

# INSEGNACI ETNA 2020

ANNUAL INTERNATIONAL WORKSHOP [ON LINE] – 2020, DECEMBER 4<sup>TH</sup>



## Benvenuti ! Welcome to the 2020 edition of the insegnaci etna!

As you know, this school reunites traditionally a number of schools from eastern Sicily, an extraordinary area, obviously one of the most fantastic in Europe, for teaching many aspect of the geosciences directly in the field. And not only about the Etna volcano, but also about earthquakes, tsunامي, meteorology, geo-environment, and the relations that exist between all these elements (and hazards) with the people who are living in that area .

Since 2018, we have been organizing this event dedicated to the teaching of science and technology. Various sensors have been installed in the Etna area for educational purposes. The teachers can easily download and use the data in the classroom.

Insegnaci Etna 2020 [on line] will be a new edition of the annual workshop which, in order to adapt to the circumstances, will be organized totally on line. Accessible entirely on line, this workshop will show presentations and activities as diverse as the previous editions. This new format will also make it possible to get a feedback of the network's instruments, ask any questions you may have and, above all, keep in touch with all the participants.

We foresee that the participants will gain understanding of all these methods and their results and will be engaged in discussions about the interpretation of the results and how they can be used in teaching.

We would like to acknowledge all the lecturers, all the participants et all our partners.

We would like to continue to offer to teachers the opportunity to participate to 'insegnacietna' workshop in future years. Of course, this depends upon us being able to show our sponsors that the School has been useful to teachers in their daily teaching, or as inspiration for teaching geoscience in new ways in their schools. Therefore, after the School we will ask you to complete the evaluation forms as soon as possible.

To find out more about the program, visit > <http://site.etna.eu>.

For further information > you can also contact us by e-mail: [edumedobs@gmail.com](mailto:edumedobs@gmail.com)

**For now, please enjoy your insegnacietna 2020 [online]**

# INSEGNACI ETNA 2020

ANNUAL INTERNATIONAL WORKSHOP [ON LINE] – 2020, DECEMBER 4<sup>TH</sup>

## Programme

09:15-09:30 > Welcome to InsegnaciEtna 2020 [on line], with  
Jean-Luc Berenguer, Committee of Education EGU - EduMed Observatory  
Sebastiana Fiscaro, Esperta formatrice di valutazione e politiche scolastiche  
Stefano Branca, INGV - Osservatorio Etneo, Director

## Session 1:

09:30-10:00 > **Etna, the volcano with a thousand faces**

*Etna, vulcano dalle mille facce*

by Boris Benncke, INGV-OE

10:00-10:30 > **Etna, inflations, deflations and slip on the faults**

*Etna, rigonfiamenti, sgonfiamenti e slittamento delle faglie*

by Pierre Briole, ENS Paris & INGV-OE, Salvatore Consoli, INGV-OE, Francesco Carnemolla, Università di Catania, Shan Gremion ENS Lyon

## Session 2:

10:45-11:15 > **Earthquakes in the classroom: 'the seismo-box: do it yourself'**

*Terremoti in classe : 'il sismo-box : do it yourself'*

by Francesca Cifelli, Università degli Studi ROMA TRE, Italy

11:15-11:45 > **Database for a better understanding of the geological mediterranean context**

*Database per una migliore comprensione del contesto geologico mediterraneo*

by Diane Carrer, EduMed Observatory

## Session 3:

14:00-14:30 > **Using hydrogeological data at school**

*Utilizzando i dati idrogeologici a scuola*

by Giuseppe Patti, Liceo Archimede, Acireale, Fabrice Mourau, EduMed Obs

14:30-15:00 > **Practical labs on plate tectonics (also suitable for distance teaching)**

*Laboratori hands-on sulla tettonica delle placche*

by Giulia Realdon, Camerino University, UNICAMearth workgroup

## Session 4:

15:15-15:45 > Erasmus + project

**Groundwater : learn to preserve the European underground environment**

*Acque sotterranee: imparare a preservare l'ambiente sotterraneo europeo*

by Fabrice Mourau, EduMed-Obs, Giuseppe Patti, Liceo Archimede, Acireale

15:45-16:15 > **Discussion between participants**

*Discussione tra partecipanti*

## Etna, a volcano with a thousand faces

**Boris Behncke, INGV-Osservatorio Etneo, Nicolosi**

Among the volcanoes on Earth, Etna is not only one of the most active in terms of eruption frequency and volumes, but it is also extremely versatile: in the arc of a few years, one can observe nearly all eruptive phenomena known from global volcanic activity. From quiet, virtually non-explosive lava effusion, once at rather low rate, another time with very high rates, over weak explosive activity (spattering) and Strombolian activity, which sometimes can be quite violent, to sub-Plinian episodes, all of this can occur during a single eruptive period, like the one initiated in January 2011 and still ongoing. Also present in the catalog of Etna's eruptive phenomena are pyroclastic flows and lahars (mudflows), though in recent time these have been of rather limited dimensions and affected only uninhabited areas. Not only the eruptive phenomenology is highly varied. Differently from many other volcanoes on Earth, activity at Etna is not limited to one single crater. Its summit area consists of no less than four main craters, the result of a significant modification in the last century (until 1911, there was only one summit – the Central – crater). Most of the time, the activity of the volcano takes place within this complex of summit craters or its immediate vicinity. In addition, every few years Etna produces eruptions from vents at lower elevation (flank eruptions). These represent the greatest potential danger, because if they take place low on the flanks of the mountain, their lava flows can reach and invade populated areas. The multitude of potentially dangerous phenomena and the frequency at which they occur demand continuous surveillance of the volcano, but also a decided communication and public outreach policy, in order to spread knowledge of volcanic risk and help improve preparedness in case of a potentially destructive eruption.



Etna – insegnaci Etna2019 field trip

## Boris Behncke

Research Scientist

Istituto Nazionale di Geofisica e Vulcanologia  
& Osservatorio Etneo Catania



Born in Frankfurt am Main in Germany, Boris Behncke lives in Sicily from the mid 1990s and is a research Scientist at the Istituto Nazionale di Geofisica e Vulcanologia, Osservatorio Etneo, Catania (INGV-OE).

As a volcanologist (Laurea in Germany, PhD in Italy), Behncke is working on the description of new eruptive products of active Sicilian volcanoes, and he is responsible for updating of volcanic activity on the site of INGV-OE.

In addition, he is active in the divulgation at the INGV-OE as well as in the schools and other forums, and often in public conferences, on the theme and issues relative to the "life" of an active volcano such as Etna. Behncke is the author of more than 40 articles in international scientific journals and has participated to numerous national and international conferences.

In addition to the Etna, Boris Behncke is fascinated by "the people of the Etna" the "Etnei", who for him represent some sort of particular population, whose mentality and language reflect in many aspects their relation to the Etna and to this land, almost always extremely welcoming but sometimes just as hostile and violent.



## Etna, inflations, deflations and slip on the faults

Pierre Briole, ENS Paris & INGV-OE,  
Salvatore Consoli, INGV-OE,  
Francesco Carnemolla, Università di Catania,  
Shan Gremion ENS Lyon

Mount Etna volcano is monitored by an array of permanent Global Positioning System (GPS) stations. One of those stations, called BRO2, is located on the roof of the IISS Benedetto Radice di Bronte (Fig. 1).

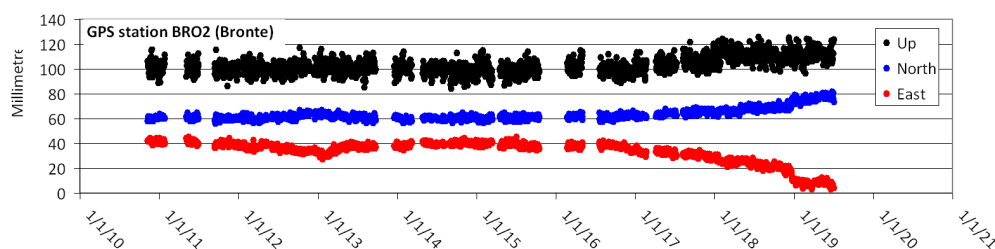


**Figure 1.** Looking at the GPS station BRO2, with Ugo Modica on the roof of the IISS Benedetto Radice, october 2019

The GPS data are transmitted in real time and processed routinely at the INGV-OE in Catania. The coordinate of BRO2, calculated with respect to the center of Sicily, supposed stable, is stable between 2011 and 2016.

Then since late 2016 a movement of the station is recorded. This movement is towards the West-North-West and its amplitude is approximately four centimeters in four years. There is an acceleration of the movement during the eruption of December 2018. The vertical component shows that the altitude of the station is slightly increasing, one centimeter in four years. This movement away from the volcano and with a component of uplift indicates that the volcano is inflating since late 2016.

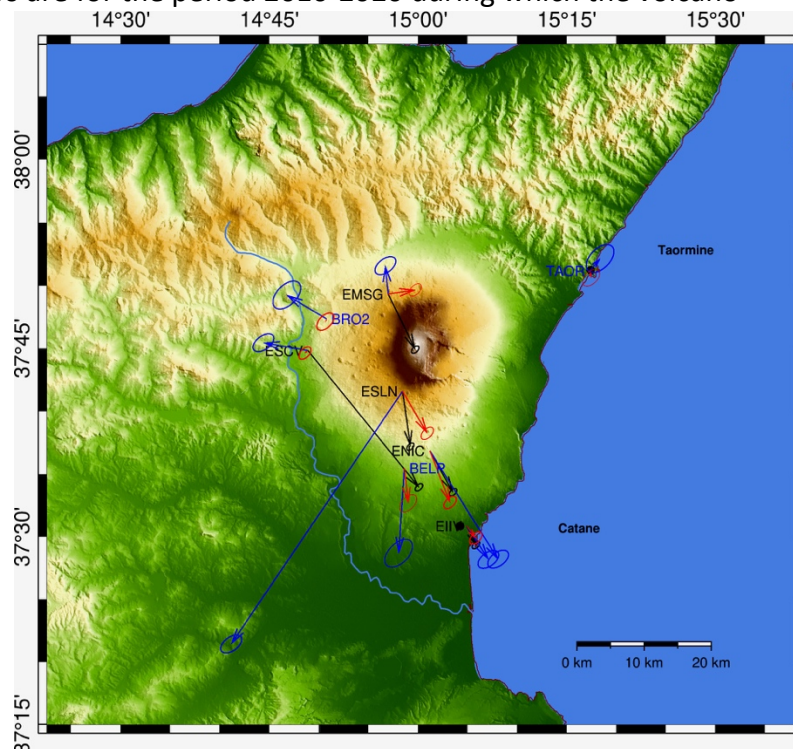
All GPS stations around Etna show the same phenomenon of inflation (Fig. 3). The reason of the inflation is the arrival of new magma at some depth beneath the volcano. This new magma accumulates, increases the pressure inside the edifice and produces the deformation that is observed by GPS. One day the pressure will become so elevated that the volcano will erupt and the pressure will decrease. The displacements that are observed by the GPS stations are very small (a few centimeters) but they are very well measured because the accuracy of our measurements is close to one millimeters. Those accurate measurements of displacements can be used to estimate the volume of magma that has entered the volcano and the depth of the magma chamber beneath the volcano. A preliminary calculation tells that the volume needed to produce those displacements is around 30 millions of cubic meters at a depth of around 10 kilometers.



**Figure 2.** Displacement with respect to the interior of Sicily of the station BRO2 since 2010.

The stations located on the east flank of Etna show that there is an additional phenomenon: the slow sliding of the entire east part of the volcano. This is because not all the new magma is emitted during each eruption. A fraction of the new magma (10 to 15 percent) remains and consolidates inside the volcano. Therefore, on the long term, the mountain cannot remain undeformed, it must deform to accommodate the presence of this material that does not erupts but remains at shallow depth inside the mountain. In the case of Etna this deformation occurs to the east, and it involved numerous shallow fault along with the material is sliding like in a giant landslide. During eruptions and after earthquakes, additional GPS measurements are performed at additional points, that are not permanent but observed periodically. This allows to have observations dense enough to be able to characterize properly the deformations and interpret them.

**Figure 3.** Displacement of GPS points around Etna from 2010 to 2020. The blue vectors are for the period 2016-2020 during which the volcano



**Figure4.** GPS measurement at a campaign point near Grotta dei Lamponi in July 2019.

## Pierre Briole

Research Director at  
Centre National de la Recherche Scientifique,  
Ecole Normale Supérieure, Paris, France

&

associated scientist to  
Istituto Internazionale di Geofisica e  
Vulcanologia, Osservatorio Etneo, Catania,  
Italy



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Pierre Briole received the M.Sc. degree in electronics, electrical engineering and automatics from the University Paris Sud in 1982, the Agrégation of Physics, option Applied Physics, in 1983, the Ph.D. degree in geophysics from the University Paris VI in 1990, the Habilitation à Diriger des Recherches from the University Paris VII in 2000.

After spending the years 1985 and 1986 in Catania, Italy with the International Institute of Volcanology, he joined the Institut de Physique du Globe in Paris where he developed applications of GPS and SAR interferometry to volcanoes and seismic faults monitoring and the geophysical modeling of ground deformations.

In 2007 he joined the Laboratory of Geology of Ecole Normale Supérieure (<http://www.geologie.ens.fr/>).

His list of scientific publications is available at :

<https://publons.com/researcher/2142345/pierre-briole/>

In the recent years he has been one of the organizers of the Insegnacietna array (<http://ietna.eu>) and the CRL School array (<https://info.crlab.eu/crl-school>) both aimed to promote geophysical education in the field and the interaction between university scientists and students and school teachers.

Dr. Briole is a member of the French Bureau des Longitudes (<https://site.bdlg.fr/>) and the current president of the Comité National Français de Géodésie et Géophysique (<http://cnfgg.fr>).



## Earthquakes in the classroom: “The SEISMO-BOX: do it yourself”

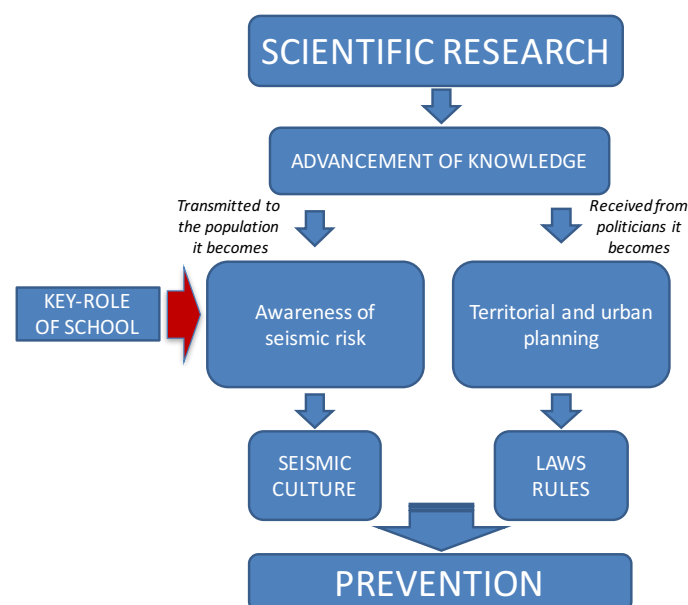
**Francesca Cifelli**  
**Università degli Studi Roma TRE, Italy**

Several geological processes remain abstract phenomena, difficult to visualize and therefore to understand. Often, traditional instruction methods are not enough to allow students to construct coherent explanations about the natural phenomena, nor to reduce students' misconceptions.

For this reason, laboratory approach helps in visualizing natural processes.

The Seismo-box project was intended as an educational kit that combines knowledge and know-how, with three main objectives 1) to stimulate the students, intended as future citizens, to the knowledge of earthquake as a natural phenomenon, and in particular to the awareness of the consequences that an earthquake may have in relation to the sub-surface geology and the type and quality of buildings in the areas most affected by earthquakes; 2) to stimulate students to practical laboratory activities, also through the creation of experimental devices; 3) to promote in students the acquisition of methodological/didactic skills in the field of dissemination of scientific culture.

This educational kit highlights the key-role of school in forming students as conscious and responsible citizen. The scientific research on earthquake in many seismic countries is very high in quality and lead to important advancement of knowledge about the seismicity in our country. If this knowledge is transmitted to population (starting from young students!) it will become awareness of seismic risk and seismic culture. If the same knowledge is effectively transmitted to politicians and stake holders it will become territorial and urban planning, laws and rules. Where these two aspects run together it is possible to talk about prevention, because all the citizens are aware about the territory where they live and they be part of it, respecting rules and becoming active citizens (Fig. 1).



*Fig. 1 Modified from Ciaccio and Cultrera 'Terremoto e rischio sismico' (Ediesse Ed.)*

## Francesca Cifelli

Associate Professor  
Dipartimento di Scienze  
Università degli Studi di Roma TRE  
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### Education

November 1999-October 2003	PhD position
March 1997	Master's degree in Geology

### Career

Since February 2015	Associate Professor in Structural geology at the University of Roma TRE
March 2011-January 2015	Non permanent researcher in Structural Geology
November 2003-February 2007	Post-doc position

### Research interests

- Paleomagnetic rotations and structural evolution of curved mountain chains
- Extension and dynamics of back-arc spreading in Mediterranean region
- Recent tectonics in Central Iran
- Neogene tectonic evolution of the Central Anatolian Plateau
- Seismic effects in urban areas
- Outreach activities

### Publications and services

Author or co-author of 50 peer reviewed scientific papers in international and national journals.  
Participant at several national and international congresses (80 abstracts)  
Reviewer of several international scientific journals on structural geology, magnetic fabric, paleomagnetism and tectonic topics.  
Participant at several research projects (EU, National, and International).  
Member of Educational Committee of Education (CoE) of the European Geosciences Union (EGU) for the organization of the GIFT (Geophysical Information for Teachers) workshop.

## Database for a better understanding of the geological Mediterranean context

**Diane Carrer (EduMed-Obs, Valbonne International School, France)**

In this virtual workshop, I will take you to discover the Mediterranean seismicity, recorded thanks to the sensors of the EDUMED network.

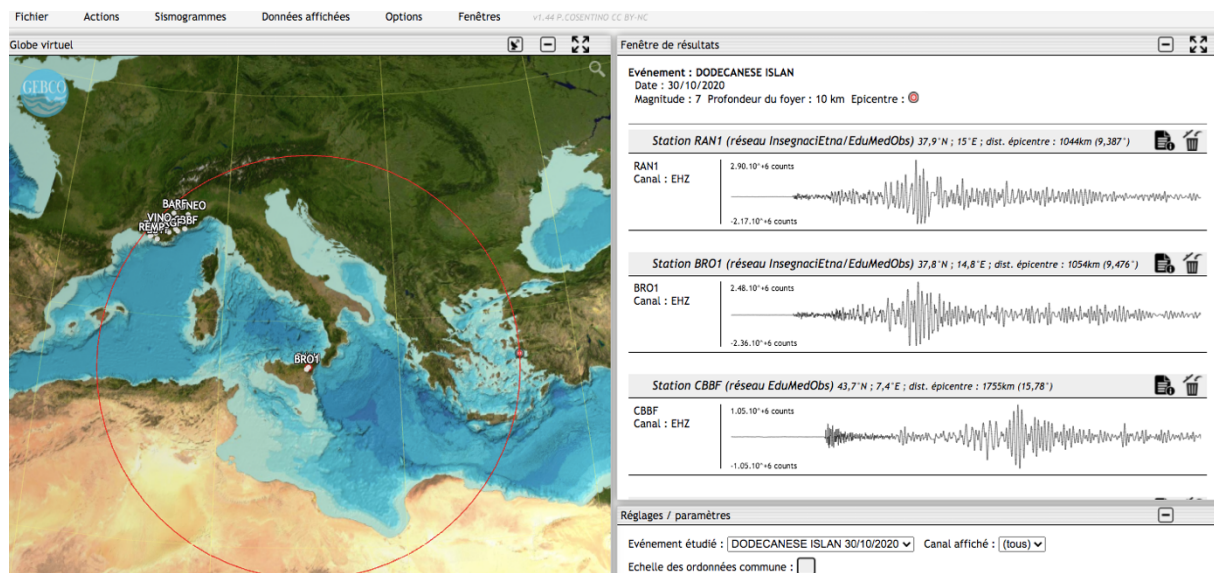
We will use sensors installed in Sicily (INSEGNACI ETNA network), but also sensors installed in schools and research stations in Italy, France, Greece, Spain...

We will be working on a recent earthquake that occurred last October in the Greek islands of the Dodecanese, which was recorded far beyond the Mediterranean ... and as far as French Polynesia !

With the TectoGlob 3D software that opens from EDUMED, we will do seismology to better understand the Mediterranean geological context.

We will study the Etna volcano and subduction using seismic data.

Get ready for a sounding and listening of the Mediterranean, with Edumed and Tectoglob3D



Tectoglob3D and seismograms from EduMed database

## Database per una migliore comprensione del contesto geologico mediterraneo

In questo workshop virtuale, vi porto alla scoperta della sismicità mediterranea, registrata grazie ai sensori della rete EDUMED.

Utilizzeremo sensori installati in Sicilia (rete INSEGNACI ETNA), ma anche sensori installati in scuole e stazioni di ricerca in Italia, Francia, Grecia, Spagna...

Lavoreremo su un recente terremoto che é avvenuto lo scorso ottobre nelle isole greche del Dodecaneso, che si è registrato ben oltre il Mediterraneo... e fino alla Polinesia francese!

Con il software TectoGlob 3D che si apre da EDUMED, faremo sismologia per capire meglio il contesto geologico mediterraneo.

Studieremo il vulcano Etna, e la subduzione utilizzando dati sismici.

Preparatevi all'ascolto del mar Mediterraneo, con Edumed e Tectoglob3D!

## Diane Carrer

Earth Science and Life Science Teacher  
International High School , Valbonne, Académie de Nice France

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### EDUCATION

Teacher at the Henri Matisse High School, and International High School in Valbonne. Responsible for various classes: 9th grades, 10th grades, 11th grades, 12th grades , Courses in pedagogy and didactics.

Toulouse Tech Engineering school «Institut National Polytechnique” ENSEEIHT-ENSIACET-ENSAT. Third year of engineering school and Master’s degree in Environmental Sciences, Hydrology, Hydrochemistry.

Lincoln University, New Zealand: Water and Soil Sciences, Environmental Sciences, Hydrology, depollution techniques.

Engineering School in Toulouse « Ecole Nationale Supérieure Agronomique de Toulouse »

### CAREER

Engineer responsible for the set-up of the Environmental Management System , to pass the standard ISO 14 001 (in a Motorways company). Environmental Impact Statement (EIS) and risk assessment on water pollution, air pollution, and soil pollution.

Disposal and recycling of clinkers from household waste incineration. Study on an industrial process. Project management, work on sizing of the Eddy current separators, Optimization, Research and Development.

Internship in a research laboratory on plant physiology. Study of various strategies and mechanisms involved in plant defense against the herbivorous, and Darwinian evolution study.

### RESEARCH INTERESTS

Educational programs on Seismology, geology at school, hydrology, astronomy, outreach in geology and biology.

### PUBLICATIONS AND SERVICES

Participation to the EGU GIFT 2015 (focused on mineral resources) and presenting a poster intitled “ **Adopt a Mermaid” participative science and seismology at school**, and EGU 2018 presenting a hands-on activity focused on meteorites and craters impacts.

Participation to several educational workshops focused on seismology, **InSIGHT** and **SEIS** with NASA, CNES, IPGP, Geoazur lab, and French National Education representatives to elaborate an educational program sharing data with schools all around the world.

Participation to **Insegnaci Etna**, Catania, Sicily, presenting Seismo Box and hands on activities on seismology at school.

Part of the Organization Committee for **IESO International Earth Sciences Olympiads**, in Sophia Antipolis, August 2017, with Jean-Luc Berenguer’s team.



## Using hydrogeological data at school

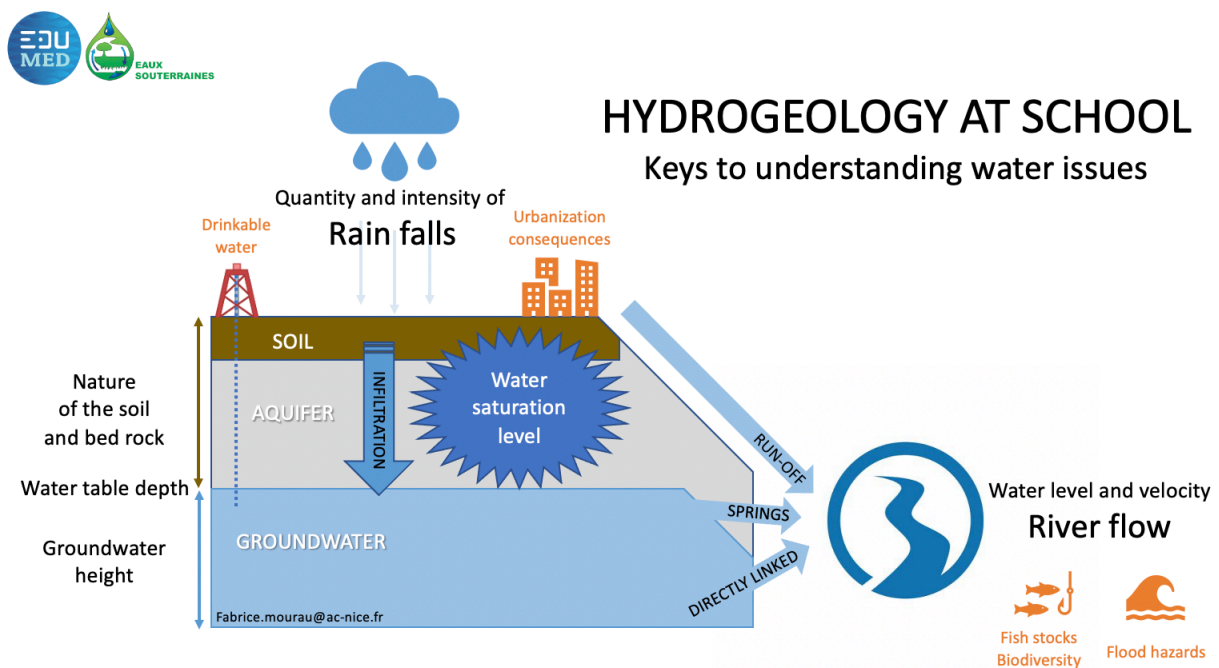
**Fabrice Mourau (EduMed-Obs, Collège P. Coubertin, Le Luc)**  
**Giuseppe Patti (Liceo Archimede, Acireale)**

Water-related issues have occupied an important place in the lives of the inhabitants of the Mediterranean basin since antiquity. The combined effects of urbanization and climate change are profoundly modifying the conditions of access to drinking water and the risk of flooding in connection with intense rainfall events.

By linking the flow of rivers and the depth of the water tables to meteorological phenomena, Hydrogeology provides students with essential keys to understanding the water cycle and its societal consequences.

By some concrete examples, we will present how secondary school pupils approach these notions by the implementation of field instruments and the use of the EduMed website.

Accompanied by analogue or digital models, the analysis of the collected data facilitates a scientific teaching of hydrological phenomena. It provides learners with a constructed vision of the parameters that explain the dynamics of the water mass and a citizen's insight into public policies for resource management and risk prevention.



## Fabrice Mourau

Science teacher

Middle school : Collège Pierre de Coubertin (Le Luc, France)  
& EDUMED Observatory (University Côte d'Azur)

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### EDUCATION

1999 Maîtrise de biologie des populations et des écosystèmes / UJF-Grenoble (France)

1998 Maîtrise de biologie cellulaire et physiologie, mention biologie générale/ UJF-Grenoble (France)

### CAREER

2001 : Science teacher, collège de Jarrie (Isère, France)

2002-2020 : Science teacher (Geology and Biologie), collège Pierre de Coubertin (Le Luc, France)

### RESEARCH INTERESTS

- Teaching Earth sciences, in particular in the fields of: karst hydrogeology & seismology
- Developing innovative educational methods using IT and field work
- As school coordinator, I was involved in two ERASMUS+ projects. One of them, called *Let stones speak: rocking around our European heritage*, allowed me to create a school network dedicated to groundwater education ([www.eauxsouterraines.eu](http://www.eauxsouterraines.eu)).
- We write Scientific papers dedicated to geologists (*Studying the hydrogeological functioning of karst in Mediterranean climatic environment as support for an educational project*, Arfib and Mourau, *Karstologia* 2016), cavers (*Groundwaters, an educational network dedicated to karst study*, Arfib, Mourau et al., *Spelunca* 2017) or teachers (*Gauging the flow rate of a river by diluting sodium chloride: pedagogical use in secondary education*, Mourau and Arfib, *HAL* 2019).
- Today, this network links 15 second degree schools (middle and high schools in France). We create links between teachers, karstologists (universities of Marseille and Nice) and the French caving federation. Datas recorded underground are shared with a large education community through the EDUMED observatory website ([edumed.unice.fr](http://edumed.unice.fr)).

### PUBLICATIONS AND SERVICES

Studying the hydrogeological functioning of karst in Mediterranean climatic environment as support for an educational project (Régaie de Néoules cave, Var, SE France); Arfib B. et Mourau F.; *Karstologia* n°66, 2015.

Eaux souterraines, un dispositif éducatif autour du karst, Arfib B., Mourau F. Lamarque T. et Laty L. ; *Spelunca* n°145, 2017

Impact event ; Mourau F. et Guicheteau D. ; website [insight.oca.eu](http://insight.oca.eu)

## Practical labs on plate tectonics (also suitable for distance teaching)

**Giulia Realdon**

**University of Camerino - Geology Section, UNICAMearth group  
EGU (European Geosciences Union) Education Field Officer**

Keywords:

Plate tectonics, practical lab, EGU (European Geosciences Union), Earthlearningidea

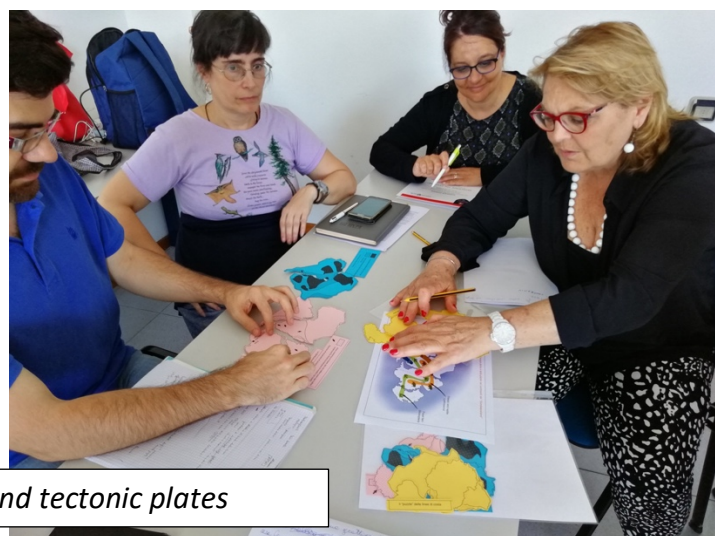
Despite being the pivotal theory in geosciences, plate tectonics can be a theoretical topic in teaching practice, due to the scale (both spatial and temporal) of the involved phenomena and to the distance from students' personal experience.

Moreover, the risk of a theoretical approach is worsened today by students' home confinement due to current COVID pandemic.

In this workshop I am presenting some practical activities from Earthlearningidea repository ([www.earthlearningidea.com](http://www.earthlearningidea.com)) that can easily adapted to distance teaching. In addition, the proposed constructivist approach, challenging students' preconceptions, leads them towards a conceptual change and towards the bridging of acquired knowledge.

The activities start from the "Geobattleships game", where students can play until they spot a pattern between earthquakes and volcanoes, resulting in the picture of plate margins. Subsequently, they can explore the matching continent evidence for plate tectonics by using "The continental jigsaw puzzle", where they seek patterns through a construction activity, bridging it to the present-day position of continents. An animation and a role-play activity on "Plate-surfing" help to summarize the presented experiences.

Finally, a short update about EGU teachers' professional development initiatives (GIFT workshops and Geoscience Field Officers Project) provides attendants with information about further training and networking opportunities.



*Around tectonic plates*

## Giulia REALDON

Teachers trainer

Science Education researcher

Non-formal science educator

Camerino University – UNICAMearth workgroup

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### Education & Career

PhD in Sciences and Technology – Earth Sciences (Earth Sciences Education) (2017)

MSc in Science Communication (2008)

BSc in Biological Sciences (1975)

EGU (European Geoscience Union) - Geoscience Education Field Officer for Italy (since 2019)  
EMSEA (European Marine Science Educators Association) – Board member (since 2020) and  
Coordinator for Italy (since 2015)

EuroCitizen Project - COST Action - Deputy Committee Member for Italy (since 2018)

European Schoolnet - Scientix Ambassador (since 2018)

Science on Stage Europe - National Steering Committee Member (since 2014)

High School teacher (1976-2013)

### Publications

Mokos M, Cheimonopoulou M, Kolouri P, Previati M, **Realdon G**, Santoro F, Mogias A, Boubonari T, Gazo M, Satta A, Ioakeimidis C, Tojeiro A, Chicote CA, Papathanassiou M, Kevrekidis T (2020) Mediterranean Sea Literacy: When ocean literacy becomes region specific. *Mediterranean Marine Science*, Vol. 21 (3). <https://doi.org/10.12681/mms.23400>

Correia G, **Realdon G**, Coupechoux G, Juan X, Baskar R, Burgeoini Y and King C (2020) Geoscience Education Field Officer international programme: The first year of activity (May 2019 – April 2020). *ASE International*, 10, 11-21 ISSN: 2515-110X

**Realdon G**, Mogias A, Fabris S, Candussio G, Paris E, Invernizzi MC (2019) Assessing Ocean Literacy in a sample of Italian primary and middle school students. *Rend. Online Soc. Geol. It.*, Vol. 49, 107-112. ISSN: 2035-8008

Mogias A, Boubonari T, **Realdon G**, Previati M, Mokos M, Koulouri P and Cheimonopoulou MT (2019) Evaluating Ocean Literacy of Elementary School Students: Preliminary Results of a Cross-Cultural Study in the Mediterranean Region. *Front. Mar. Sci.* 6:396  
<https://doi.org/10.3389/fmars.2019.00396>

**Realdon G.**, Paris E., Invernizzi M.C. & Zulini L. (2018) Learning of Geological Time in a Sample of 9th Grade Italian Liceo Students. *Rend. Online Soc. Geol. It.*, Vol. 45, 59-67. ISSN: 2035-8008

**Realdon G.**, Paris E., Invernizzi M.C. (2016) Teaching Earth Sciences in Italian Liceo High School following the 2010 reform: a survey. *Rend. Online Soc. Geol. It.*, Vol. 40, 71-79. ISSN: 2035-8008



## Groundwater : Learn to preserve the European underground environment

**Fabrice Mourau (Collège Pierre de Coubertin, Le Luc, France & EduMed Obs)**  
**Giuseppe Patti (High-school "Liceo Archimede", Acireale (Italy))**

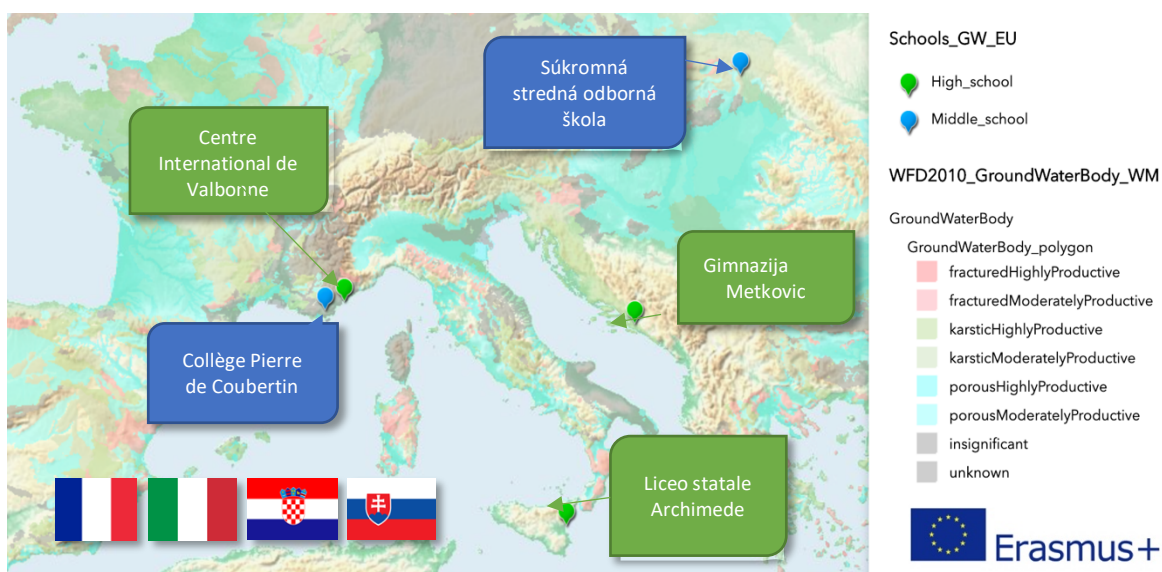
The "Insegnaci Etna" network gathers every year a community of teachers and researchers from all over Europe and the ERASMUS+ project "Groundwater: learn to preserve the European underground environment" was born from these meetings.

It brings together 5 European schools: the "liceo statale Archimede" in Acireale, the "Súkromná stredná odborná škola" of Gíraltove in Slovakia, the "Gimnazija Metkovic" in Croatia, the "collège Pierre de Coubertin" and the "Centre International de Valbonne" in France (Figure 1).

Associated with the "EduMed Observatory" and "Insegnaci Etna" networks, the teachers and students of these schools will work for 2 years on the project. They will focus on the resilience of the underground world to human action in terms of living environment and water tank. The underground environment is home to a little-known and fragile life. Underground living beings are directly dependent on the biological and climatic conditions on the surface. They constitute a reservoir of biodiversity that must be preserved because it participates in the planetary balance, thus directly affecting human health or the economy.

The underground environment is an irreplaceable reservoir of drinking water for the population. The size and rate of renewal of this mass of water depends on surface climatic conditions.

Based on data recorded in the different project countries, we will propose tutorial case studies that illustrate the phenomena at the interfaces between atmosphere, lithosphere and hydrosphere and explain the circulation of groundwater. We will also show how these dynamics, subject to climate change, will evolve in terms of resource depletion and increased flood risk.



**Figure 1:** Map showing the schools of the project "Groundwater: learn to preserve the European underground environment" associated with the nature of European aquifers. Interactive document available online :

<https://edumedobs.maps.arcgis.com/apps/webappviewer/index.html?id=7a92112ce0643a7b172e5de7468ec20>

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### EDUCATION

1988 - Laurea in Scienze Geologiche

### CAREER

Dal 1990 : Docente Geografia e di Scienze della Terra, Chimica e Biologia presso Istituti superiori. Attualmente presso il Liceo Scientifico "Archimede" di Acireale (CT), Sicilia, Italia.

Docenza: "Cartografia tematica e fotointerpretazione" nell'ambito del Master in "Procedure di Valutazione d'Impatto Ambientale"

Attività libera professione

Dal 1988: Professione Geologo, 1994 - Società di Botanica Italiana - Ministero dell'Ambiente – CEE - Rilevatore censimento e cartografia "Progetto di ricerca sugli habitats prioritari presenti in Sicilia" 1996 - Dipartimento di Biologia Animale dell'Università di Catania - Censimento dei Siti di Importanza Comunitaria (SIC) della Regione Siciliana, nell'ambito del Progetto BioItaly.

2003 – 2004 - Ente Parco dell'Etna - Consulenza per la realizzazione del progetto:  
"Potenziamento ed introduzione dati nel sistema informativo territoriale del Parco dell'Etna, con funzione di osservatorio locale sull'ambiente".

### RESEARCH INTERESTS AND SERVICES

1982 – 1989 - Istituto Internazionale di Vulcanologia di Catania - Ricerca rilevamento e raccolta dati macrosismici e vulcanologici nell'area etnea  
1983 – 2002 -. Realizzazione: "Carta degli ambienti naturali dell'Etna", Gruppo di lavoro progetto P. O. P. Sicilia "Inquinamento ed erosione del suolo: indagine sperimentale su valutazione e controllo dell'erosione".

2000 - Carta della Vegetazione dell'Etna" scala 1 : 50.000. Università di Catania - Ente Parco dell'Etna

### AWARDS AND HONORS

ASUform - Università di Catania e la Rete delle Istituzioni scolastiche della Provincia di Catania  
- Componente gruppo di lavoro materie Scientifiche