools for the dynamic modelling of the hazards. Theoretical and experimental studies on the dynamics of the landslide phenomena have been carried on through numerical modelling. Hazard maps and models integrated within a GIS framework for a better understanding of the spatial and temporal factors controlling triggering and propagation of events are in progress. The acquired know-how is transferred to practitioners and technicians by means of workshops and seminars.

Line 2) Granular flows [refs. 1, 2, 5, 9, 13, 20, 21, 22]

Granular material flows are a form of two-phase flow consisting of solid (particles) and an interstitial fluid (air and/or water). When sheared the particles may either flow as a fluid, or resist the shearing like a solid. The dual nature of these flows makes them quite difficult to analyze and model. Natural granular flows are distinguished in: 1) debris flows; 2) rock avalanches; 3) snow avalanches.

The nature of the physical processes that trigger and move rock avalanches and the striking and inexplicable mobility of their flow has been the object of many field and desk studies mainly focused on: (i) field grain size distribution using new techniques (image analyses); (ii) morphology of the ground surface of the deposits; (iii) modeling of triggering conditions and simulation of the flow. The morphology of the deposits gave some useful information on the phenomenon dynamics and, in particular, on the progressive thinning of the moving debris mass with run-out. A discontinuum code, suitable where the interaction of many discrete objects exhibiting large-strain is required, has been used in the analyses of the rock mass flow.

The activity in the field of snow avalanches began recently (2007) as a continuation of researches initiated at the Trento University and it was mainly concerned with the determination of hazard maps in two snow avalanches sites of the Province of Trento. To this goal detailed analyses of the past events have been performed, frequent winter and summer surveys to the catchments have been organized and numerical methods for the simulation of the dynamics of dense and powder snow avalanches have been carried out. Statistical methods have been used in order to determine the volumes of snow mass in the detachment area, starting from the data available in the weather stations. Snow hazard map has been conceived as a function of the return period assigned to simulated events. The hazard intensity has been defined using the stopping distance in case of dense snow avalanches and the impact pressure in case of powder snow avalanches.

Line 3) Deep seated landslides [refs. 8, 14]

Deep-seated gravitational slope deformations (DSGSD) are rather common phenomena in areas of high relief energy such those of the northern-eastern Italy. The DSGSD displacement rate is extremely slow and thus the related risk generally appears to be not significant. However, their evolution may suddenly change, so that very dangerous events (like rock avalanches) may be generated. Numerical models on some training areas have been performed with a two-dimensional numerical program based on the distinct element method for discontinuum modelling, particularly suitable to simulate the response of jointed rock masses subject to either static or dynamic loading.

Geomechanical surveys of involved rock masses and simple laboratory tests have been carried out to outline corresponding geomechanical models and to obtain reasonable values of the parameters required by the numerical modelling. Parametric analyses were performed to test the mechanical consistency of the hypotheses made on the evolution of the slope, and to numerically set possible driving and triggering factors of the phenomena. Analyses were carried out also considering the effects of both geomorphological history (glaciations) and active cyclic stresses (earthquakes).

Line 4) Database

An important approach towards improving the knowledge of landslide processes has been the gathering of data from field monitoring stations. Field data and measurements can be then inserted into a database so that statistic considerations on event characteristics and history, rainfall included, are possible.

The European Alps Debris Flow Database was implemented during the period 1992-1998 as a part of the THARMIT project, financially supported by the European Community. During 2003-2007 the database has been updated and the collected information concern: (i) the debris flow events (General data, Hydrological parameters, Debris flow initiation area, Flow and channelling, Triggering factor, Deposition mechanism, Geotechnical properties, Damages); (ii) the debris flow catchment (Location, Climate, Morphometry, Geology and Geomorphology, Hydrology and Hydrogeology, Vegetation, Soil erodibility, Slope stability); and (iii) the debris flow risk (Previous events, Vulnerability of the area, Risk Map). Data are available to researchers and public institutions and the web space dedicated to this research task is being renewed, considering also that other types of landslide phenomena could be inserted.

Line 5) Field measurements and Monitoring [refs. 3, 6, 10, 11, 15, 17, 25, 26, 27, 28]

Direct measurements of the hydrological conditions for the occurrence of debris flows and of flow behavior are of the outmost importance for developing effective flow prevention techniques. Automated monitoring systems are needed to collect data on debris flows, but owing to the usually difficult access to debris-flow sites and the high costs of installation, only a few systems are set up around the world. The scientific objective of the task was to monitor debris flow activity so collecting data that can be used for a deeper knowledge of the debris flow behaviour and, then, for testing existing or new numerical models.

An automated and remotely controlled monitoring system has been installed in Acquabona Creek in the Dolomites, where debris flows occur almost every 1-2 years. If implemented to the numerous debris-flow sites in the Dolomitic Region, the technology will provide civil defence and warn residents of impending debris flows.

A new GPS-based monitoring system has been installed (June 2006) in the Cinque Torri Group (Cortina d'Ampezzo, Eastern Alps) in order to monitor displacements as precursors of parossistic events.

Terrestrial laser scanners, allowing the generation of a detailed model of ground surface, have been used for computing the displacement field of landsliding areas by multi-temporal scans. A new method for the automatic calculation of a landslide displacement field has been conceived and successfully applied to different test sites located in the North-Eastern Italian Alps affected by high-risk. The results show that this technique can provide high-quality data and can be very useful in the monitoring intended for the mitigation of hydrogeological risk in a wide range of cases.

4.3.2	Project 2: Characterization, evaluation and protection of groundwater resources (Coordinator: Paolo Fabbri)
	This project is concerned with the hydrogeological characteristics, the protection and the exploitation situation of the principal aquifers located in NE Italy. The aim is to identify the hydrodynamic processes controlling the recharge and ground water flow paths. The aquifers are defined in their hydrostratigraphical structure, spatial geometry, water budget, flow velocity, transmissivity, permeability and storability. Hydrogeological interests also concentrate on the monitoring of the aquifer potentiometric level changes caused by exploitation for industrial and agricultural purposes. Attention has been given also on <u>coastal aquifer</u> problems related to saltwater ingression. Final goal is to provide at the decision support level some fundamental operational conditions. This project is concerned with the hydrogeological characteristics, the protection and the exploitation situation of the principal aquifers located in NE Italy. The main interests concentrate on the porous unconfined and confined aquifers present in the upper and middle Venetian plain, which are the main water resources of the principal public water companies of NE Italy, and also in the deep fissured and thermal aquifer of the Euganean area, which is one of the most important regional hydrothermal systems existing in Italy. The aim is to identify the hydrodynamic processes controlling the recharge and ground water flow paths. The aquifers are defined in their hydrostratigraphical structure, spatial geometry, water budget, flow velocity, transmissivity, permeability and storability. Hydrogeological interests also concentrate on the monitoring of the aquifer potentiometric level changes caused by exploitation for industrial and agricultural purposes, in order to achieve well balanced management and control of zones used particularly for drinking water supplies in central-eastern Veneto Plain; the main focus is to provide at the decision support level some operational conditions: standard operations, anticipated system failure, emergency operations. Line 1) Hydrogeology of the Euganean geothermal area[refs. 4, 9] The deep fissured and thermal aquifer of the Euganean area is studied from the point of view of its hydrogeological aspects. In particular, in these last three years, the main interest has focused on control of the thermal resource overexploitation. In this line of research the relationships between flow rate exploitation and potentiometric artificial levels have been studied with the aim of forecasting. In order both to predict and simulate some hydrogeological parameters of reservoirs in non sampled areas and to assess degree of uncertainty at some significant thresholds, some numerical hydrogeological parameters (i.e.,transmissivity, temperature) are considered from a geostatistical point of view. The analyses concern the spatial distribution of groundwater parameters (i.e. "variographic analysis" to define anisotropy in spatial structure of data), the interpretation of the variographic results in view of the hydrogeological structures in the thermal aquifer and predicting (kriging l.s.) or simulating (sequential Gaussian simulation, sequential indicative simulation, simulated annealing, etc.) the spatial distribution of the parameters examined. Line 2) Hydrogeology of the Venetian plain [refs. 3, 5, 6] The studies are focused both on the hydrostratigraphical structures of middle plain aquifers and on their hydrogeological parameterization. Aquifer transmissivity is

	calculated by aquifer and well tests with the aim of obtaining an empirical relationship between them in gravel and sandy gravel confined aquifers. The simpler well test procedure allows us to calculate many transmissivity values defining the aquifer transmissivity distribution in a large area. The aquifer parameterization is directed towards a regional scale aquifer modeling. Geostatistical methods were taken into consideration on numerical hydrogeological parameters, simulating contaminant distribution in groundwater derived from nonpoint source (NPS) in a large area. The problem of compositional data in geostatistics was also dealt with, simulating on a small scale the 3D geological structure of the subsoil of Porto Marghera (VE). The site of interest, located on the edge of the Venice Lagoon (Italy), is characterized by strong soil and groundwater pollution owing to the industrial activities in the area during the last fifty years.
4.3.3	Project 3: Near surface geophysics (Coordinators: Giorgio Cassiani and Annalisa Zaja)
	The application of geophysical exploration to shallow targets is a fast-growing area of research. This growth is motivated by the increasing need to image and measure properties of the near subsurface, for a number of practical applications in environmental studies, hydrology, geotechnics, engineering geology, natural hazard evaluation and so on. This project deals specifically with the development and application of geophysical prospecting techniques to the shallow subsurface, and with the interpretation of these data in terms of system geometry and of quantifiable physical properties of specific interest to each application. Such detailed characterization provides key information to many end users, having practical, technical and scientific problems of very different nature, such as: - hydraulic engineers and hydrogeologists interested in the motion of fluids in, out and within the soil and subsoil; - geotechnical engineers and engineering geologists interested in the geomechanical properties of soil and rock masses as well as in water pressure changes due to fluid flow; - meteorologists interested in the exchange of energy, carbon and water with the soil surface; - soil physicists and agronomists interested in the motion of water in the shallow vadose zone and its availability to plants; - geologists interested in the subsurface structure; - volcanologists wishing to understand the structure and dynamics of volcanoes. The fast development of digital technology has brought a revolution in the capabilities of techniques that are based on the measurement of physical properties of soil surface and subsurface. This revolution has affected both the data acquisition and the data processing, opening new pathways to applied research in this area. In terms of data use, the geometrical imaging of the subsurface is of general interest to all applications, as it aims at identifying interfaces that have, in addition to a geophysical meaning, also a physical meaning: for example the contact between an aquifer and the overlying confining layer, or the slip surface of a landslide. On the other hand, the key new developments are to be found in the quantitative translation of geophysical data into variables of more direct practical use. The research group in the Department of Geoscience has focused its activities on the link between geophysical

techniques and their end use. This link is essential to the advancement of this applied science, as only a solid understanding of the actual aims of the investigation can drive the choice, adaptation, tuning, inversion and interpretation of the method towards answering the precise questions, often quantitative and physical in nature, of the end users. This approach is a Copernican revolution in the approach to the investigation of the subsurface, that has been for a long time limited to providing only a qualitative “image” of the subsurface through the deforming lens of the geophysical inversion. This geometric characterization of the subsurface is of course still necessary, but the current available techniques, and the ones that can be developed, provide a means to translate the (geo-) physical measurements into quantitative estimates of the variables of direct interest of the end user, such as geomechanical soil and rock properties, degree of fracturing, soil moisture content, non aqueous fluids saturation, porosity, hydraulic properties, heat flux etc. This approach is particularly effective when measurements are taken in time-lapse mode, i.e. repeated measurements of the same physical quantities are repeated over time. This approach allows to sample the state variables of the system and therefore cast light on the behaviour of the underlying physical processes acting in the system over space and time.

Line 1) Environmental geophysics

This task aims at developing new geophysical tools and at applying different geophysical methods for a more detailed imaging of the shallow ground subsurface for environmental purposes in a broad sense. Two main areas of research have been actively pursued:

(1) aquifers

The geometric characterization of aquifers and the spatial definition of the hydraulic parameters are of fundamental importance for the construction of mathematical models of flux and transport. Various geophysical techniques have been used to this end. Several applications have been investigated. In order to test a high resolution method in an urban setting, a P-wave seismic reflection survey was conducted along a profile in the Lambro park in Milan. The test was successful at imaging the depositional framework of the near surface and in mapping some geometrical features of the multi-layer aquifer system. Electrical and electromagnetic methods (TDEM and AMT) were used to study the Parma aquifer and solve some interpretative problems which were still unsolved. The principal objectives were the recognition of the aquitard that separates the various aquifers and the definition of the depth and the lateral continuity of the hydro-geological threshold that separates the alluvial deposits from underlying marine deposits. A research project was also aimed at studying fractured aquifers in low-permeability formations (Apennines), with the aim of locating fault zones. An integrated investigation program, based on remote sensing, structural geology and geophysical exploration, was initiated in 2002 to better define the hydrological model. High resolution geophysics was chosen as an imaging tool to map the fault zone. GPR, 2D and 3D Earth Resistivity Tomography and 3D seismic traveltime inversion proved very effective. A specific study was carried out to map saltwater intrusion on Venetian coastal shallow aquifers, with particular reference to the Venice Lagoon mainland [refs. 59, 80, 84]. The research was conducted using geophysical methods in conjunction with chemical and isotopic analyses on water samples. The main aim was to detect the age and the chemical composition of waters and, so, to distinguish old fossil from actual marine waters.

(2) Volcanoes

Volcanic system may be characterized by its resistivity signatures since electrical resistivity is highly affected by temperature and the presence of melts in the subsurface. The transient electromagnetic (TDEM) and MT methods were used in investigations of

the two main Italian volcanoes (Mt. Somma-Vesuvius and Mt. Etna). Both methods have been deployed in order to clarify the shallow and deep resistivity distribution. The combined TEM-MT approach provided new insight into the conductivity structure and made a useful contribution towards our understanding of the subsurface fluid processes inside volcanoes monitoring the presence of temporary magma storage. In M. Etna the monitoring of the electrical resistivity in time lapse proved that magma storage changes volume and position with time.

(3) CO₂ sequestration

Some monitoring and geophysical measurements have been carried on over a site where natural, thermo-metamorphically produced CO₂ finds its way to the surface. This small site became an official 'leaking test site' for CO₂ GeoNet (an EC-funded Network of Excellence on geological CO₂ storage). The aim of the study was to identify which monitoring methods can detect the migrating CO₂ and to gain understanding of the preferential migration pathways of the CO₂. Studies are ongoing to extend the knowledge gained here to other geological settings and lithologies.

Line 2) Hydro-geophysics

This task started in October 2006 upon the arrival of new researchers in Geophysics. The key objective of this task is to develop and/or improve techniques for the characterization of the shallow subsurface, with the specific aim of contributing towards a more in-depth understanding of the hydrological dynamics. A few such techniques are ideal tools to help in hydrological characterisation of the near surface as they (a) provide images of the subsoil at high resolution (m or less); (b) are sensitive to the changes induced by water to the bulk physical properties of the subsurface; (c) can be conducted in time-lapse to allow for monitoring of the subsoil conditions as a consequence of fluid (water) motion. The research group has focused its activities particularly on the use of Ground-penetrating Radar (GPR), Electrical Resistance Tomography (ERT) and Spectral Induced Polarization, in both surface-to-surface and cross-borehole or borehole to surface applications. The main applications of such techniques have been on the vadose zone and the shallow aquifer system. In all cases, the key interest has been to provide the quantitative estimates of water and solute presence and motion to be used in the calibration of predictive models. This approach is a revolution in the approach to the investigation of the subsurface, that has been for a long time limited to providing only "images" of the subsurface.

The development and application of time-lapse hydro-geophysical techniques have been particularly the focus of the research brought to the Department by new staff members (Cassiani since 2006, Deiana since 2007). A number of research projects have been continued by these researchers following funded activities started in the institutions of their past affiliations, particularly the University of Milano Bicocca. National and International collaborations have been the focus of the following funded research projects that have been carried out at the Department of Geoscience of the University of Padova since October 2006. A specific research project has been conducted on clastic quaternary sediments of the Po River plain with particular attention to the vadose zone (site at Gorgonzola, Milan), conducting to the quantitative estimation of the vadose zone hydraulic properties, that are key to the assessment of the vulnerability of the underlying aquifers. Another long term research project has been focused on the hydro-geophysical monitoring of a mountain catchment response, close to the Como Lake (Montemezzo Site). In this latter site a novel surface-to-surface GPR technique, based on guided electromagnetic waves in the shallow soil cover, has been developed and assessed. Another field of activity has been the basic research conducted on Spectral Induced Polarization response of variably saturated sediments, with the aim of identifying in a non invasive manner their state of saturation and possibly also the

	presence of contaminants in oily phase. The investigation of constitutive laws linking electrical, dielectrical and IP response of porous media to their saturation state has been also an aspect of pursued theoretical research.
4.4	Human resources
	Project 1: Rinaldo Genevois – Full Professor Giovanni Battista Pellegrini – Full Professor (2003-2006) Roberto Sedeà – Associate Professor Paolo Scotton – Associate Professor (2006-2007) Antonio Galgaro – Assistant Professor Mario Floris – Assistant Professor (since 2007) Ph.D. and Post-graduate students: M. Rocca, M.C. Armento, C. Squarizoni, A. Cuman, N. Sanvitale, F. Moro, G. Teza Project 2: A Dal Prà – Full Professor (Partially 2003-2004) Renzo Antonelli – Associate Professor Paolo Fabbri – Associate Professor Antonio Galgaro – Assistant Professor (occasionally) Ph.D. and Post-graduate students: P.A. Vorlicek, S. Trevisani, M. Cultrera, A. Rosignoli Project 3: Giorgio Cassiani – Associate Professor (2006-2007) Annalisa Zaja - Associate Professor Antonio Galgaro – Assistant Professor (occasionally) Rita Deiana – Assistant Professor (2007) Ph.D. and Post-graduate students: M. Rossi
4.5	Financial resources
	See attachment DG 1.7
4.6	Links with other public or private organizations at local, national and international level
	<u>Project 1</u> Main collaborations with national institutes: CNR-IRPI di Padova. Veneto Region, Hydrological Cycle Bureau Center for Advanced Studies on Hydrogeological Risks in Mountain Areas - CUDAM, University of Trento University ‘La Sapienza’ of Rome - Research Centre on Geologic Risks (CE.RI) University of Sannio - Department of Geological and Environmental Sciences

University of Insubria - Department of Chemical and Environmental Sciences
University of Bologna - Department of Earth Sciences

Main collaborations with international institutes:

Université Claude Bernard Lyon-1 (France) - Laboratoire Sciences de la Terre,
Grenoble (France) - Cemagref, Agricultural and Environmental Engineering Research,
Centre de Geosciences, Ecole des Mines de Paris, Université Marne-La-Vallée (France)
Department of Earth Sciences, University of Waterloo (Belgium)
Earth and Ocean Sciences Department, University of British Columbia (Canada)
Escuela de Geología, Universidad de Salta, Argentina.
Center of Environmental Restoration & Disaster Reduction, National Chung-Hsing
University, Taichung, Taiwan
Gebirgshydrologie und Wildbaeche, WSL, Birmensdorf-CH

Project 2

Main collaborations with national institutes:

Politecnico di Milano – Dipartimento Ingegneria Civile, Ambientale e Territoriale
Politecnico di Milano – Dipartimento Ingegneria - Università di Venezia
Università di Venezia - Dipartimento di Scienze Statistiche
Università di Milano - Dipartimento di Scienze Ambientali
Università di Bologna – Dipartimento di Ingegneria Chimica, Mineraria e delle
Tecnologie Ambientali
CNR – Istituto di Geoscienze e Georisorse – Pisa
Istituto Universitario di Architettura di Venezia - Dipartimento di Costruzione
dell'Architettura
Università di Padova - Dipartimento di Scienze Statistiche
Università di Padova - Dipartimento di Metodi e Modelli Matematici
Regione del Veneto – Direzione Geologia
Regione del Veneto – Direzione Ambiente
Autorità d'Ambito Territoriale Ottimale Laguna di Venezia
Provincia di Venezia
Ordine Regionale dei Geologi del Veneto

Main collaborations with international institutes:

University of Stuttgart (D) - Dept. of Hydrology and Geohydrology
Weitzmann Institute of Science - Kimmel Center for Archaeological Science - Israele
Geological Survey of Baden Wurttemberg (D)
C.D.G. –Foundation for international Training and development, Berlin (D- Eotvos
Lorand Geophysical Institute of Hungary

Project 3

Main collaborations with national institutes:

Università di Milano-Bicocca - Dipartimento di Scienze Geologiche e Geotecnologie,
Milano
Politecnico di Torino - Dipartimento di Ingegneria del Territorio, dell'Ambiente e delle
Geotecnologie

	Università di Torino - Dipartimento di economia ed ingegneria agraria, forestale ed ambientale Università di Padova - Dipartimento di Ingegneria Idraulica, Marittima, Ambientale e Geotecnica, (IMAGE) Università di Padova - Dipartimento di Metodi e Modelli Matematici per le Scienze Applicate (DMMMSA) Università di Trento - Dipartimento di Ingegneria Civile e Ambientale Università di Napoli - Dipartimento di Geofisica e Vulcanologia Università di Trieste - Dipartimento di Ingegneria Civile Istituto Nazionale di Oceanografia e Geofisica Sperimentale (OGS), Trieste, Italy Eni S.p.A. – Exploration and Production Division – San Donato Milanese, Italy. EUCENTRE - European Centre for Earthquake Engineering, Pavia, Italy Istituto Nazionale di Geofisica e Vulcanologia-Sezione di Catania Istituto di Geoscienze e Georisorse, C.N.R., Pisa Istituto Nazionale di Geofisica e Vulcanologia (INGV), Pisa Università di Milano - Dipartimento di Scienze della Terra Università “La Sapienza” Roma - Dipartimento di Elettronica Università “La Sapienza” Roma - Dipartimento di Scienze della Terra Università di Modena e Reggio Emilia - Osservatorio Geofisico, Dipartimento di Ingegneria dei Materiali e dell’Ambiente Università di Parma - Dipartimento Scienze della Terra Università di Padova - Dipartimento di Scienze dell’Antichità Soprintendenza Archeologica del Veneto Università di Padova - Dipartimento di Matematica Pura ed Applicata IUAV Università di Venezia Università Cà Foscari di Venezia Main collaborations with international institutes: Department of Environmental Science, Lancaster University University of Bonn, Department of Geodynamics and Geophysics, Bonn, Germany Agrosphere (ICG 4), Forschungszentrum Jülich, Germany Central Institute for Electronics (ZEL), Forschungszentrum Jülich, Germany Environmental Research Centre (UFZ), Leipzig, Germany Ecole Polytechnique Fédérale de Lausanne, Laboratoire de technologie écologique, Institut des sciences et technologies de l’environnement (Switzerland) Institute for Geophysical Research, Department of Physics, Alberta University, Canada
4.7	Other activities relevant for the research Program <u>Project 1</u> <u>Invited seminars</u> 1) 2003 - CUDAM (Università degli Studi di Trento): Characteristics and analyses of slopes instability and debris flows. (<u>R. Genevois</u>) 2) 2005 - Salta, Argentina: Debris flow hazard and mitigation (<u>R. Genevois, A. Galgardo</u>)

3) 2006-2007 – Research Center (CERI), University “La Sapienza” of Rome: Characteristics and analyses of debris flows. (**R. Genevois**)

4) 2007 - Research Center (CERI), University “La Sapienza” of Rome: From the Hydrology to the design (**P. Scotton**).

Peer reviewing

Reviewers for the following journals

Natural Hazards; Engineering Geology; Computers & Geosciences; Computational Geosciences; Environmental Modelling & Software; Geotechnical and Geological Engineering; Quaternary International; Italian Journal of Engineering Geology; Giornale di Geologia Applicata; Bulletin de la Société Géologique de France; Geophysical Journal International; Geophysical Research Letters

Reviewing for research projects

- Referee of research projects for the CNR (Italian National Researches Council) and the Austrian Science Foundation (R. Genevois)
- Member of the Commission of Vicenza Province for landslide remedial works Projects (R. Genevois);
- Member of the National Council of Researches Commission for the appointment of Research Centers Heads (R. Genevois);
- Member of PhD final examination in Italy (University of Rome, Chieti, Perugia) and in France (Ecole des Mines, Paris; Cemagref, Grenoble).(R. Genevois)

Project 2

Workshop organization

- 1) December 2005. Università di Padova - Dipartimento di Geologia, Paleontologia e Geofisica. Title: La pulizia dei pozzi per acqua (**P. Fabbri**)
- 2) February 2007. Università di Padova - Dipartimento di Geoscienze Title: Progettazione dei pozzi per acqua (**P. Fabbri**)
- 3) February 2007. Università di Padova - Dipartimento di Geoscienze Title: Metodi di perforazione dei pozzi per acqua (**P. Fabbri**)

Courses and seminars

1) “*An Introduction to Groundwater Flow and Transport Modeling with Practical Application on the PC*” Dipartimento di Geologia, Paleontologia e Geofisica dell’Università di Padova, 2003 in collaboration with University of Stuttgart (D) and Federal Institute for Geosciences and Natural Resources, Hannover (D). (**P. Fabbri**)

2) Course on Groundwater research in arid region - Asmara – Eritrea. Central Eritrean Ministry/ONU (2006-2007) (**A. Galgari**)

Peer reviewing

Reviewers for the following journals:

Reviewing for research projects

- PRIN-COFIN 2004 (Fabbri)
- CIVR (Fabbri)

Project 3

External teaching activities

External examiner for PhD defenses: Giulio Vignoli (Università di Ferrara, 2006), Umberta Tinivella (Università di Trieste, 2006), Majken Looms (University of Copenhagen, 2007). (**G. Cassiani**)

Solicited/Invited seminars and presentations at international and national congresses:

ROSE School - Centre for Post-Graduate Training and Research in Earthquake Engineering and Engineering Seismology – Pavia, Italy - Course of Applied Geophysics (**G. Cassiani**)

Seismic Microzonation course (II edizione), University of Pavia, Italy, May 29-30 2007. (**G. Cassiani**)

Short Training Course on "Groundwater Management in the Framework of Integrated Water Resources Management IWRM" organized by UNESCO at the The Regional Center for Training and Water Studies (RCTWS) Cairo, Egypt, 2006. (**G. Cassiani**)

FIVA PhD course on Hydrogeophysics, 15-17 June 2006, University of Copenhagen, Denmark. (**G. Cassiani**)

International School of Applied Geophysics, 13th Course , Centro Ettore Majorana, Erice: 29/09-3/10/2006; (**G. Cassiani**)

Invited talk at Institut des sciences et technologies de l'environnement, Station No. 2, Ecole Polytechnique Fédérale de Lausanne (EPFL) (2007). (**G. Cassiani**)

Invited talk at the *AGU Fall Meeting*, San Francisco, 11-15 December 2006. (**G. Cassiani**)

Invited talk at the *EGU General Assembly* 2007, Vienna, 15-20 April 2007. (**G. Cassiani**)

Awards

EAGE Mintrop Award as best paper in Near Surface Geophysics 2007 to R. Deiana for: Deiana R., G. Cassiani, A. Kemna, A. Villa, V. Bruno and A. Bagliani, 2007, An experiment of non invasive characterization of the vadose zone via water injection and cross-hole time-lapse geophysical monitoring, *Near Surface Geophysics*, Vol 5, 3 June 2007, 183-194 (to be presented at the EAGE annual conference in Rome, June 2008).

Memberships of scientific committee and organizations

- Member of the American Geophysical Union (AGU) Hydrogeophysics Technical Committee since 2005. (**G. Cassiani**)

Organization activity, Conferences, School

- Co-convenor of the Hydrogeophysics session (with Alberto Bellin and Klaus Holliger) – American Geophysical Union AGU Fall Meeting – San Francisco, December 2007. (**G. Cassiani**)

Editorial activity

- Associate Editor of Near Surface Geophysics (**G. Cassiani**)
- Member of the Editorial Board of the journal SERRA (Stochastic Environmental Research & Risk Assessment), Springer-Verlag. (**G. Cassiani**)
- Giorgio Cassiani is Member of the scientific committee of the journal “Acque Sotterranee”, Italy. (**G. Cassiani**)

Peer reviews for the following journals:

Water Resources Research, Geophysics, Journal of Applied Geophysics, Near Surface Geophysics, Journal of Environmental and Engineering Geophysics, Vadose Zone Journal.

Reviewing for research projects

External reviewer for projects of the following funding agencies: DFG (Germany), NERC (UK), ISF (Israel), The Research Council of Norway. (**G. Cassiani**)

4.8**Research products****Project 1**Summary of research products

	2003	2004	2005	2006	2007	Total
A1	2	0	2	2	3	9
A2	0	1	0	3	1	5
B1	0	0	0	1	0	1
D	3	2	8	5	3	21
F	2	4	1	2	1	10
Total	7	7	11	13	8	

List of research products

1. 2003 A1 GENEVOIS R., TECCA P.R., GALGARO A., DEGANUTTI A.M..
DEVELOPMENT OF A REMOTELY CONTROLLED DEBRIS FLOW

			MONITORING SYSTEM IN THE DOLOMITES (ACQUABONA, ITALY). HYDROLOGICAL PROCESSES. VOL. 17, PP. 1771-1784, ISSN: 0885-6087.
2.	2003	A1	SQUARZONI C., DELACOURT C., ALLEMAND P.. NINE YEARS OF SPATIAL AND TEMPORAL HETEROGENEITIES OF THE LA VALETTE LANDSLIDE MOTION OBSERVED BY SAR INTERFEROMETRY. ENGINEERING GEOLOGY. VOL. 68, PP. 53-66.
3.	2005	A1	GALGARO A., TECCA P.R., GENEVOIS R., A.M. DEGANUTTI. ACOUSTIC MODULE OF THE ACQUABONA (ITALY) DEBRIS FLOW MONITORING SYSTEM. NATURAL HAZARDS, VOL. 5; P. 211-215, ISSN: 0921-030X.
4.	2005	A1	SQUARZONI C., DELACOURT C., ALLEMAND P. DIFFERENTIAL SINGLE-FREQUENCY GPS MONITORING OF THE LA VALETTE LANDSLIDE (FRENCH ALPS). ENGINEERING GEOLOGY, 79, 3-4, PP. 215-229.
5.	2006	A1	LUZI G., PIERACCINI M., MECATTI D., NOFERINI L., MACALUSO G., GALGARO A., ATZENI C.. ADVANCES IN GROUND-BASED MICROWAVE INTERFEROMETRY FOR LANDSLIDE SURVEY: A CASE STUDY. INTERNATIONAL JOURNAL OF REMOTE SENSING. VOL. 27, PP. 2331-2350 ISSN: 0143-1161.
6.	2006	A1	PIERACCINI M., NOFERINI L., MECATTI D., MACALUSO G., ATZENI C., TEZA G., GALGARO A., ZALTRON N.. INTEGRATION OF RADAR INTERFEROMETRY AND LASER SCANNING FOR MONITORING THE STABILITY OF AN ALPINE URBAN SITE. IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING. VOL. 44, PP. 2335-2342 ISSN: 0196-2892.
7.	2007	A1	ARMENTO M.C., GENEVOIS R., TECCA P.R.. COMPARISON OF NUMERICAL MODELS OF TWO DEBRIS FLOWS IN THE CORTINA D'AMPEZZO AREA, DOLOMITES, ITALY. LANDSLIDES, ISSN: 1612-510X, DOI: 10.1007/s10346-007-0111-2.
8.	2007	A2	PESCI, A., TEZA, G.. STRAIN RATE ANALYSIS OVER THE CENTRAL APENNINES FROM GPS VELOCITIES: THE DEVELOPMENT OF A NEW FREE SOFTWARE. BOLLETTINO DI GEODESIA E SCIENZE AFFINI, 56, 69-88.
9.	2007	A1	PESCI A., TEZA G.. TERRESTRIAL LASER SCANNER AND RETRO-REFLECTIVE TARGETS: AN EXPERIMENT FOR ANOMALOUS EFFECTS INVESTIGATION. INTERNATIONAL JOURNAL OF REMOTE SENSING, 3425- 3446 (ID TRES-PAP-2006-0542.R3).
10.	2007	A1	TEZA G., GALGARO A., ZALTRON N., GENEVOIS R.. TERRESTRIAL LASER SCANNER TO DETECT LANDSLIDE DISPLACEMENT FIELDS: A NEW APPROACH. INTERNATIONAL JOURNAL OF REMOTE SENSING, VOL. 28 (16); P. 3425-3446, ISSN: 0143-1161, DOI: 10.1080/01431160601024234
11.	2004	A2	GALGARO A., GENEVOIS R., TEZA G., CONFORTI D., ROCCA M.. MONITORAGGIO DA TERRA DI FENOMENI DI INSTABILITÀ GEOLOGICA MEDIANTE SISTEMI DI TELERILEVAMENTO LASER SCANNER: UN PRIMO TEST SULLE CINQUE TORRI (CORTINA D'AMPEZZO, BL). CARTOGRAPHICA, VOL. 9; P. 11-15.
12.	2006	A2	GENEVOIS R., SEDEA R., FABBRI P., ARMENTO C.. STUDIO SULLE CARATTERISTICHE DELLE CAVE IN SOTTERRANEO. QUARRY AND CONSTRUCTION, N. 519, VOL. 3, PP. 31-36.
13.	2006	A2	PELLEGRINI G.B., SURIAN N., ALBANESE D., DEGLI ALESSANDRINI A., ZAMBRANO R.. LE GRANDI FRANE PLEISTOCENICHE DI MARZIAI E DEI COLLESEI DI ANZÙ E LORO EFFETTI SULL'EVOLUZIONE GEOMORFOLOGICA E PALEOIDROGRAFICA DELLA VALLE DEL PIAVE NEL CANALE DI QUERO (PREALPI VENETE). STUDI TARENTINI DI SCIENZE NATURALI. ACTA GEOLOGICA. MUSEO TRIDENTINO DI SCIENZE NATURALI, TRENTO
14.	2006	A2	SQUARZONI C., GALGARO A., GENEVOIS R., PAOLI F., FRANCESE R., VERONESE L., CAMPEDEL P., GENEVOIS R.. A MULTIDISCIPLINARY APPROACH TO LANDSLIDE MODELLING: THE CASE OF CAMPODENNO, NORTH-EASTERN ALPS, ITALY. GIORNALE DI GEOLOGIA APPLICATA, VOL. 3; P. 257-262, ISSN: 1826-1256
15.	2006	B1	GENEVOIS R., ARMENTO M.C., TECCA P.R. FAILURE MECHANISMS AND RUNOUT BEHAVIOUR OF THREE ROCK AVALANCHES IN THYE NORTH-EASTERN ITALIAN ALPS. IN: EVANS S.G.; SCARASCIA MUGNOZZA G.; STROM A.; HERMANN R.L.. LANDSLIDES FROM MASSIVE ROCK SLOPE FAILURE. VOL. 49, P. 407-430 SPRINGER, ISBN/ISSN: 1-4020-4036-9
16.	2003	D	DEGANUTTI A., TECCA P.R., GENEVOIS R., GALGARO A.. FIELD AND LABORATORY STUDY ON SOME RHEOLOGICAL PROPERTIES OF A DEBRIS FLOW. DEBRIS FLOW HAZARD AND MITIGATION: MECHANICS, PREDICTION AND ASSESSMENT. SEPTEMBER 10-12 , 2003. (VOL. 3, PP. 833-841). PROC. 3TH INT. CONF., DAVOS, SWITZERLAND MILLPRESS, ROTTERDAM.
17.	2003	D	DELACOURT, C., ALLEMAND, P., SQUARZONI, C., PICARD, F., RAUCOULES, D., CARNEC, C.. POTENTIAL AND LIMITATION OF ERS-DIFFERENTIAL SAR INTERFEROMETRY FOR LANDSLIDE STUDIES IN THE FRENCH ALPS AND PYRENEES. FRINGE 2003, ESA-ESRIN, ROME, 1-5 DECEMBER 2003.
18.	2003	D	TECCA P.R.; DEGANUTTI A.; GENEVOIS R.; GALGARO A.. VELOCITY DISTRIBUTION IN A COARSE DEBRIS FLOW. IN: DEBRIS FLOW HAZARD

			AND MITIGATION: MECHANICS, PREDICTION AND ASSESSMENT, SEPTEMBER 10-12. 2003, VOL. 3, P. 905-916.
19.	2004	D	GALGARO A., GENEVOIS R., TEZA G., ROCCA M., SQUARZONI C.. INTEGRAZIONE DI DATI DA LASER SCANNER E METODI TRADIZIONALI PER LA MISURA DELLE DEFORMAZIONI DELLA FRANA DI PERAROLO DI CADORE (BL). IN: 8° CONFERENZA NAZIONALE ASITA: GEOMATICA, VOL. 1, P. 1881-1886.
20.	2004	D	PELLEGRINI G.B., SURIAN N.. FADALTO LANDSLIDE. IN: GEOMORPHOLOGY AND SLOPE INSTABILITY IN THE DOLOMITES (NORTHERN ITALY): FROM LATEGLACIAL TO RECENT. GEOMORPHOLOGICAL EVIDENCE AND ENGINEERING GEOLOGICAL APPLICATIONS. 32° INTERNATIONAL GEOLOGICAL CONGRESS, FIELD TRIP GUIDE BOOK-P22, FLORENCE, AUGUST 20-28, ITALY 2004,12-15.
21.	2005	D	ARMENTO M.C., SQUARZONI C., GENEVOIS R.. TWO- AND THREE-DIMENSIONAL NUMERICAL ANALYSIS OF AN UNDERGROUND QUARRY. IN: THE 11TH INTERNATIONAL CONFERENCE OF IACMAG, TURIN, ITALY, JUNE, 19-24 2005,, VOL. 3, P. 19-26, ISBN/ISSN: 88-555-2812-2.
22.	2005	D	CUMAN A., GENEVOIS R., GALGARO A.. PROSPEZIONI GEOELETTICHE SU UN ANTICO CORPO DI FRANA: IL CASO DEI LAVINI DI MARCO (ROVERETO). IN: WORKSHOP: OTTIMIZZAZIONE DELLE MISURE GEOFISICHE TRAMITE INDAGINI SU MODELLI RIDOTTI E AREE TEST, 10 DICEMBRE 2004, P. 121-135, ISBN/ISSN: 88-7498-061-2.
23.	2005	D	CUMAN A., GENEVOIS R., GALGARO A.. DEPOSITION PROCESSES AND RUN-OUT BEHAVIOR OF THE LAVINI DI MARCO ROCK AVALANCHE (NORTHERN ITALY). IN: INTERNATIONAL CONFERENCE ON LANDSLIDE RISK MANAGEMENT, VANCOUVER, CANADA 31ST MAY-3RD JUNE 2005.
24.	2005	D	LUZI G., PIERACCINI M., MACALUSO G., MECATTI D., NOFERINI L., ATZENI C., GALGARO A., TEZA G.. GROUND BASED MICROWAVE INTERFEROMETRY FOR ESTIMATING THE MOVEMENT OF LANDSLIDES. 2005 INTERNATIONAL CONFERENCE ON LANDSLIDE RISK MANAGEMENT, VANCOUVER B.C., CANADA, MAY 31-JUNE 4, PP. 309-314. E. EBERHARDT, O. HUNGR, R. FELL, R. COUTURE (EDS.).
25.	2005	D	SQUARZONI C., GALGARO A., TEZA G., GENEVOIS R., ROCCA M., BAGLIONI A.. INTEGRAZIONE DI LASER SCANNER E METODI GEOFISICI NELLO STUDIO DELLA FRANA DI PERAROLO DI CADORE. IN: 9A CONFERENZA NAZIONALE ASITA, CATANIA, 15-18 NOVEMBRE 2005, VOL. 2, P. 1867-1872.
26.	2005	D	SQUARZONI C., GENEVOIS R., ROCCA M.. FINITE DIFFERENCES STABILITY MODEL OF THE S. ANDREA LANDSLIDE (ITALY). IN: 11TH INTERNATIONAL CONFERENCE AND FIELD TRIP ON LANDSLIDES (ICFL), SEPTEMBER, 1-10 2005, NORWAY, P. 335-341, ISBN/ISSN: 0-415-38678-0.
27.	2005	D	TEZA G., PESCI A., FABRIS M., LODDO F., ZALTRON N.. VERIFICA DELLE PRESTAZIONI DI DIVERSI LASER SCANNER A LUNGA DISTANZA. 9A CONFERENZA NAZIONALE ASITA, CATANIA, 15-18 NOVEMBRE 2005. (VOL. II, PP. 1951-1956).
28.	2005	D	TEZA G., PIERACCINI M., GALGARO A., LUZI G., ZALTRON N.. MONITORAGGIO DA TERRA DI VERSANTI INSTABILI CON LASER SCANNER E RADAR INTERFEROMETRICO. 9A CONFERENZA NAZIONALE ASITA, CATANIA, 15-18 NOVEMBRE 2005. (VOL. II, PP. 1945-1950).
29.	2006	D	ARMENTO M.C., GENEVOIS R., TECCA P.R.. DEBRIS FLOW HAZARD AND MITIGATION WORKS IN FIAMES SLOPE (DOLOMITES, ITALY). IN: PROCEEDINGS OF THE 1ST INTERNATIONAL CONFERENCE ON MONITORING, SIMULATION, PREVENTION AND REMEDIATION OF DENSE AND DEBRIS FLOWS. RHODES, GREECE, JUNE 7-9, 2006, SOUTHAMPTON: WIT PRESS, P. 15-25, ISBN/ISSN: ISBN: 1-84564-169-8.
30.	2006	D	GALGARO A., TEZA G., GENEVOIS R.; SQUARZONI C., ROCCA M., ARMENTO M.C.. THE LASER SCANNER AS A TOOL FOR LANDSLIDE DIAGNOSTICS: THE EXPERIENCE OF UNIVERSITY OF PADUA- ITALY. IN: 1ST LASER SCANNER. POLITECNICO DI MILANO, JUNE 8TH 2005, MILANO.
31.	2006	D	SIMONI, S., ZANOTTI, F., RIGON, R., SQUARZONI, C.. APPROCCIO PROBABILISTICO ALLA DETERMINAZIONE DELL'INNESCO DI FRANE SUPERFICIALI CON UN MODELLO ACCOPPIATO IDRO-GEOTECNICO: GEOTOP-SF. XXX° CONVEGNO DI IDRAULICA E COSTRUZIONI IDRAULICHE - IDRA 2006, ROMA, 10-15 SETTEMBRE 2006.
32.	2006	D	TEZA G., GALGARO A., GENEVOIS R., DEL PRA C., GRADIZZI A., GENEVOIS R.. LASER SCANNER E RILIEVO GEOMECCANICO NELLO STUDIO DELLE CAVE SOTTERRANEE DEL CAGLIERON (TV). IN: ATTI DELLA 10A CONFERENZA NAZIONALE ASITA., BOLZANO, 14-17 NOVEMBRE 2006, P. 1803-1808.
33.	2006	D	TEZA G., GALGARO A., GENEVOIS R., SQUARZONI C., ROCCA M., ARMENTO C.. INTEGRATION OF LASER SCANNER AND GEOPHYSICAL SURVEY: THE CASE OF PERAROLO DI CADORE LANDSLIDE. IN: 1ST LASER SCANNER 3D OPTTECH SEMINAR, JUNE 8TH 2005.

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| 34. | 2007 | D | GENEVOIS R.. DEBRIS FLOW STUDIES AND MONITORING FOR HAZARD EVALUATION IN THE AREA OF CORTINA D'AMPEZZO (DOLOMITES, NORTH-EASTERN ITALIAN ALPS). IN: 2007 INTERNATIONAL CONFERENCE ON SLOPELAND DISASTER MITIGATION. TAIPEI, OCTOBER 29-30, 2007, TAIPEI, P. 32-51. INVITED LECTURE. |
| 35. | 2007 | D | GENEVOIS R.; P. R. TECCA; A.M. DEGANUTTI; M. C. ARMENTO (2007). NUMERICAL MODELLING OF TWO DEBRIS FLOWS IN THE DOLOMITES (NORTH-EASTERN ITALIAN ALPS). IN: DEBRIS-FLOW HAZARDS MITIGATION: MECHANICS, PREDICTION, AND ASSESSMENT. CHENGDU, SEPTEMBER 10-13, 2007, CHENGDU. INVITED LECTURE |
| 36. | 2007 | D | GHIROTTI M., GENEVOIS R.. A COMPLEX ROCK SLOPE FAILURE INVESTIGATED BY MEANS OF NUMERICAL MODELLING BASED ON LASER SCANNER TECHNIQUE. IN: ROCK MECHANICS. VANCOUVER, CANADA, 27-31 MAGGIO 2007, LEIDEN: TAYLOR & FRANCIS, VOL. 2, P. 917-924, ISBN/ISSN: 978-0-415-44400-2. |
| 37. | 2003 | F | SQUARZONI, C.; DELACOURT, C.; ALLEMAND, P., 2003. GPS MONITORING OF THE LA VALETTE LANDSLIDE (FRENCH ALPS) WITH TWO MONO-FREQUENCY RECEIVERS. EGS - AGU - EUG JOINT ASSEMBLY, NICE, FRANCE, APRIL 2003. ABSTRACT. |
| 38. | 2003 | F | TECCA P.R.; GALGARO A.; GENEVOIS R.; DEGANUTTI A. (2003). GROUND VIBRATIONS MEASUREMENS AND DEBRIS FLOW DISCHARGE ESTIMATES. IN: EGS. |
| 39. | 2004 | F | CUMAN A., ROCCA M., SQUARZONI C., VETTORE L., 2004. DEPOSITION PROCESSES AND TRIGGERING FACTORS OF THE LAVINI DI MARCO ROCK AVALANCHE (NORTHERN ITALY). 32ND IGC, FLORENCE, ITALY, AUGUST 20-28, 2004. |
| 40. | 2004 | F | GALGARO A.; GENEVOIS R. (2004). A NEW CONCEPT IN DEBRIS FLOW MONITORING - WARNING SYSTEMS: THE EXAMPLE OF RIO GERE CATCHMENT (EASTERN ALPS, ITALY). IN: 32° INTERNATIONAL GEOLOGICAL CONGRESS, VOL. 1. |
| 41. | 2004 | F | FABBRI P.; FRANCESE R.; GALGARO A.; GENEVOIS R.; SCHMIDT D.; SEDEA R.; ZAJA A. (2004). SEISMIC REFLECTION TESTS WITHIN THE EUGANEAN THERMAL BASIN (ABANO TERME, ITALY). IN: 32° INTERNATIONAL GEOLOGICAL CONGRESS, VOL. 1. |
| 42. | 2004 | F | SQUARZONI C.; GENEVOIS R. (2004). A STUDY OF THE S. ANDREA LANDSLIDE (ITALIAN EASTERN ALPS) WITH FINITE DIFFERENCES CODES. IN: EUROPEAN GEOPHYSICAL UNION, 1ST GENERAL ASSEMBLY, NICE, FRANCE 25-30 APRIL 2004. |
| 43. | 2005 | F | SQUARZONI C.; GENEVOIS R. (2004). A STUDY OF THE S. ANDREA LANDSLIDE (ITALIAN EASTERN ALPS) WITH FINITE DIFFERENCES CODES. IN: EUROPEAN GEOPHYSICAL UNION, 1ST GENERAL ASSEMBLY, NICE, FRANCE 25-30 APRIL 2004. |
| 44. | 2006 | F | SQUARZONI; C; ARMENTO; M.C; SCOTTON; GENEVOIS R. (2006). FIELD DATA AND NUMERICAL SIMULATIONS OF THE JULY 19TH, 2004 DEBRIS FLOW EVENT (CORTINA D'AMPEZZO, NORTHERN ITALY), EGU 3° GENERAL ASSEMBLY, VIENNA, AUSTRIA, 24-29 APRIL 2005., ABSTRACT. |
| 45. | 2006 | F | TEZA; G; GENEVOIS; R; GALGARO; A; ZALTRON; GENEVOIS R. (2006). A NEW APPROACH TO THE MEASUREMENT OF A LANDSLIDE DISPLACEMENT FIELD BY USING TERRESTRIAL LASER SCANNER, ABSTRACT EGU06-A-08256, 03-07 APRIL 2006., SESSION NATURAL HAZARDS 03.10, EUROPEAN GEOPHYSICAL UNION, GENERAL ASSEMBLY, VIENNA (AUSTRIA). |
| 46. | 2007 | F | TEZA, G., GENEVOIS, R., PESCI, A., GALGARO, A., 2007. GROUND SURFACE STRAIN FIELD COMPUTATION OF AN UNSTABLE SLOPE. ABSTRACT EGU2007-A-09143 IN THE SESSION NATURAL HAZARDS 03.04, EUROPEAN GEOPHYSICAL UNION, GENERAL ASSEMBLY, VIENNA (AUSTRIA), 15-20 APRIL 2007. |

Project 2

Summary of research products

	2003	2004	2005	2006	2007	Total
A1	0	1	2	0	1	4
A2	2	0	0	0	3	5
F	2	6	2	1	3	14
Total	4	7	4	1	7	

List of research products

1.	2004	A1	VORLICEK PA, ANTONELLI R, FABBRI P., RAUSCH R. (2004). QUANTITATIVE HYDROGEOLOGICAL STUDIES OF THE TREVISO ALLUVIAL PLAIN, NE ITALY. QUARTERLY JOURNAL OF ENGINEERING GEOLOGY AND HYDROGEOLOGY. VOL. 37, PP. 23-29 ISSN: 1470-9236, ISI:000221394400004
2.	2005	A1	FABBRI P., TREVISANI S. (2005). SPATIAL DISTRIBUTION OF TEMPERATURE IN THE LOW-TEMPERATURE GEOTHERMAL EUGANEAN FIELD (NE ITALY): A SIMULATED ANNEALING APPROACH. GEOTHERMICS. VOL. 34, PP. 617-631 ISSN: 0375-6505, ISI:000232072700004.
3.	2005	A1	FABBRI P., TREVISANI S. (2005). A GEOSTATISTICAL SIMULATION APPROACH TO A POLLUTION CASE IN NORTHEASTERN ITALY. MATHEMATICAL GEOLOGY. VOL. 37, PP. 569-586 ISSN: 0882-8121, ISI:000232842400002.
4.	2007	A1	DOSSI C., CICERI E., GIUSSANI B., POZZI A., GALGARO A., VIERO A. AND VIGANÒ A. WATER AND SNOW CHEMISTRY OF MAIN IONS AND TRACE ELEMENTS IN THE KARST SYSTEM OF MONTE PELMO MASSIF (DOLOMITES, EASTERN ALPS, ITALY). MARINE AND FRESHWATER RESEARCH, 2007, 58, 649-656
5.	2003	A2	ALTISSIMO L., DAL PRÀ A., MOZZI G. - IL SISTEMA IDROGEOLOGICO DELLA PIANURA VENETA E LA DIMINUZIONE PROGRESSIVA DELLE RISORSE IDRICHE SOTTERRANEE. ACQUE SOTTERRANEE, V. 82, PP. 9-22, 2003
6.	2003	A2	ANTONELLI R., MARI G.M. - VALUTAZIONI SULLA EVOLUZIONE DEL CHIMISMO NEI SISTEMI ACQUIFERI DELLA MEDIA E BASSA VALLE DELL'AGNO-GUÀ E DEL CHIAMPO (M.LESSINI ORIENTALI - VICENZA) ATTRAVERSO OSSERVAZIONI PLURIENNALI NON SISTEMATICHE. MEMORIE DI SCIENZE GEOLOGICHE, V. 55, PP. 47-103, 2003.
7.	2007	A2	ANTONELLI R., MARI G.M. - LO SFRUTTAMENTO DI ACQUA POTABILE NEL DOMINIO IDROGEOLOGICO CENTRALE DELLA PIANURA ALLUVIONALE VENETA. PROPOSTE E PROSPETTIVE PER UNA RETE DI MONITORAGGIO AVANZATA. GIORNALE DI GEOLOGIA APPLICATA, V. 5, PP. 75-87, 2007.
8.	2007	A2	ELOISA DI SPIO, ANTONIO GALGARO, GIOVANNI MARIA ZUPPI. 2007. CONTAMINAZIONE SALINA NEI SISTEMI ACQUIFERI DELL'ENTROTERRA MERIDIONALE DELLA LAGUNA DI VENEZIA. GIORNALE DI GEOLOGIA APPLICATA 6 (2007) 01-08
9.	2007	A2	FABBRI P., SOCCORSO C. (2007). LA RISPOSTA DEI LIVELLI POTENZIOMETRICI ALLO SFRUTTAMENTO DEL CAMPO GEOTERMICO EUGANEO (PD). GIORNALE DI GEOLOGIA APPLICATA. VOL. 5, PP. 115-124 ISSN: 1826-1256.
10.	2003	F	F BOARETTO E, CARM I, FABBRI P., HEINEMEIER J, SARTORI S, SVEINBJORNSDOTTIR A.E, YECHIELI Y. (). RADIOCARBON IN THERMAL AND FRESH GROUNDWATER IN VENETO REGION, NORTHERN ITALY. XVIII INTERNATIONAL RADIOCARBON CONFERENCE. 1-5 SEPTEMBER.
11.	2003	F	FABBRI P., TREVISANI S. (2003). TEMPERATURE IN THE GEOTHERMAL EUGANEAN BASIN: A SIMULATED ANNEALING APPROACH. INTERNATIONAL CONFERENCE ON GROUNDWATER IN FRACTURED ROCKS. 15-19/09/2003. (VOL. 1, PP. 199-200). ISBN/ISSN: 92-9220-002-X.
12.	2004	F	ANTONELLI R. - QUANTITATIVE HYDROGEOLOGICAL STUDIES OF THE

			TREVISO ALLUVIAL PLAIN (NE ITALY). 32ND INTERNATIONAL GEOLOGICAL CONGRESS FLORENCE. INTERNATIONAL GEOLOGICAL CONGRESS, 20-28 AUGUST 2004, FIRENZE
13.	2004	F	FABBRI P. – LA GEOSTATISTICA NEL TRATTAMENTO DEI DATI GEOLOGICI. GEOFLUID, WORKSHOP DI GEOFISICA, OTTOBRE 2004, PIACENZA.
14.	2004	F	FABBRI P., FRANCESE R, GALGARO A, GENEVOIS R, SCHMITT M, SEDEA R, ZAJA A. (2004). SEISMIC REFLECTION TEST WITHIN THE EUGANEAN THERMAL BASIN (ABANO TERME, ITALY). INTERNATIONAL GEOLOGICAL CONGRESS. 20-28 AUGUST 2004. (PP. 1233).
15.	2004	F	FABBRI P., TREVISANI S. (2004). GEOSTATISTICAL ANALYSIS AND MAPPING IN A GROUND WATER POLLUTION PHENOMENON IN THE AREA OF PADOVA, NE ITALY. INTERNATIONAL GEOLOGICAL CONGRESS. 20-28 AUGUST 2004. (PP. 1048).
16.	2004	F	FABBRI P., TREVISANI S. - RICOSTRUZIONI PROBABILISTICHE DEL SOTTOSUOLO: UN APPROCCIO GEOSTATISTICO. CONVEGNO NAZIONALE “SVILUPPO DEGLI STUDI IN SEDIMENTOLOGIA DEGLI ACQUIFERI E ACQUE SOTTERRANEE IN ITALIA”, 25 GIUGNO 2004, PARM
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23.	2007	F	FABBRI P., MARCOLONGO E, ROSIGNOLI A, ZANGHERI P. (2007). DEEP AQUIFER REGIMES IN THE VENETIAN PLAIN (NE ITALY). XXXV I.A.H. CONGRESS, GROUNDWATER AND ECOSYSTEMS. 17-21 SEPTEMBER 2007. (PP. 205).

Project 3

Summary of research products

	2003	2004	2005	2006	2007	Total
A1	0	2	1	3	2	8
A2	0	0	1	1	0	2
B1	0	0	0	2	0	2
D	0	0	0	2	6	8
F	3	8	1	2	7	21
Total	3	10	3	10	15	

List of research products

1.	2004	A1	MANZELLA A., VOLPI G., ZAJA A., MEJU M. COMBINED TEM-MT INVESTIGATION OF SHALLOW-DEPTH RESISTIVITY STRUCTURE OF MT.SOMMA VESUVIUS. JOURNAL OF VOLCANOLOGY AND GEOTHERMAL RESEARCH. VOL. 131, PP. 19-32 ISSN: 0377-0273.
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3.	2005	A1	FRANCESE R., GIUDICI M., SCHMITT D.R., ZAJA A. (2005). MAPPING THE GEOMETRY OF AN AQUIFER SYSTEM WITH A HIGH RESOLUTION REFLECTION SEISMIC PROFILE. GEOPHYSICAL PROSPECTING. VOL. 53 ISSUE 6, PP. 817-828 ISSN: 0016-8025. DOI:10.1111/J.1365-2478.2005.00506.X.
4.	2006	A1	MANZELLA A., ZAJA A. (2006). VOLCANIC STRUCTURE OF THE SOUTHERN SECTOR OF MT ETNA AFTER THE 2001 AND 2002 ERUPTIONS DEFINED BY MAGNETOTELLURIC MEASUREMENTS. BULLETIN OF VOLCANOLOGY. VOL. 69, PP. 41-50 ISSN: 0258-8900. DOI:10.1007/S00445-006-0054-9
5.	2006	A1	DI SIPIO E., GALGARO A., ZUPPI G.M.(2006): NEW GEOPHYSICAL KNOWLEDGE ABOUT GROUNDWATER SYSTEMS IN A COMPLEX ESTUARINE ENVIRONMENT: THE CASE OF VENICE LAGOON. ESTUARINE COASTAL AND SHELF SCIENCE. VOL. 66, 1-2, PAG. 6-12.
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10.	2005	A2	DI SIPIO E., GALGARO A., ZUPPI G.M. AND ZANGHERI P., 2005. DETECTING THE ORIGIN OF SALT WATER CONTAMINATION IN GROUNDWATER IN A LAGOON AREA BY THE COMBINED USE OF GEOPHYSICAL AND GEOCHEMICAL TOOLS: THE EXAMPLE OF THE SOUTHERN VENICE LAGOON MAINLAND, ARAGUÁS, L.; CUSTODIO, E. AND MANZANO, M. (EDS). 2005. GROUNDWATER AND SALINE INTRUSION. HIDROGEOLOGÍA Y AGUAS SUBTERRÁNEAS SERIES, 15, PP. 373-384
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18.	2007	D	GIUSTINIANI M., G. CASSIANI, S. FERRARIS E R. DEIANA, 2007, MISURE GPR DA SUPERFICIE IN TIME LAPSE PER IL MONITORAGGIO DI TEST DI IRRIGAZIONE, XXVI CONGRESSO CNR-GNGTS, ROMA, 13-15 NOVEMBRE 2007.
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28.	2004	F	FABBRI P., FRANCESE R., GALGARO A., GENEVOIS R., SCHMITT D., SEDEA R., ZAJA A., 2004, SEISMIC REFLECTION TESTS WITHIN THE EUGANEAN THERMAL BASIN (ABANO TERME, ITALY). 32ND INTERNATIONAL GEOLOGICAL CONGRESS "FROM THE MEDITERRANEAN AREA TOWARD A GLOBAL GEOLOGICAL RENAISSANCE", AUGUST 20-28, FLORENCE, ITALY, PROGRAM AND ABSTRACTS.
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