



# CRL School 2021

**Corinth Rift Observatory**



**1-3 October 2021**

*via Webex teleconference Platform*

# Welcome!!!

Dear **teachers and students**, welcome to the 2021 edition of the CRL School!

As you know, the general objective of the School is to unite Master and PhD students from Greek and foreign Universities that collaborate in the framework of the Corinth Rift Observatory (<http://crlab.eu>), together with high school European teachers. The goal is to introduce them to different geophysical and geological methods and observations, as well as to first-hand scientific knowledge.

Unfortunately, due to the restrictions imposed by the Covid-19 Pandemic, the CRL School 2021 will be held via the teleconference platform Webex. One of the main characteristics of the CRL School is the educational field component, performed in the natural area of the Corinth Rift. Since this is not the case for this year, the CRL School 2021 is not considered as a 'normal' one and no certificates of attendance will be provided to the students. A certification of attendance of the online 'version' of the School will be given only to the secondary level teachers, to facilitate their admission from their supervisors. Moreover, the number of the participant is not limited and all the participants of 2021 may apply for the next CRL Schools, which will hopefully be held on site.

At the School, scientific issues of various Earth Sciences disciplines, including seismology, geodesy, geology and geophysics will be examined from a theoretical point of view, as well as from the point of view of their applications in the research studies and results at the Corinth Rift.

This rift is one of the most seismically active regions of Europe, where movements are so rapid that it has been defined as "a natural geodynamical laboratory". The knowledge acquired there is applicable to other seismically active regions worldwide and, thus, has a broad scientific signification.

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.

The Scientific Committee has been one of the actors in preparing this School, but other persons and/or Institutions have contributed to it. We would like to acknowledge all the lecturers and Mrs. Annita Panteleli who assisted the organization of the School.

We would like to continue to offer to students and teachers the opportunity to participate to the CRL School in future years. Of course, this depends upon us being able to show our sponsors that the School has been useful to students and teachers in their studies and 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 (for students and for teachers) as soon as possible.**

We also encourage you to write reports for the School in publications specifically intended for geosciences, science and geography teachers.

For now, please enjoy your CRL School 2021.

And please tell your colleagues at school, fellow students and friends about it and encourage them to come to future editions of the School!

***The Scientific Committee of the CRL School***

# Scientific Committee

## CHAIR

### **Panagiotis Elias**

Associate Researcher  
National Observatory,  
Athens, Greece  
pelias@noa.gr



## MEMBERS

### **George Kaviris**

Associate Professor  
National & Kapodistrian University of Athens  
Faculty of Geology and  
Geoenvironment, Department of Geophysics  
and Geothermics  
gkaviris@geol.uoa.gr



### **Fotios Danaskos**

Geologist, School Teacher  
8th Junior - Senior High School  
in Chalandri, HELLAS  
fdanas@yahoo.gr



# Corinth Rift Laboratory School – 2021

via Webex teleconference Platform

(October 1-3, 2021)

## *Program*

### Friday October 1st, 2021

(Time in EET, UTC+2)

- 10:00 – 10:15**    **Welcome to the CRL School 2021**  
Panagiotis Elias, National Observatory, Athens, Greece  
*[CV: page 10]*
- 10:15 – 10:30**    **Why CRL?**  
Pascal Bernard, Institut de Physique du Globe de Paris, Paris, France  
*[CV: page 11]*
- 10:30 – 10:45**    **Understanding the physics of earthquakes from the smallest to the largest and the growth of faults in the western gulf of Corinth**  
Athanasios Ganas, National Observatory, Athens, Greece  
*[CV: page 12, Abstract page 40]*
- 10:45 – 11:00**    **The geodetic monitoring of the Corinth Rift Observatory with GPS and SAR interferometry**  
Panagiotis Elias, National Observatory, Athens, Greece  
*[CV: page 10, Abstract page 41]*
- 11:00 – 11:15**    **Break**
- 11:15 – 11:30**    **The Corinth Rift through the use of marine remote sensing techniques**  
Maria Geraga, University of Patras, Greece  
*[CV: page 13, Abstract page 42]*
- 11:30 – 11:45**    **Age, origin and history of the rocks that can be found along the north coast of the Corinth Rift**  
Christian Beck, Savoie-Mont-Blanc University, France  
*[CV: page 14, Abstract page 43]*
- 11:45 – 12:00**    **CRL offshore tectonics and deformation**  
Aurélia Hubert-Ferrari, Université de Liège, Belgium  
*[CV: page 15]*
- 12:00 – 12:15**    **Lessons-learned from the two recent tsunamis in Greece: the May 2, 2020 south Crete, and October 30, 2020 Samos-Aegean tsunamis**  
N. Kaligeris, National Observatory, Athens, Greece  
*[CV: page 16, Abstract page 44]*

- 12:15 – 12:45    Break**
- 12:45 – 13:00    Large Earthquakes and Focal Mechanisms in the Gulf of Corinth**  
George Kaviris, National & Kapodistrian University, Athens, Greece  
*[CV: page 17, Abstract page 45]*
- 13:00 – 13:15    Seismic Parameters and Microseismicity in the Gulf of Corinth**  
E. Papadimitriou - V. Karakostas, Aristotle University of Thessaloniki, Greece  
*[CV: page 18 & 19, Abstract page 46]*
- 13:15 – 13:30    Tectonics, structural setting and tectono-sedimentary processes in the Corinth Rift**  
Haralambos Kranis, National & Kapodistrian University, Athens, Greece  
*[CV: page 20, Abstract page 47]*
- 13:30 – 13:45    Break**
- 13:45 – 14:45    Hands-on simple seismic software packages provided on-line in the CRL portal**  
George Kaviris & Ioannis Spingos, National & Kapodistrian University, Athens, Greece  
*[CV: page 17 & 21, Abstract page 48]*
- 14:45 – 15:00    Break**
- 15:00 – 15:30    Students' Presentations**

## Saturday October 2, 2021

(Time in EET, UTC+2)

- 10:00 – 10:15**     **Global Positioning System: from the planning of a monitoring network to the data analysis and the interpretation of the relative results**  
Antonio Avallone, Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy  
*[CV: page 22, Abstract page 49]*
- 10:15 – 10:30**     **Introduction to the Differential SAR Interferometry for measuring ground deformation**  
Panagiotis Elias, National Observatory, Athens, Greece  
*[CV: page 10, Abstract page 50]*
- 10:30 – 10:45**     **A Geospatial Intelligence Application Based on SAR Interferometry to Support Immediate Post-seismic Infrastructure Inspections: The Cases of Earthquakes in the Balkan Peninsula**  
Isaak Parcharidis, Harokopio University, Athens, Greece  
*[CV: page 23, Abstract page 51]*
- 10:45 – 11:00**     **Break**
- 11:00 – 11:15**     **GATHERS project – MSc and PhD training on monitoring and modelling the Earth's surface deformations and seismic risk**  
Maya Ilieva, Institute of Geodesy and Geoinformatics, Wroclaw University of Environmental and Life Sciences, Wroclaw, Poland  
*[CV: page 24, Abstract page 52]*
- 11:15 – 11:30**     **Geographical Information Systems (GIS) – Introduction to QGIS**  
Antonios Mouratidis & Georgia Karadimou, Aristotle University, Thessaloniki, Greece  
*[CV: page 25 & 26, Abstract page 53]*
- 11:30 – 11:45**     **Relative sea level changes in the Corinth Gulf during the late Holocene**  
Niki Evelpidou & Anna Karkani National & Kapodistrian University, Athens, Greece  
*[CV: page 27 & 28, Abstract page 54]*
- 11:45 – 12:00**     **Quantification of N. Peloponnese shoreline displacement using very high spatial resolution remote sensing data**  
Emmanuel Vassilakis, National and Kapodistrian University, Athens, Greece  
*[CV: page 29, Abstract page 55]*

**12:00 – 12:15    Break**

**12:15 – 12:30    Ground acceleration produced by earthquakes and their local amplifications depending on the properties of the underlying soils**  
Ioannis Kassaras, National and Kapodistrian University, Athens, Greece  
*[CV: page 30, Abstract page 56-57]*

**12:30 – 12:45    Physical mechanisms behind seismic site response - Some examples from Aegion**  
Olga Ktenidou, National Observatory, Athens, Greece  
*[CV: page 31, Abstract page 58]*

**12:45 – 13:00    Structural morphology and geometric control of the Rio-Antirrio bridge**  
Akis Panagis, GEFYRA, Greece  
*[CV: page 32, Abstract page 59]*

**13:00 – 13:15    The Geohazards Lab initiative**  
Michael Foumelis, Aristotle University of Thessaloniki, Greece  
*[CV: page 33, Abstract page 60]*

**13:15 – 13:30    Hosted Processing Services on Geohazard Exploitation Platform (GEP)**  
Michael Foumelis, Aristotle University of Thessaloniki, Greece  
*[CV: page 32, Abstract page 61]*

**13:30 – 13:45    Open Discussion**

**13:45 – 14:00    Break**

**14:00 – 14:30    Students' Presentations**

## Sunday October 3, 2021

(Time in EET, UTC+2)

- 10:00 – 10:30 Tuned in to the Earth : Using data online at school**  
Jean-Luc Berenguer, University Côte d’Azur, Valbonne, France  
*[CV: page 34, Abstract page 62]*
- 10:30 – 10:45 The European Space Education Resource Office (ESERO)**  
Antonios Mouratidis, Aristotle University, Thessaloniki, Greece  
*[CV: page 25, Abstract page 63]*
- 10:45 – 11:00 Study of the "breathing" of Etna volcano through GPS beacons and seismometers**  
Diane Carrer & Jean-Luc Bérenguer, International High School and Géoazur Education Lab, EDUMED, France; University Côte d’Azur, Valbonne, France  
*[CV: page 35 & 34, Abstract page 64]*
- 11:00 – 11:15 Break**
- 11:15 – 11:30 Incorporating the seismobox into school teaching**  
Kiki Makri, National Observatory, Athens, Greece  
*[CV: page 36, Abstract page 65]*
- 11:30 – 11:45 The earthquake suitcase**  
Vasiliki Kouskouna, National & Kapodistrian University, Athens, Greece  
*[CV: page 37, Abstract page 66]*
- 11:45 – 12:00 Diffusion of SEISMOBOX in Hellenic schools**  
Fotis Danaskos, 8th Junior - Senior High School in Chalandri  
*[CV: page 38, Abstract page 67-68]*
- 12:00 – 12:15 Break**
- 12:15 – 13:15 Teachers’ Presentations**
- 13:15 – 13:45 Overall discussion – Conclusions**

End of the CRL 2021 School



# Curricula Vitae



## **Panagiotis Elias**

Associate Researcher

National Observatory of Athens  
Institute for Astronomy, Astrophysics, Space  
Applications and Remote Sensing (IAASARS)

pelias@noa.gr

### **Education**

- 2013 PhD in the framework of co-tutelle agreement between the École Normale Supérieure (Département des Géosciences, France) and the University of Patras (Department of Physics, Greece), with title “Ground deformation observed in the western Corinth rift (Greece) by means of SAR interferometry”.
- 2007 MSc in Signal Processing for Telecommunications and Multimedia of the department of Informatics and Telecommunications of the University of Athens, Greece.
- 2003 Degree of Electronics Engineering of the Technological Educational Institute of Piraeus.

### **Career**

- 2021- Associate Researcher of IAASARS/NOA.
- 2005-2021 Scientific staff of IAASARS/NOA.
- 1998-2005 Research assistant of Institute for Space Applications and Remote Sensing (later IAASARS) of NOA.

### **Research interests**

I have participated in more than 40 research projects in the field of satellite geodesy and image/signal processing exploiting the synergy of active and passive earth observations satellites as well as GNSS and other in-situ measurements such as inclinometers, levelling and seismological data. My research interest is focused in the detection and measurement of ground deformation and infrastructure instability due to geophysical processes of manmade activities. Moreover I am contributing to the development of methodologies and to the modelling of the deformation sources considering the particular underlying geodynamic and geophysical background. I am author of 38 peer refereed publications in international journals, and more than 60 presentations in international conferences.

### **Selected publications and services**

1. G Kaviris, P Elias, V Kapetanidis, A Serpetsidaki... (2021) The Western Gulf of Corinth (Greece) 2020–2021 seismic crisis and cascading events: First results from the Corinth Rift Laboratory network. *The Seismic Record*, 1 (2), 85-95
2. P. Elias, I Spingos, G Kaviris, A Karavias, T Gatsios, V Sakkas and I . Parcharidis (2021). Combined Geodetic and Seismological Study of the December 2020 Mw= 4.6 Thiva (Central Greece) Shallow Earthquake. *Applied Sciences* 11 (13), 5947
3. Briole P., Ganas A., Elias P., Dimitrov D. (2021). The GPS velocity field of the Aegean. New observations, contribution of the earthquakes, crustal blocks model, *Geophysical Journal International*, 2021, ggab089, <https://doi.org/10.1093/gji/ggab089>
4. Roukounakis N., Elias P., Briole P., Katsanos D., Kioutsoukis I., Argiriou A., Retalis A. (2021). Tropospheric Correction of Sentinel-1 Synthetic Aperture Radar Interferograms Using a High-Resolution Weather Model Validated by GNSS Measurements. *Remote Sensing* 13 (12), 2258
5. Briole P., Ganas A., Elias P., Dimitrov D. (2021). The GPS velocity field of the Aegean. New observations, contribution of the earthquakes, crustal blocks model, *Geophysical Journal International*, 2021, ggab089, <https://doi.org/10.1093/gji/ggab089>

Co-responsible for the operation of 16 GNSS stations of the CRL observatory

### **Awards and honors**

Member of the ESA Living Planet Symposium Scientific Committee for the years 2010 and 2013.



**Pascal Bernard**

Research Director  
**Institut De Physique Du Globe de Paris**

## **Education**

1978 Ecole Normale Supérieure de St Cloud, Physique  
1979 Maîtrise de Physique, Univ. Paris 6.  
1981 Agrégation de Physique  
1983 PhD Thesis - Thèse de 3ème Cycle, Univ. Paris 6.  
1987 Doctorat d'Etat, Univ. Paris 6.

## **Career**

After three years as Assistant Professor at ENS, I joined the CNRS (Centre National pour la Recherche Scientifique) as research scientist in seismology. From 1979 to 1992, I was affected at IPGP (Institut de Physique du Globe de Paris). In 1992, I moved to Géoazur (CNRS/University of Nice Sophia Antipolis) where I was in charge of the regional seismic network in Provence Alpes Côte D'Azur region and developed the broad band seismological observation on land and more recently on sea floor in the frame of ESONET and EMSO programs.

## **Research Interests**

Working on seismic sources studies, I have participated to the characterisation of the Mediterranean large seismic events (in Algeria, Italy and Greece). I contributed to seismological studies in different countries (Colombia, Mongolia, Tanzania, Haiti, Ecuador...) to understand of relation between faults, large earthquakes and seismic crisis. Since late 1980's I am strongly involved in different projects in Greece on large earthquake, seismicity, seismogenesis and tectonics and since 2000 I contribute to the development of the Corinth Rift Laboratory recently integrated in EPOS as an European Near Fault Observatory.

More recently, I turned also my interest towards effects of strong ground motions produced by earthquakes: characterisation, site effects, site/structure interaction.

Since 15 years I am following "Sismo à l'Ecole", an initiative to bring seismology at schools and more recently EduMed (<http://edumed.unice.fr/fr>), a program to provide to teachers and undergraduate students with easy access to controlled data sets on meteorology, hydrology, oceanography and seismology across Mediterranean area for teaching applications.

I have published over 180 articles in international scientific journals.

I supervised 10 PhD students in seismology and different Masters of Science, mostly at the Université Côte d'Azur



## Athanassios Ganas

Research Director

Institute of Geodynamics, National Observatory of Athens

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### Education

He holds a BSc degree in Geology from the National-Kapodistrian University of Athens (1986), an MSc in Structural Geology from Carleton University, Ottawa (1990) and a PhD in Geological Remote Sensing from the University of Reading, UK (1997).

### Career

date	Position
2012-2020	Research Director NOA
2000-2011	Researcher NOA

### Research interests

Active Tectonics-Seismology and Remote Sensing / Geophysical Earth Observation including Fault Interaction, Tectonic Geomorphology and GNSS networks.

### Publications and services

Ganas, A., Elias, P., Briole, P., Cannavo, F., Valkaniotis, S., Tsironi, V., Partheniou, E.I. 2020. *Ground Deformation and Seismic Fault Model of the M6.4 Durrës (Albania) Nov. 26, 2019 Earthquake, Based on GNSS/INSAR Observations*. Geosciences, 10 (6), 210 <https://www.mdpi.com/2076-3263/10/6/210/htm>

Ganas A, Briole P, Bozionelos G, Barberopoulou A, Elias P, Tsironi V, Valkaniotis S, Moshou A, Mintourakis I, 2020. *The 25 October 2018 Mw= 6.7 Zakynthos earthquake (Ionian Sea, Greece): a low-angle fault model based on GNSS data, relocated seismicity, small tsunami and implications for the seismic hazard in the west Hellenic Arc*, Journal of Geodynamics doi: <https://doi.org/10.1016/j.jog.2020.101731>

Since May 2009 he serves as Member of the Greek National Committee for Seismic Hazard Assessment. On March 2010 he was elected Member of the Executive Board of the Geological Society of Greece (position held until currently). He is President of the Remote Sensing and Space Applications Committee <http://etde.space.noa.gr/> He is the Editor-in-Chief of BGSG <https://ejournals.epublishing.ekt.gr/index.php/geosociety> . During 2010-2017 he served as regular member at the Board of Directors of the EPPO (Earthquake Planning and Protection Organisation, Greece). Since 2010 he is involved with the Geodetic Data group of the EPOS project <https://epos-ip.org/>

### Awards and honors

In 2016 he received the best Geodesy paper of the Academy of Athens (with Kostas Chousianitis). In 2007 he won the Fulbright prize “Project Title: *Earthquake recurrence and seismic hazard forecast along the Cascadian and Hellenic subduction zones*”. In 2010 he was awarded the distinction «AGU Editors’ Citations for Excellence in Refereeing». In 2017 he was announced as “Outstanding Reviewer” for Tectonophysics. Member of the executive secretary of the Remote Sensing and Space Applications Committee of the Geological Society of Greece.



## **Maria Geraga**

Associate Professor

School of Natural Sciences, Department of Geology, University of Patras, Greece

mgeraga@upatras.gr

### **Education**

- 2000:** Phd in Oceanography, Department of Geology, University of Patras, Greece.  
**1993:** B. Sc. in Geology, University of Patras, Greece

### **Career**

- 2015-2016** **Permanent Assistant Professor**  
School of Natural Sciences, Department of Geology, University of Patras, Greece
- 2012-2015** **Under Appointed Assistant Professor**  
School of Natural Sciences, Department of Geology, University of Patras, Greece
- 2012-2006** **Lecturer**  
School of Natural Sciences, Department of Geology, University of Patras, Greece
- 2000-2006** **Under Appointed Professor**  
Department Fisheries & Aquaculture, Polytechnics (Higher Educational Technological Institute), Mesolonghi, Greece
- 1993-2000** **Research Associate**  
Laboratory Marine Geology, Department of Geology, University of Patras, Greece

### **Research interests**

Palaeoclimatology-Palaeoceanography, Marine Geoarchaeology, Marine Geology, Marine hazards and Marine natural and cultural heritage sites.

### **Publications and services**

45 papers in scientific journals of science citation index and peer reviewed International journals, 20 book chapters and Special Publications, over of 60 full-length papers in Proceedings of International and National Conferences and 60 abstracts. More than 1200 citations (Google scholar). Scientist in charge for several national and EU projects. Reviewer in journals of Science Citation Index and peer reviewed journals. Evaluator in national and international Science Foundations. Supervisor of undergraduate and postgraduate dissertations and Phd dissertations. Member of the Science Party of IODP Expedition 381 Corinth Rift.



## Christian Beck

Emeritus Professor

Earth Sciences Institute (*ISTerre*), Savoie-Mont-Blanc University, and Grenoble Universe Sciences Observatory (*OSUG*)

[beck@univ-smb.fr](mailto:beck@univ-smb.fr), [https://isterre.fr/spip.php?page=auteur&id\\_auteur=136&lang=fr](https://isterre.fr/spip.php?page=auteur&id_auteur=136&lang=fr)

### Career

- + Assistant Professor (University of Lille, 1978-1987)
- + Professor (Savoie-Mont-Blanc University, 1988 to 2013)
- + Advisor in Ministry of Research and Higher Education (*M.E.S.R.-D.G.E.S.I.P.*, 2010-2013)
- + Chair of ECOS South-American / French Scientific Cooperation Committee (2013-2019)

### Research Interests

C.B. focused his research on the **sedimentary recording of tectonic processes at different space and time scales**, for long term processes as well as for instantaneous events as earthquakes (based on field work, coring, high-resolution seismic imagery, and laboratory analyses). Since 1991, he is dedicating his work to **recent paleoseismic sedimentary archives** (lacustrine and marine) within integrated projects dedicated to major seismogenic active faults systems, developing sedimentological tools to characterize earthquakes and tsunamis imprints and provide long term archives for hazards estimation.

Main investigated areas are: south-eastern Caribbean Margin (Boconó-San Sebastian-El Pilar transform boundary and Lesser Antilles subduction), Sea of Marmara (North Anatolian Fault), Gulf of Corinth. C.B. participated to different International Oceanographic Surveys: **Ocean Drilling Project**, Leg 110 (Barbados Accretionary Complex) aboard R/V JOIDES RESOLUTION, Turkish/French MARMACORE and MARMARASCARPS projects. C.B.'s last cruise participations were dedicated to earthquakes and tsunami hazards assessment in Lesser Antilles forearc (GWADASEIS and CASEIS Cruises, 2009 and 2014). Beside, he designed and conducted lacustrine coring campaigns (Chile, French Alps, Venezuela, Albania). Within the frame of SISCOR Project (2011-2013) C.B. conducted two offshore surveys on the western Gulf of Corinth. He is presently achieving analyses of recent sediments cored during I.O.D.P. Expedition 381 (Gulf of Corinth).

### Selected Publications

- Beck, C., 2009. Late Quaternary lacustrine paleo-seismic archives in north-western Alps: Examples of earthquake-origin assessment of sedimentary disturbances. *Earth-Science Reviews*, 96:327–344.
- Beck, C, et al., 2007. Late Quaternary co-seismic sedimentation in the Sea of Marmara's deep basins. *Sedimentary Geology*, 199:65–89.
- Beck, C., 2012. Identification of deep subaqueous co-seismic scarps through specific coeval sedimentation in Lesser Antilles: implication for seismic hazard. *Natural Hazards and Earth System Sciences*, doi:10.5194/nhess-12-1-2012.
- Chapron, E., Beck, C., et al., 1999. 1822 earthquake-triggered homogenite in Lake Le Bourget (NW Alps). *Terra Nova*, 11:86-92.
- Campos, C., Beck, C., et al., 2013. Late Quaternary paleoseismic sedimentary archive from deep central Gulf of Corinth: time distribution of inferred earthquake-induced layers. *ANNALS OF GEOPHYSICS*, 56, 6, S0670:1-15; doi:10.4401/ag-6226.
- Beckers, A., Beck, C., et al., 2016. Sedimentary impacts of recent moderate earthquakes from the shelves to the basin floor in the western Gulf of Corinth. *Marine Geology*, 384:81–102, doi.org/10.1016/j.margeo.2016.10.018



## **Aurelia Hubert Ferrari**

Professor

Université de Liège, Department of Geography

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### **Career**

- 2009 – ... Professor , Université de Liège, Department of Geography
- 2009 – 2005 Researcher and Team leader, Royal Observatory of Belgium, Marie Curie Excellence Grant untitled "Seismic Cycle" funded by the European Commission
- 2009 – 2008 CNRS Researcher (Chargé de Recherche de première classe), Laboratoire de Géologie, Ecole Normale Supérieure de Paris
- 2005 – 2002 Postdoctoral fellow and lecturer, Institute of Geology, U. de Neuchâtel, Switzerland, FNS grant
- 2001 – 2000 Post-doctoral Research Associate, Department of Geosciences, Princeton University, National Science Foundation Grant
- 1998 – 2000 Post-doctoral Researcher, Department of Geosciences, Princeton University, Elf Inc. Post-doctoral fellow
- 1998 – 1994 PhD researcher, Institute of the Physics of the Globe of Paris (IPGP), Title PhD thesis: Seismotectonics of the North Anatolian Fault (Estimation of its Quaternary slip rate and of its total displacement, and modeling of its propagation and of stress coupling between earthquakes)
- 1998 – 1995 Instructor in Geology, University of Paris 7-Denis Diderot.
- 1994 – 1993 Master in Geophysics, Institut de Physique du Globe de Paris and University of Paris 7-Denis Diderot. Title MSc. Thesis: Modeling of the 1981 Corinth earthquake sequence
- 1991 – 1995 Fellow of Ecole Normale Supérieure de Paris

### **Research Interests**

The research of Aurélie Hubert-Ferrari focuses on understanding tectonics and its interplay with geomorphological and sedimentological processes at different scales. She is specialized in exploiting relevant geophysical, sedimentological and geomorphological data to retrieve a history of deformation and earthquake shaking occurrence. For example in the Gulf of Corinth (Greece), her researches exploited, high-resolution seismic-reflection profiles to characterize the deformation and sedimentary processes at the tip of this intracontinental rift. Most of her work focuses on Asia and Europe. Her recent achievements include (1) the characterization of deformation in different setting (extensional, translational and compressional) in the eastern Mediterranean and in the Tianshan (Western China), (2) obtaining paleoseismological records from different continental, lacustrine and marine setting. As a geographer, she has furthermore been involved in other research projects dealing with a range of topics like assessing the geomorphic impacts of agricultural land use through history (Antakya, Southwestern Turkey), geotechnical mapping (Antananariva, Madagascar) and geoarchaeology.





## **Nikos Kalligeris**

Principal Researcher

Institute of Geodynamics

National Observatory of Athens

[nkalligeris@noa.gr](mailto:nkalligeris@noa.gr)

### **Education**

He holds a BEng (2004) and an MSc (2005) in Civil Engineering from the University of Brighton (UK) and Imperial College (UK), respectively, an MSc (2010) in Environmental Engineering from the Technical University of Crete (Greece) and a PhD (2017) in Civil and Environmental Engineering from the University of Southern California (USA).

### **Career**

24/7/2019      Operational head of the Hellenic National Tsunami Warning Center

17/7/2019      Principal Researcher, Institute of Geodynamics, NOA, Greece

16/10/2018      Postdoctoral Researcher, Coastal Flood Lab, UCLA, USA

### **Research interests**

His primary research interests include nearshore hydrodynamics, coastal engineering, coastal flood modeling, tsunami hazard assessment, tsunami field surveys and experiments in fluid mechanics.

### **Publications and services**

His most recent publications are on tsunami-induced currents and eddies that form in the nearshore during tsunami events. The two publications in the *Journal of Fluid Mechanics* and *Ocean Modelling* are the result of an experimental and numerical investigation of wave-induced turbulent coherent structures (eddies with large length-to-depth ratio). His services include being the Tsunami National Contact, representing Greece in UNESCO and serving as a referee for multiple Geophysical and Coastal Engineering academic journals.

### **Awards and honors**

He received two fellowships and the Best PhD Dissertation award in Civil and Environmental Engineering during his PhD at the University of Southern California.





### **George Kaviris**

Associate Professor  
National and Kapodistrian University of Athens  
Faculty of Geology and Geoenvironment  
Department of Geophysics and Geothermics  
Email: [gkaviris@geol.uoa.gr](mailto:gkaviris@geol.uoa.gr)  
Tel: +30-210-7274841  
[http://dggs1.geol.uoa.gr/cv/en\\_kaviris.html](http://dggs1.geol.uoa.gr/cv/en_kaviris.html)

### **Education**

- 1994: Graduated from the Faculty of Physics, National and Kapodistrian University of Athens (NKUA)  
2003: PhD of Seismology, Department of Geophysics and Geothermics, Faculty of Geology and Geoenvironment, NKUA. Thesis subject: "Study of Seismic Source Properties of the Eastern Gulf of Corinth".

### **Career**

- 2021 – today: Associate Professor of "Seismology–Seismic Anisotropy", Sect. Geophysics and Geothermics, Department of Geology and Geoenvironment, NKUA.  
2016 – 2021: Assistant Professor of "Seismology – Seismic Anisotropy", Sect. Geophysics and Geothermics, Department of Geology and Geoenvironment, NKUA.  
2013 – 2016: Lecturer of "Seismology", Sect. Geophysics and Geothermics, Department of Geology and Geoenvironment, NKUA.  
2006 – 2013: Research Associate, Laboratory of Seismology, Sect. Geophysics and Geothermics, Department of Geology and Geoenvironment, NKUA.  
2004 – 2007: Post-Doc Researcher, Research Project "Pythagoras" entitled: «Identification of Anisotropic Media in Greece using body and surface waves».

### **Research interests**

My primary research interest is Seismic Anisotropy and Shear-wave Splitting of the upper crust and mantle. In addition, Seismotectonics, Seismic Hazard and Risk, Receiver Functions, Ambient Noise, Slip Distribution, Seismic Swarms and Earthquake Early Warning.

### **Publications and services**

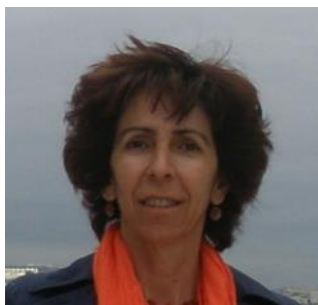
Supervisor of 16 MSc and 21 BSc students. I am currently supervising 2 PhD Theses.

I have 160 publications in international scientific journals and congress proceedings. Among my publications for the Gulf of Corinth:

1. G. KAVIRIS, P. Elias, V. Kapetanidis, A. Serpetsidaki, A. Karakostas, V. Plicka, L. De Barros, E. Sokos, I. Kassaras, V. Sakkas, I. Spingos, S. Lambotte, C. Duverger, O. Lengliné, Ch. Evangelidis, I. Fountoulakis, O.-J. Ktenidou, F. Gallovič, S. Bufférol, E. Klein, El M. Aissaoui, O. Scotti, H. Lyon-Caen, A. Rigo, P. Papadimitriou, N. Voulgaris, J. Zahradnik, A. Deschamps, P. Briole, P. Bernard, 2021. *The Seismic Record*, 1, doi.org/10.1785/0320210021.
2. G. KAVIRIS, I. Spingos, V. Kapetanidis, P. Papadimitriou, N. Voulgaris and K. Makropoulos, 2017. Upper crust seismic anisotropy study and temporal variations of shear-wave splitting parameters in the Western Gulf of Corinth (Greece) during 2013. *Phys. Earth Plan. Int.*, 269, 148-164, doi.org/10.1016/j.pepi.2017.06.006.
3. G. KAVIRIS, Ch. Millas, I. Spingos, V. Kapetanidis, I. Fountoulakis, P. Papadimitriou, N. Voulgaris and K. Makropoulos, 2018. Observations of shear-wave splitting parameters in the Western Gulf of Corinth focusing on the 2014 Mw=5.0 earthquake. *Phys. Earth Plan. Int.*, 282, 60-76. doi.org/10.1016/j.pepi.2018.07.005.

### **Awards and honors**

January 2017: Highly cited Research Award for the publication "Karst collapse susceptibility mapping considering peak ground acceleration in a rapidly growing urban area" in which I was a co-author. This publication was awarded being among the five (5) most cited works of the international journal "Engineering Geology" for the period January 2014 - June 2016. The award was given in recognition for the contribution of this work to the quality of the scientific journal "Engineering Geology". A certificate has been issued by Elsevier.



### **Papadimitriou Eleftheria**

Professor of Seismology  
Aristotle University of Thessaloniki  
School of Geology  
Geophysics Department  
e-mail: [ritsa@geo.auth.gr](mailto:ritsa@geo.auth.gr)

**Education:** B. Sc. In Geology – University of Thessaloniki, Greece (1981)  
Ph. D. Thesis in Seismology – University of Thessaloniki, Greece (1984)

**Former career:** Research Assistant of the Geophysics Department of the Aristotle University of Thessaloniki (1982–1985)  
Lecturer (1985–1990)  
Assistant Professor (1990–1994)  
Associate Professor (1994–2001)

### **Research activities**

1. Long-term earthquake prediction on the basis of seismicity and probabilistic models
2. Studies of seismic sequences
3. Seismotectonics
4. Fault plane solutions and stress patterns
5. Source parameters by synthetic seismograms
6. Time dependent seismicity by the application of the Time Predictable Model.
7. Fractal analysis of the global seismicity and the seismicity of Greece
8. Stress evolution by the use of Coulomb Failure Function changes
9. Statistical Seismology
10. Seismic hazard assessment

### **Publications and services**

Karakostas, V., Mirek, K., Mesimeri, M., Papadimitriou, E. & Mirek, J. The aftershock sequence of the 2008 Achaia, Greece, earthquake: joint analysis of seismicity relocation and persistent scatterers interferometry. *Pure & Applied Geophysics*, 174, 151–176, DOI 10.1007/s00024-016-1368-y, 2017.  
Mangira, O., Console, R., Papadimitriou, E. & Vasiliadis, G. A restricted Linked Stress Release Model (LSRM) for the Corinth gulf (Greece). *Tectonophysics*, 723, 162–171, 2018.  
Bountzlis, P., Papadimitriou, E. & Tsaklidis, G. Estimating the earthquake occurrence rates in Corinth Gulf (Greece) through Markovian arrival process modeling. *Journal of Applied Statistics*, 46(6), 995–1020, doi:10.1080/02664763.2018.1531977, 2019.

### **Supervision of young researchers**

Supervision of Master theses (completed): **14**  
Supervision of Ph D theses (completed): **6**  
Supervision of Master theses in progress: **1**  
Supervision of Ph D theses in progress: **3**  
Member of the advisory committee of Master theses: **12**  
Member of the advisory committee of Ph D theses: **8**  
Member of Examination Committees for Ph D theses: **14**  
Member of the advisory committee of Ph D theses in progress: **5**



### **Karakostas Vassilis**

Professor of Seismology  
Aristotle University of Thessaloniki  
School of Geology  
Geophysics Department  
e-mail: [vkarak@geo.auth.gr](mailto:vkarak@geo.auth.gr)

#### **Education:**

B. Sc. In Geology – University of Thessaloniki, Greece (1981)  
Ph. D. Thesis in Seismology – University of Thessaloniki, Greece (1988)

#### **Former career:**

Cooperating Researcher of the Geophysics Department of the Aristotle University of Thessaloniki (1988–1991)  
Seismologist of the Central Seismological Station of Thessaloniki of the same Department (1991–1999)  
Lecturer of Seismology (1999–2003)  
Assistant Professor of Seismology (2003–2009)  
Associate Professor of Seismology (2009–2014)

#### **Research activities**

1. Long-term earthquake prediction on the basis of seismicity and probabilistic models.
2. Studies of seismic sequences
3. Seismotectonics
4. Fault plane solutions and stress patterns
5. Tsunamis and tsunami hazard
6. Fractal analysis of the global seismicity and the seismicity of Greece
7. Stress evolution by the use of Coulomb Failure Function changes
8. Statistical Seismology
9. Seismic Hazard Assessment
10. Induced Seismicity

#### **Publications and services**

Karakostas, V., Mirek, K., Mesimeri, M., Papadimitriou, E. & Mirek, J. The aftershock sequence of the 2008 Achaia, Greece, earthquake: joint analysis of seismicity relocation and persistent scatterers interferometry. *Pure & Applied Geophysics*, 174, 151–176, DOI 10.1007/s00024-016-1368-y, 2017.

Mesimeri, M., Karakostas, V., Papadimitriou, E., Tsaklidis, G. & Jacobs, K., (2018). Relocation of recent seismicity and seismotectonic properties in the Gulf of Corinth (Greece), *Geophys. J. Int.*, 212, 1123-1142. doi: 10.1093/gji/ggx450.

Mesimeri, M. & Karakostas, V. Repeating earthquakes in western Corinth Gulf (Greece): implications for aseismic slip near locked faults. *Geophys. J. Int.*, 215, 659-676. doi: 10.1093/gji/ggx301, 2018.

#### **Supervision of young researchers**

1. Supervision of undergraduate theses: 46
2. Supervision of Master theses: 15
3. Supervision of Ph D theses: 1
4. Member of the advisory committee of Master theses: 11
5. Member of the advisory committee of Ph D theses: 8
6. Member of Examination Committees for Ph D theses: 14
7. Supervision of Ph D theses in progress: 2
8. Member of the advisory committee of Ph D theses in progress: 4



## **Haralambos Kranis**

Assistant Professor

National and Kapodistrian University of Athens

Department of Geology and Geoenvironment

Panepistimiopolis, 15784 Zographou, Greece

[hkranis@geol.uoa.gr](mailto:hkranis@geol.uoa.gr)

Secretary General, Geological Society of Greece

### **Education:**

Degree in Geology (NKUA), Post-graduate Diploma, in Seismology, (International Institute for Seismology and Earthquake Engineering), Ph.D. in Geological Sciences, (NKUA)

### **Career**

My scientific career mainly involves working for the Department of Geology and Geoenvironment, at the Sector of Dynamic, Tectonic and Applied Geology, while I have also served as Tectonics and Structural Geology expert for the General Secretariat for Civil Protection, collaborated with the Earthquake Research and Planning Organization (EPPO), and the Hellenic Centre for Marine Research (HCMR); and as a consultant for major infrastructure projects, such as gas and oil pipelines, and management of natural hazards.

### **Research Interests:**

My main research interests include, but are not limited to, Tectonics and Structural Geology (especially brittle deformation), Neotectonics, Active Tectonics and Earthquake Geology, Tectonic Geomorphology and Palaeoseismology. In the last decade, I am involved in research on the tectonic control on sedimentation and basin formation in actively evolving continental rifts and their inactive analogues. Extending my scope in field geology and geological mapping, I have adopted methods and techniques that involve spatial analysis of geological structures through Structure from Motion (SfM), 3D outcrop modelling of outcrops, digital field mapping and modelling of tectonically-controlled landscapes.

### **Publications and Services**

I have published over 40 articles in peer-reviewed scientific journals, several field guides and special reports, as well as geological and neotectonic maps at various scales.

### **Awards and Honors:**

Scholarship from the Government of Japan (Japan International Cooperation Agency)

Goldschmidt Lecturer, Geological Survey of Norway

## Ioannis Spingos



PhD Candidate in Seismology  
NKUA, Dpt of Geology & Geoenvironment,  
Section of Geophysics-Geothermics,  
Seismological Laboratory

ispingos@geol.uoa.gr

### Education

I completed the undergraduate programme of the Department of Geology & Geoenvironment at the National and Kapodistrian University of Athens to obtain my BSc and then continued in the postgraduate courses at the same department, to obtain my MSc in Seismology. Today, I am a PhD candidate in Seismology.

### Career

August 2018- today	Researcher in various nationally and EU- funded research projects at the National and Kapodistrian University of Athens, the Geodynamic Institute of the National Observatory of Athens, and the Hellenic Mediterranean University.
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### Research interests

My research focuses on shear-wave splitting in the upper crust and its properties as earthquake precursors. I have also worked on seismic hazard and earthquake early warning topics. I extensively code in Python, maintaining my own GitHub repositories.

### Publications and services

My published work includes 16 articles in international peer-reviewed journals and 29 publications in conferences, with over 100 citations, which focus on shear-wave splitting, seismotectonics and earthquake early warning. Selected publications:

- Kaviris, G., **Spingos, I.**, Kapetanidis, V., Papadimitriou, P., Voulgaris, N., Makropoulos, K., 2017. Upper crust seismic anisotropy study and temporal variations of shear-wave splitting parameters in the Western Gulf of Corinth (Greece) during 2013. *Phys. Earth Planet. Inter.* 269, 148–164. doi: 10.1016/j.pepi.2017.06.006
- Kaviris, G., Millas, C., **Spingos, I.**, Kapetanidis, V., Fountoulakis, I., Papadimitriou, P., Voulgaris, N., Makropoulos, K., 2018. Observations of shear-wave splitting parameters in the Western Gulf of Corinth focusing on the 2014 Mw = 5.0 earthquake. *Phys. Earth Planet. Inter.* 282, 60–76. doi: 10.1016/j.pepi.2018.07.005
- **Spingos, I.**, Kaviris, G., Millas, C., Papadimitriou, P., Voulgaris, N., 2020. Pytheas: An open-source software solution for local shear-wave splitting studies. *Comput. Geosci.* 134, 104346. doi: 10.1016/j.cageo.2019.104346



## Antonio Avallone

Researcher

Istituto Nazionale di Geofisica e Vulcanologia

antonio.avallone@ingv.it

### Education

In 19998, he obtained a Master Degree in Geological Sciences with specialization in geophysics at University of Naples “Federico II” (Italy). Title of the manuscript is “Study of the deformation in active tectonic and volcanic area through SAR interferometry: examples of the Colfiorito (central Italy) and Campi Flegrei (Naples) areas. In 2003, he defended his PhD Thesis in Geophysics at the Institut de Physique du Globe de Paris (France). Topic of the PhD was the “Analysis of ten years of deformation in the Corinth rift (Greece) by means of GPS and InSAR data and techniques”.

### Career

2004-present      He got a position of Researcher at the Istituto Nazionale di Geofisica e Vulcanologia (INGV) to study the strain accumulation along with the seismogenic faults and to contribute in developing a permanent GPS network in Italy.

### Research interests

His research interest is focused on the study of the ground deformation at different spatial and temporal scales, to determine and model the strain accumulation on the seismogenic faults and the ground motion associated with the earthquakes. He contributed to the creation and the development of a permanent real-time GNSS network (RING) in Italy and of the relative data, metadata and products infrastructure. He is recently working on earthquake source characteristics and real-time GPS analysis for early warning applications. This activity is performed at the euro-mediterranean level in the active deformation studies at the Eurasia-Africa plate boundary. He recently participated in the deployment of RING stations on the Hellenic Arc to study the long-term and short-term deformation associated with the subduction zone and to contribute to the tsunami early warning in the Ionian area.

### Publications and services

Cirella, A., F. Romano, **A. Avallone** *et al.* (2020), The 2018  $M_w$  6.8 Zakynthos (Ionian Sea, Greece) Earthquake: Seismic source and local tsunami characterization, *Geophys. J. Int.*, <https://doi.org/10.1093/gji/ggaa053>.

Cheloni, D., N. D’Agostino, L. Scognamiglio, E. Tinti, C. Bignami, **A. Avallone** *et al.* (2019), Heterogeneous Behavior of the Campotosto Normal Fault (Central Italy) Imaged by InSAR GPS and Strong-Motion Data: Insights from the 18 January 2017 Events, *Remote Sensing*, 11(12), 1482; <https://doi.org/10.3390/rs11121482>.

Twardzik, C., M. Vergnolle, A. Sladen and **A. Avallone** (2019), Unravelling the contribution of early postseismic deformation using sub-daily GNSS positioning. *Scientific Reports*, vol. 9, 1775, ISSN: 2045-2322, doi: <https://doi.org/10.1038/s41598-019-39038-z>

Ragon, T., A. Sladen, Q. Bletery, M. Vergnolle, O. Cavalié, **A. Avallone** *et al.* (2019), Joint Inversion of Coseismic and Early Postseismic Slip to Optimize the Information Content in Geodetic Data: Application to the 2009  $M_w$  6.3 L’Aquila Earthquake, Central Italy, *J. Geophys. Res – Solid Earth*, <https://doi.org/10.1029/2018JB017053>.

**Avallone A.** *et al.* (2017), Near Source High-Rate GPS, Strong Motion data and InSAR to Image the Rupture History of the 2015,  $M_w$  6.5, Lefkada, Greece, Earthquake, *Scientific Reports*, <https://doi.org/10.1038/s41598-017-10431-w>.

**RING website** <http://ring.gm.ingv.it>; **RING data repository** <ftp://gpsfree.gm.ingv.it>;





**Name: Issaak Parcharidis**

**Position: Professor**

**Institute and department: Harokopio University/Dep. of Geography**

**parchar@hua.gr**

**Education: Geologist**

### **Career**

- 2020 Member of "Permanent Scientific Committee for the Monitoring of the Greek Volcanic Arc"
- 2019 National expert for validation of Science for Disaster Risk Management 2020: Acting today, protecting tomorrow» published by Disaster Risk Management Knowledge Centre (DRMKC) of JRC (Joint Research Centre).
- 2004 Professor at Harokopio University/ Dep. of Geography
- 2001 Member of ACTIONTEAMN. 7 COMMITTEEON THE PEACEFUL USES OF OUTERSPACE (United Nations)
- 2000 Associate researcher at Geophysics Dep. /NKUA
- 2000 Scientific advisor at General Secretariat of Civil Protection
- 1999 Scientific advisor at Earthquake Planning and Protection Organization

### **Research interests**

Earth Observation applications using optical and radar data, Geoinformation in hazard assessment and management for risk disaster.

### **Publications and services**

Markogiannaki, O., Karavias, A., Bafi, D., Angelou D., Parcharidis I., (2020), A geospatial intelligence application to support post-disaster inspections based on local exposure information and on co-seismic DInSAR results: the case of the Durres (Albania) earthquake on November 26, Nat Hazards, 103, 3085–3100. <https://doi.org/10.1007/s11069-020-04120-7>

Karatza A., Galani L., Parcharidis I. (2020), Teaching Climate Change and Glaciers, Current Journal of Applied Science and Technology 39(15): 68-78, 2020; Article no.CJAST.57167.

Elias, P.; Benekos, G.; Perrou, T.; Parcharidis, I..(2020), Spatio-Temporal Assessment of Land Deformation as a Factor Contributing to Relative Sea Level Rise in Coastal Urban and Natural Protected Areas Using Multi-Source Earth Observation Data. *Remote Sens*, 12, 2296.

Gatsios T., Cigna F., Tapete D., Sakkas V., Pavlou K., Parcharidis I., (2020), Copernicus Sentinel-1MT-InSAR, GNSS and Seismic Monitoring of Deformation Patterns and Trends at the Methana Volcano, Greece. *Appl. Sci.*, 10, 6445; doi:10.3390/app10186445.

Kaitantzian A., Loupasakis C., Tzampoglou P., Parcharidis I.(2020) Ground Subsidence Triggered by the Overexploitation of Aquifers Affecting Urban Sites: The Case of Athens Coastal Zone along Faliro Bay (Greece), *Geofluids*, Article ID 8896907, <https://doi.org/10.1155/2020/8896907>

Chen F., Zhou W., Xu H., Parcharidis I., Lin H., Fang C., (2020) Space technology facilitates the preventive monitoring and preservation of the Great Wall of the Ming Dynasty: a comparative study of the Qingtongxia and Zhangjiakou sections in China, in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, doi: 10.1109/JSTARS.2020.3023297.

### **Projects (2020)**

Spaceborne SAR Interferometry as a noninvasive tool to assess the vulnerability over cultural heritage sites.(2019-2021) Bilateral project, Greece-China,GSRT (principal Investigator)

Space for Shore Phase, ESA/ITT (2019-2020)

"Telemachus" Innovative Operational Seismic Risk Management System in the Region of Ionian Islands, (2019-2021) PEP Ionian Nisss, Greece-EU, National Strategic Reference Framework (NSRF)

"Laertis", (2019-2021) PEP Ionian Nisss, Greece-EU, National Strategic Reference Framework (NSRF)



## **Maya Ilieva**

Research Scientist

Institute of Geodesy and Geoinformatics, Wrocław University of Environmental and Life Sciences (UPWr), Wrocław, Poland

maya.ilieva@upwr.edu.pl

### **Education**

PhD Geosciences (2011), University “Pierre and Marie Curie” – Paris 6, Paris, France, and National Institute of Geophysics, Geodesy and Geography (NIGGG), Sofia, Bulgaria

MSc Geodesy (2004), University of Architecture, Civil Engineering and Geodesy (UACEG), Sofia, Bulgaria

### **Career**

- |            |  |
|------------|--|
| 2017-today | Researcher, Institute of Geodesy and Geoinformatics, UPWr, Wrocław, Poland   |
| 2015-2020  | Guest-lecturer, Dept. of Mine surveying and Geodesy, University of Mining and geology "St. Ivan Rilski", Sofia, Bulgaria                     |
| 2011-2017  | Assist. Prof. (till 2014), Assoc. Prof. and Head of Dept. (from 2016), Dept. of Geodesy and Geoinformatics, Faculty of Geodesy, UACEG, Sofia |
| 2010-2020  | Engineer (till 2011) and Assist. Prof., Dept. of Geodesy in NIGGG, Sofia   |
| 2010-2011  | Research-engineer, National Center of Scientific Researches – France (CNRS) in Lab. of Geology, Ecole Normale Supérieure, Paris, France      |

### **Research interests**

Deformation monitoring by InSAR with application for seismicity, mining subsidence and landslides, modelling and data assimilation, geoinformatics

### **Publications and services**

- Foumelis, M., Papazachos, C., Papadimitriou, E., Karakostas, V., Ampatzidis, D., Moschopoulos, G., Kostoglou, A., Ilieva, M., Minos-Minopoulos, D., Mouratidis, A., Kkallas, C., Chatzipetros, A. (2021). On rapid multidisciplinary response aspects for Samos 2020 M7.0 earthquake. *Acta Geophys.* 69, 1025–1048  
<https://doi.org/10.1007/s11600-021-00578-6>
- Ilieva, M., Rudziński, Ł., Pawłuszek-Filipiak, K., Lizurek, G., Kudłacik, I., Tondaś, D., & Olszewska, D. (2020). Combined Study of a Significant Mine Collapse Based on Seismological and Geodetic Data—29 January 2019, Rudna Mine, Poland. *Remote Sensing*, 12(10), 1570, <https://doi.org/10.3390/rs12101570>
- Ilieva, M., Polanin, P., Borkowski, A., Gruchlik, P., Smolak, K., Kowalski, A., Rohm, W. (2019). Mining deformation life cycle in the light of InSAR and deformation models. *Remote Sensing*, 11(7), 745, <https://doi.org/10.3390/rs11070745>

Since 2020 Task Leader for EPOS-PL+ project (UPWr)

Since 2019 Project coordinator of H2020 CSA project GATHERS (UPWr)

### **Awards and honors**

2020: 1<sup>st</sup> degree individual award for scientific achievements given by the Rector of UPWr

2017: 2<sup>nd</sup> place Lecturer of the year for the Faculty of Geodesy, UACEG, given by students

2016: 1<sup>st</sup> place The most innovative methods of teaching in UACEG, given by students





## Antonios Mouratidis

Assistant Professor,  
Head of Remote Sensing and GIS Application Lab

Department of Physical and Environmental Geography  
Aristotle University of Thessaloniki, Greece

[amourati@geo.auth.gr](mailto:amourati@geo.auth.gr)

### Education

Antonios Mouratidis graduated from the Aristotle University of Thessaloniki, Greece, with a diploma in Rural and Surveying Engineer and a B.Sc. in Geology. His post-graduate studies included an M.Sc. diploma in Geography and Environment and a PhD in Remote Sensing - GPS - GIS, focused on land applications in the domain of Geomorphology.

### Career

**2019-to date** Assist. Prof., Aristotle University of Thessaloniki, Greece  
**2014-2018** Lecturer, Aristotle University of Thessaloniki, Greece  
**2015-2017** Assist. Prof. (visiting), Charles University in Prague, Czech Republic  
**2013-2015** Consultant, European Space Agency (ESA), Italy  
**2010-2013** Post-doctoral Research Fellow, European Space Agency (ESA), Italy  
**2007-2008** PhD student, Ecole Normale Supérieure de Paris, France  
**2005-2010** PhD student, Aristotle University of Thessaloniki, Greece

### Research interests

Applications of Geospatial Science and Technology to Geosciences and Education [Earth Observation/Remote Sensing, Digital Elevation Models (DEMs), Global Navigation Satellite Systems (GNSS), Geographical Information Systems (GIS)]

### Publications and services

1. Pennos, C., Lauritzen, S.-E., Vouvalidis, K., Cowie, P., Pechlivanidou, S., Gkarlaouni, C., Styllas, M., Tsourlos, P., and **Mouratidis, A.** (2019) From subsurface to surface: a multidisciplinary approach to decoding uplift histories in tectonically-active karst landscapes. *Earth Surf. Process. Landforms*, <https://doi.org/10.1002/esp.4605>.
2. **Mouratidis A.**, Ampatzidis D. (2019). European Digital Elevation Model Validation against Extensive Global Navigation Satellite Systems Data and Comparison with SRTM DEM and ASTER GDEM in Central Macedonia (Greece). *ISPRS Int. J. Geo-Inf.* 8, 108 DOI:10.3390/ijgi8030108.
3. Papageorgiou, E., Fomelis, M., Trasatti, E., Ventura, G., Raucoules, D., **Mouratidis, A.** (2019). Multi-Sensor SAR Geodetic Imaging and Modelling of Santorini Volcano Post-Unrest Response. *Remote Sens.*, 11 (3), 259. DOI: 10.3390/rs11030259

### Awards and honors

2011: Research grant for the project entitled "Contribution of earth observation data and geographical information systems to mapping and managing flood events in Greece", by the John S. Latsis Public Benefit Foundation  
 2011: Ranked first in the competition for a business proposal on GNSS, organized within the 2011 "ESA International Summer School on GNSS", Berchtesgaden, Germany  
 2008: Award Grant from the Research Committee of the Aristotle University of Thessaloniki, for the scientific achievements within the PhD studies  
 2006: Award Grant from the Research Committee of the Aristotle University of Thessaloniki, for the scientific achievements within the PhD studies  
 2004-2010: I.K.Y. (Greek State Scholarships Foundation), postgraduate scholarship, in the field of "Remote Sensing and Geographical Information Systems in Geosciences"



## Georgia Karadimou

PhD Student

Remote Sensing and GIS Application Lab  
Department of Physical and Environmental Geography  
Aristotle University of Thessaloniki, Greece

[gkaradimou@geo.auth.gr](mailto:gkaradimou@geo.auth.gr)

### Education

- 11/2020 - to date** **Ph.D Student**, School of Geology, Aristotle University of Thessaloniki, Greece, *“Study of Compound Geological Disasters in Greece with Earth Observation data and GIS”*
- 11/2013 - 11/2016** **M.Sc.** in “Geology and Geoenvironment” program with specialization in “Geography and Environment”, School of Geology, Aristotle University of Thessaloniki, Greece, *“Geomorphological and Environmental Changes of Ismarida Lake”*
- 9/2009 - 11/2013** **B.Sc.** in Geology, School of Geology, Aristotle University of Thessaloniki, Greece, *“Study of caves at the hill of Kastoria City”*

### Career

- 10/2018 - to date** **Earth Observation Specialist**, SERCO ITALIA SpA, RUS Copernicus Project (funded by the EC and managed by ESA), Frascati, Italy
- 10/2017 - 8/2018** **Scientific Assistant**, ETH Zürich, Department of Earth Sciences (D-ERDW), Engineering Geology Group, Zurich, Switzerland
- 2/2017 - 10/2017** **Earth Observation Intern**, ESA/ESRIN, Frascati, Italy - Research & Development Section, Data Applications Division, Science, Applications & Climate Department, (EOP-SDR), Directorate of Earth Observation Programmes
- 2014 - 2016** **Laboratory, Field and Teaching Assistant**, School of Geology, Aristotle University of Thessaloniki, Greece (Geography, Physical Geography, Sedimentology, Oceanography, Remote Sensing and GIS courses)
- 8/2012** **Geologist Intern**, Hail Protection Program Thessaloniki Airport “Makedonia”, Meteorological Applications Center

### Research interests

Geologist interested in applications of Remote Sensing to Geosciences, Geohazards and Education. Participation in Geomorphological, Sedimentological, Geophysical and Stratigraphic surveys, as well as in Speleological and Archaeological projects.

### Publications and services

- Koukousioura, O., Kouli, K., Vouvalidis, K., Aidona, E., **Karadimou, G.**, Syrides, G. *A multi-proxy approach for reconstructing environmental dynamics since the mid Holocene in Lake Ismarida (Thrace, N. Greece)* (2020) *Revue de Micropaleontologie*, 68, art. no. 100443. DOI: 10.1016/j.revmic.2020.100443
- Mouratidis, A., **Karadimou, G.**, Ampatzidis, D. *Extraction and Validation of Geomorphological Features from EU-DEM in the Vicinity of the Mygdonia Basin, Northern Greece* (2017) *IOP Conference Series: Earth and Environmental Science*, 95 (3), art. no. 032009. DOI: 10.1088/1755-1315/95/3/032009
- EO Researcher-Geologist and InSAR specialist for the SOILRISK Project**, funded by the European Space Agency, under the EYECON GROUP. A Landslide Early Warning System that provides comprehensive ground risk information, including landslide susceptibility, ground/building deformation, vegetation index, moisture & precipitation data

### Awards and honors

- 7/2012:** Participation in the 19<sup>th</sup> World Orienteering Championship in Lausanne, Switzerland, representing Greece



## **Dr. Niki Evelpidou**

Professor

Faculty of Geology and Geoenvironment, National and Kapodistrian University of Athens

Email address [evelpidou@geol.uoa.gr](mailto:evelpidou@geol.uoa.gr)

### **Education**

Dr. Dr. Niki Evelpidou holds a BSc degree in Geology from the National and Kapodistrian University of Athens, an MSc in “Geography and Environment” from the National and Kapodistrian University of Athens, a PhD on Geomorphology and GIS from the Faculty of Geology and Geoenvironment, National and Kapodistrian University of Athens, and a second PhD on Geoarchaeology from the University of Franche Comte.

### **Career**

2019-today	Professor, Faculty of Geology and Geoenvironment, National and Kapodistrian University of Athens
2014-2018	Associate Professor
2009-2014	Assistant Professor
2003-2009	Lecturer

### **Research interests**

geomorphology, sea level changes, palaeogeography, geoarchaeology, spatial technologies, study and modeling of natural hazards

### **Publications and services**

Her research numbers more than 300 publications in scientific conferences and journals and 28 books and educational textbooks.

She is actively involved in academic, research and educational activities, as she has organized more than 30 educational seminars and training schools while she has participated in the organization of 37 national conferences and workshops, of national and international interest.

#### *Recent indicative publications:*

Evelpidou N., Karkani A., Kampolis I., 2021. Relative sea level changes and morphotectonic implications triggered by the Samos earthquake of 30th October 2020. Journal of Marine Science and Engineering, 9(1), 40. <https://doi.org/10.3390/jmse9010040>

Evelpidou, N., Zerefos, C., Synolakis, C., Repapis, C., Karkani, A., Polidorou, M., Saitis, G., 2020. Coastal Boulders on the SE Coasts of Cyprus as Evidence of Palaeo-Tsunami Events. Journal of Marine Science and Engineering 8, 812. doi:10.3390/jmse8100812

### **Awards and honors**

Dr.Dr. Evelpidou has received a number of awards and recognitions. Amongst the most significant are two awards from the Academy of Athens: in 2013 for work promoting the geological knowledge of the Greek region for the paper entitled "Evidence of a recent rapid subsidence in the S-E Cyclades (Greece): an effect of the 1956 Amorgos earthquake?" and in 2019 for her monography “Sea level changes”.



## **Dr. Anna Karkani**

Postdoctoral researcher  
Faculty of Geology and Geoenvironment, National and Kapodistrian  
University of Athens

Email address [ekarkani@geol.uoa.gr](mailto:ekarkani@geol.uoa.gr)

### **Education**

BSc in Geology and Geoenvironment, National and Kapodistrian University of Athens (2009)

MSc in Oceanography and Management of Marine Environment (2012)

PhD “Study of the geomorphological and environmental evolution of the coastal zone of Central Cyclades” (2017)

### **Career**

2020-today	Postdoctoral researcher
2012-2016	Research associate, Faculty of Geology and Geoenvironment, National and Kapodistrian University of Athens

### **Research interests**

Geomorphology, palaeogeography, sea level changes, geoarchaeology, natural hazards

### **Publications and services**

Karkani A., Evelpidou N., 2021. Multiple submerged tidal notches: A witness of sequences of coseismic subsidence in the Aegean Sea, Greece. *Journal of Marine Science and Engineering* 9(4), 426, <https://doi.org/10.3390/jmse9040426>.

Evelpidou, N. Karkani, A., Kampolis, I. 2021. Relative sea level changes and morphotectonic implications triggered by the Samos earthquake of 30th October 2020. *Journal of Marine Science and Engineering*, 9(1), 40. <https://doi.org/10.3390/jmse9010040>.

Evelpidou N., Zerefos C., Synolakis C., Repapis C., Karkani A., Polidorou M., Saitis I., 2020. Coastal boulders on the SE coasts of Cyprus as evidence of palaeo-tsunami events. *Journal of Marine Science and Engineering* 8(10), 812. <https://www.mdpi.com/2077-1312/8/10/812>

Karkani, A., Evelpidou, N., Morhange, C., Giaime, M., Marriner, N., Spada, G., Late Holocene sea level evolution of Paros Island (Cyclades, Greece), *Quaternary International* 500, 139-146. <https://doi.org/10.1016/j.quaint.2019.02.027>

### **Awards and honors**

Scholarship for postdoctoral research by State Scholarships Foundation (2020-2021)

Scholarship from National & Kapodistrian University of Athens for PhD studies (2012-2016)

DAAD scholarship for training on OSL–Optically Stimulated Luminescence on beachrocks (2014)



## **Emmanuel Vassilakis**

Associate Professor in Remote Sensing & Tectonic Geomorphology  
NKUA, Dpt of Geology & Geoenvironment,  
Remote Sensing Laboratory

[evasilak@geol.uoa.gr](mailto:evasilak@geol.uoa.gr)

### **Education**

My education at NKUA includes BSc in Geology, MSc in Applied Geology and PhD in Remote Sensing & GIS Techniques. I'm still collaborating with Earth, Atmospheric & Planetary Sciences Dpt at MIT (USA) after appointed for a Post-Doctoral Associate Position during 2006.

### **Career**

February 2021	Associate Professor (NKUA)
April 2016	Assistant Professor (NKUA)
April 2012	Lecturer (NKUA)
March 2003	Researcher (NKUA)
June 2000	Sergeant (Hellenic Air Force, National Centre of Space Applications)

### **Research interests**

My scientific interests include optical Remote Sensing data processing, Airborne and Terrestrial LiDAR data interpretation, UAS data acquisition and processing, active tectonics, coastline displacement and high precision geodetic techniques, mainly used for surface deformation measurements.

### **Publications and services**

My research work (more than 150 papers) has been published in international scientific journals or conference proceedings and have been cited more than 550 times. In the most recent publications, my colleagues and I describe techniques for combining UAS and LiDAR data for measuring several geomorphological landforms and processes.

### **Awards and honors**

I have been offered scholarships from GSF for my PhD studies (1996), from MIT for a Post Doctoral Associate position (2006), as well as for a Visiting Scientist (2018).





## **Ioannis Kassaras**

National & Kapodistrian University of Athens  
Department of Geology and Geoenvironment  
Division of Geophysics-Geothermics  
Panepistimiopolis, Zografou  
Athens 15784  
Greece  
[Kassaras@geol.uoa.gr](mailto:Kassaras@geol.uoa.gr)

### **Education:**

Secondary school in Athens, BSc in Geology at Dept. of Geology, National & Kapodistrian University of Athens (NKUA), PhD in Seismology at Dept. of Geology, National & Kapodistrian University of Athens

### **Career:**

- July 2013 - today: Assistant Professor of Seismology, Dpt. Geophysics-Geothermics, NKUA.
- January 2009 - July 2013: Lecturer of Seismology, Dpt. Geophysics-Geothermics, NKUA.
- 2003-2009: Laboratory Teaching Staff, Dpt. Geophysics-Geothermics, NKUA.
- 1995-2003: Research, Technical and Administrative Staff, Dpt. Geophysics-Geothermics, NKUA.
- 1993-1995: Research Fellow, Dpt. Geophysics-Geothermics, NKUA.
- 1991: Research Fellow at LGIT (Grenoble, France).
- 1989-1991: Research Fellow, Dpt. Geophysics-Geothermics, NKUA.

### **Research Interests:**

- Earthquake source properties
- Seismotectonics and active deformation
- Seismic structure of the Earth's interior, surface waves
- Engineering seismology, microzonation
- Seismic Risk analysis

### **Educational activities:**

Undergraduate courses

- Seismology
- Plate Tectonics, Seismology of Greece
- Engineering Seismology
- Earth structure

Postgraduate courses

- Advanced Seismology
- Signal processing
- Data analysis
- Supervision of MSc and PhD dissertations

### **Publications (of educational purpose):**

Kassaras I. & Kazantzidou-Firtinidou D. 2017. "Earthquakes", Chapter in N. Dalezios (Ed), "Environmental Hazards Methodologies for Risk Assessment and Management", IWA Publishing, Water Intelligence Online, 16, doi: 10.2166/9781780407135.

Kassaras I. & Kapetanidis V., 2018. Resolving the tectonic stress by the inversion of earthquake focal mechanisms. Application in the region of Greece. A TUTORIAL, Chapter in: "Moment Tensor Solutions A Useful Tool for Seismotectonics", D'Amico, S. (Ed.), Springer Natural Hazards, ISBN 978-3-319-77359-9.



**Name:** Olga-Joan KTENIDOU

**Position:** Associate researcher

**Institute and department:** National Observatory of Athens, Institute of Geodynamics (Athens, Greece)

**Email address:** [olga.ktenidou@noa.gr](mailto:olga.ktenidou@noa.gr)

### Education

2021 (exp'd) **Aristotle University Thessaloniki**, BA in English Language & Literature  
2018 **University of Greenwich**, Postgraduate Certificate in Higher Education  
2010 **Aristotle University Thessaloniki, Greece**, PhD in Civil Engineering  
**National Autonomous University of Mexico**, Visiting researcher (2008)  
2004 **Imperial College London**, MSc in Soil Mechanics and Engineering Seismology  
2003 **Aristotle University Thessaloniki, Greece**, Diploma in Civil Engineering

### Career

2018 – **NOA**, Associate researcher  
2016 – 2018 **University of Greenwich**, Department of Engineering Science, Senior Lecturer  
2015 – 2016 **GFZ German Research Centre for Geosciences**, Senior researcher  
2011 – 2014 **Université Grenoble-Alpes - ISTERre (France)**, Postdoctoral researcher  
**PEER - University of California at Berkeley**, Visiting scholar (2013)  
2010 – 2011 **Institute for Radiological Protection and Nuclear Safety (France)**, Postdoc.

### Research interests

Olga's niche expertise is in engineering seismology and strong ground motion: site characterisation and reference station definition, site effects and soil amplification (experimental study and numerical analysis), seismic hazard and ground motion prediction, ground motion attenuation, uncertainty and variability. Also interested in geotechnical/earthquake engineering, earthquake reconnaissance, and structural response under low gravity.

### Publications and services

- Publication summary: 26 articles in int'l journals, 29 full articles in peer-reviewed conferences, 21 invited talks, 43 intl conf. abstracts, 8 technical reports, 3 book sections
- Pub metrics (GoogleScholar): 770 citations (640 after 2016) • h-index=13 • i10-index=24
- 2020 - : Head of NOA seismic monitoring and analysis group
- 2019 - : Executive Committee of EFEHR (European Facilities for Earthquake Hazard & Risk)
- 2019 - : User Feedback Group of EU consortium EPOS (European Plate Observing System)
- 2018 - : UAG of ORFEUS (Observatories & Research Facilities for European Seismology)
- Referee for 21 international journals and 2 UK proposal schemes
- Convener or co-convener for 7 international conference special sessions
- Consulting services for ground motion characterisation for critical facilities & energy sector

### Awards and honors

- 2020: Top-2 finalist for the British Council's 'Study UK' Professional Development awards in Greece (top 2 out of over 1000 UK graduates since 2004)
- 2020: Featured alumna, Imperial College London, School of Engineering (<https://www.imperial.ac.uk/alumni/alumni-stories/olga-joan-ktenidou/>)
- Fellow of the UK Higher Education Academy since 2018



**Akis PANAGIS**

Civil Engineer MSc UPatras

Monitoring engineer GEFYRA SA

akis.panagis@gefyra .gr

**EDUCATION**

2004: Diploma in Civil Engineering Department University of Patras

2006: Master in Seismic design of structures in Civil Engineering Department University of Patras

**CAREER**

2005-2006: Structural modelling and analysis of the lattice roof structure of the archaeological excavation in Akrotiri Santorini (In cooperation with the scientific committee appointed to investigate collapse mechanism) and evaluation of partial collapse mechanism upon dead loading.

2006-Present: Structural Designer for various Industrial and residential Buildings composing of different structural system (Steel/Concrete/Timber).

2008-Present: Monitoring engineer for Structural Dpt of Rion Antirion Bridge, involved in the maintenance of Structural Health Monitoring system instrumentation, as well as with the data analysis and engineering interpretation of the records. Engaged with the structural design of Building and maintenance equipment for Rion Antirion Bridge.

**RESEARCH INTERESTS**

Structural modelling, analysis and design of structures, Earthquake structural design, Modal Identification, Ambient structural vibration. Modal Operational Analysis. Sensor technology. Data acquisition. Data analysis Technics.

**PUBLICATIONS AND SERVICES**

[Olivier Flamand, Fabrice De Oliveira, Aris Stathopoulos-Vlami, Panagiotis Papanikolas, Akis Panagis, Using non continuous records from full scale monitoring system for fatigue assessment, EWSHM2014, July 08-11, 2014, Nantes, France](#)

Panayotis Papanikolas, Aris Stathopoulos-Vlami, Akis Panagis, Alain Pecker, Samuele Infanti, The behavior of Rion-Antirion Bridge during the Earthquake of “ACHAIA-ILIA” on June 8, 2008, 3rd fib International Congress – 2010





## **Michael Foumelis**

Assistant Professor

Aristotle University of Thessaloniki

m.foumelis@brgm.fr

### **Education**

He obtained his degree in Geology from the National and Kapodistrian University of Athens (NKUA). During his MSc, at the Department of Dynamics, Tectonics and Applied Geology of NKUA, he worked on Remote Sensing and GIS for geohazards' assessment, whereas for his PhD at the Geophysics Department of NKUA on ground deformation monitoring using GNSS and InSAR. From 2010 to 2011 he was an adjunct Lecturer in the Geography Department of the Harokopio University of Athens (HUA). In 2012 he started a Post Doc at ESA-ESRIN focusing on the development of SAR and InSAR products and services from geohazards.

### **Career**

03/2017 – present	Senior Researcher in Remote Sensing at BRGM
09/2014 – 02/2017	Earth Observation scientist at ESA-ESRIN
02/2012 – 08/2014	Research Fellow at ESA-ESRIN
01/2010 – 01/2012	Adjunct Lecturer (Academic staff under contract) at HUA
09/2006 – 01/2012	Associate researcher at HUA

### **Research interests**

Applications of Remote Sensing, Imaging Geodesy and Geoinformatics to geohazards.

### **Publications and services**

He has several publications in scientific journals and international conference proceedings and participated in numerous research projects funded by national and international organizations. He has been supporting the integration of processing services on exploitation platforms.

#### *Most recent publication:*

Bacques, G., de Michele, M., Foumelis, M., Raucoules, D., Lemoine, A. & Briole, P., 2020. Displacement field of the Mw7.5 Sulawesi earthquake from Copernicus Sentinel 1-2 offset tracking and modeling: Strike slip motion on two sub-parallel faults branches could explain the tsunami genesis. Nature Scientific Reports 10, 9103, <https://doi.org/10.1038/s41598-020-66032-7>.

### **Awards and honors**

He has received scholarships from NKUA and the General Secretariat of Research and Technology of Greece for postgraduate and doctoral studies, respectively. He has received the “2014 ESA TEAM ACHIEVEMENT AWARD” in recognition of the contribution to the Sentinel-1 development and operations.



## **BERENGUER Jean-Luc**

Science Teacher

Geoazur (University Côte d'Azur)  
Education & Outreach team

Jean-luc.berenguer@univ-cotedazur.fr

### **Education & Career**

Agregation Sciences Naturelles (1990) in France  
IESO 2017 FRANCE - Organization Committee Leader (2017)  
EduMed Observatory project leader - University Côte d'Azur (since 2017)  
InSight Education project leader in France (since 2016)  
EGU Committee of Education member (since 2003)  
IGEO Senior Council (since 2018)  
French educational seismological network leader (since 1996)

### **Publications and services**

**Berenguer J.-L.** et al., Tuned into the Earth from the school EduSismo: French educational seismological network, *Bull. Soc. Géol. de France*, **184**, 183, [10.2113/gssgfbull.184.1-2.183](https://doi.org/10.2113/gssgfbull.184.1-2.183), 2013.

Bigot-Cormier F., **Berenguer J.-L.** , How Students Can Experience Science and become Researchers: Tracking MERMAID Floats in the Oceans, *Seis. Res. Letters* ., 88 , [10.1785/0220160121](https://doi.org/10.1785/0220160121) , 2017

Balestra J., **Berenguer J.-L.** et al., The InSight Blind Test: An Opportunity to Bring a Research Dataset into Teaching Programs, *Seis. Res. Letters* ., 91 , 2020

**Berenguer J.-L.** et al., Schools Tuned In to Mars with InSight space mission, Poster session, AGU 2018

**Berenguer J.-L.**, Virieux J., How to teach natural hazards in school: Raising awareness on earthquake hazard, Office for Official Publications of the European Communities, 2008

**Berenguer J.-L.**, Ferry H., Pascucci F., Book, 'Le cahier du sismo', CRDP Nice, 2010

### **Awards and honors**





Palme Académiques – Officer (France)







Diane Carrer  
Earth Science and Life Science Teacher  
International High School , Valbonne,  
Académie de Nice France  
[Diane.carrer@ac-nice.fr](mailto:Diane.carrer@ac-nice.fr) / [diane.carrer@gmail.com](mailto:diane.carrer@gmail.com)  
00 33 6 74 66 91 51



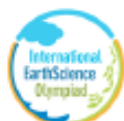
## EDUCATION

- 2013  
2014  **University of Lyon " Claude Bernard - Lyon 1" , Lyon, France**  
Intensive courses to prepare the competitive exam (called "agrégation" ) to become a teacher in Life and Earth Sciences
- 2012  
2013  **University of Nice Sophia- Antipolis, Sciences Department , Valrose Campus**  
Intensive courses to prepare the competitive exam to become a teacher (CAPES), in Life and Earth Sciences.
- 2009  
2010  **Toulouse Tech Engineering school «Institut National Polytechnique» ENSEEIHT-ENSIACET-ENSAT**  
Third year of engineering school and Master's degree in Environmental Sciences, Hydrology, Hydrochemistry.
- 2009  
2007  **Lincoln University, New Zealand : Water and Soil Sciences, Environmental Sciences, Hydrology, Geology**  
**Masséna High School : Intensive courses to prepare the competitive exams to enter engineering schools.**  
Biology, Geology , Chemistry, Physics and Mathematics ; called CPGE in France ( "BCPST-Veto" )

## CAREER

- 2014  
2021  **Biology & Geology Teacher at International High School in Valbonne, and Geology teacher for students (L2) in University of Nice and for Intensive Preparation for Engineering schools (CPGE, BCPST, Masséna)**  
Responsible for various classes: from 9<sup>th</sup> to 12<sup>th</sup> grades , First & Second Year of University, and Courses in didactics.
- 2010  
2012  **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.
- 2010  **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.
- 2009  **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 the first Insegnaci Etna in Acireale, 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.



**Dr. Kiki Makri**

Postdoctoral Researcher/ Teacher of Geosciences at Secondary Education

Institute of Environmental Research and Sustainable Development  
of National Observatory of Athens.

kikimakri@noa.gr

### Education

- **PhD:** 2015, Department of Geology, Aristotle University of Thessaloniki. Prof. Spyridon Pavlides. Study of historical development of geological education in Greece, (Greece). **ND36236**
- **M.Sc.:** 2007, Teaching of Chemistry and New Educational Technologies, Department of Chemistry, Aristotle University of Thessaloniki, Assoc. Prof. Evaggelia Varela. Study of comparative research of Geology teaching in relation to physics and chemistry, in Greece at 1830-1930, (Greece).
- **B.Sc.:** 2005, Department of Geology, Aristotle University of Thessaloniki Prof. Michalis Fytikas, Study of geothermal research methods, (Greece).

### Career

- 10/2020 - 12/2021 Postdoctoral Researcher, Institute and department: Institute of Environmental Research and Sustainable Development of National Observatory of Athens.
- 10/2019 - 5/2020 Educator at the school program "Sustainable Planet", Stavros Niarchos Foundation Cultural Center, Athens.
- 10/ 2017 - 6/ 2020 Assistant Coordinator MSc in Space Sciences Technologies and Applications at National Observatory of Athens.
- 2016-2018 Contract Lecturer: 2016-2018. Teaching for the course "Teaching of Geology". Department of Geology, Aristotle University of Thessaloniki, Greece.

### Research interests

My research interests are focused on History of Geoscience, History of Education, Epistemology, Teaching Methodology, Curriculum Design, Curriculum Studies.

### in peer-reviewed scientific conferences all of which as first author:

1. **Kyriaki Makri**, Elissavet Galanaki, Ioannis Koletsis, Vassiliki Kotroni, Konstantinos Lagouvardos, Assessment of informal learning program on weather phenomena: its perception and necessity in Greece. International Journal of Educational Research Review. <https://doi.org/10.24331/ijere.753774>.
2. **Makri Kyriaki**, Sp. Pavlides: Conceptual changes in the Geosciences textbooks of Secondary Education. A timeless view. 4th Hellenic Conference "Education in the 21st Century: School and Culture, Athens, May 2019.
3. **K. Makri**, S.B. Pavlides. Classification of contents of Geoscience in secondary curricula in Greece, 1830 - 2015. 14th International Congress, Thessaloniki, May 2016.
4. **Makri Kyriakoula** & Pavlides Spyridon. The evolution of the content of geology textbooks in Greece at 19th - 20th century ESERA Conference 2013 Nicosia Cyprus.

### Awards and honors

- Operational Programme «Human Resources Development, Education and Lifelong Learning» in the context of the project "Reinforcement of Postdoctoral Researchers - 2nd Cycle" (MIS-5033021), implemented by the State Scholarships Foundation (IKY). Co-financed by Greece and the European Union (European Social Fund- ESF). Research title: "Approaches of Meteorology and Climate Change in school textbooks of sciences: the case of a Junior High School and High School in Greece".
- EC2E2N Award for excellence present: 2012 Makri K., Antoniadis A., Koliarmou E. National Greek Team. The Magic of Chemistry - European Competition of educational chemical experiments. Annual Plenary meeting Milan.



**Name: Vasiliki KOUSKOUNA**

**Position:** Associate Professor

**Institute and department:** National and Kapodistrian University of Athens (NKUA), Department of Geology and Geoenvironment, Section of Geophysics-Geothermics

**Email address:** vkouskouna@geol.uoa.gr

### **Education**

Degree in Physics, PhD in Seismology, National and Kapodistrian University of Athens

### **Career**

2007-2021 Associate Professor, NKUA  
1999-2007 Assistant Professor, NKUA  
2017 Fulbright Visiting Scholar, Saint Cloud State University (SCSU), MN, USA  
2009-2012 Director of Laboratory of Seismology, DGG, NKUA  
2008-todate Volunteer lecturer, «Popular Open University», Athens, Greece

### **Research interests**

Seismicity, Seismic Hazard, Seismic Risk, Natural Hazards, Macroseismology, Historical Earthquakes, Disaster Response, Engineering Seismology, Educational Seismology

### **Publications and services**

- V. Kouskouna, N. Petropoulos, T. Tsounakos 2005. "Living with earthquakes – protecting myself". Patakis Editions, 38pp.
- A. Kourou, M. Panoutsopoulou, O. Vaggelatou, I. Bergiannaki, N. Petropoulos, I. Parcharidis, V. Kouskouna, 2005. "Earthquakes and society – Education, Protection, Recovery". Patakis Editions, 40pp.
- Kouskouna V, Diagourtas D, Galanos N, Makropoulos K (2006). Earthquake scenarios for educational shake table. ECEES: 1st Eur. Conf. on Earthq. Eng. and Seismology 3-8/9, Geneva, ID-2022, p.472.
- Kouskouna V, Sakkas G (2013). The University of Athens Hellenic Macroseismic Database (HMDB.UoA): historical earthquakes. J Seismol, 17(4), 1253-1280, <https://doi.org/10.1007/s10950-013-9390-3>.
- Kouskouna V, Kaperdas V, Sakellariou N (2020). Comparing calibration coefficients constrained from early to recent macroseismic and instrumental earthquake data in Greece and applied to eighteenth century earthquakes. J Seismol, <https://doi.org/10.1007/s10950-019-09874-7>.
- Kassaras I, Kapetanidis V, Ganas A, Tzanis A, Kosma C, Karakonstantis A, Valkaniotis S, Chailas S, Kouskouna V, Papadimitriou P (2020). The New Seismotectonic Atlas of Greece (v1.0) and Its Implementation. Geosciences, 10(11):447, <https://doi.org/10.3390/geosciences10110447>.
- Kouskouna V, Sakkas G, Cecic I, Tsimpidaros VI, Sakkas S, Kaviris G, Tertulliani A (2020). Earthquake induced crises: game tree approached risk communication and lessons learnt. Annals of Geophysics, 64/3, <https://doi.org/10.4401/ag-8405>.
- Kouskouna V (2020). The earthquake suitcase. 360°Actions, Corporate Social Responsibility Panorama, Hellenic Petroleum Group, p.8.
- Kouskouna V, Ganas A, Kleanthi, M Kassaras I, Sakellariou, N Sakkas G, Valkaniotis S, Manousou E, Bozionelos G, Tsironi V, Karamitros I, Tavoularis N, Papaioannou Ch, Bossu R (2021). Evaluation of macroseismic intensity, strong ground motion pattern and fault model of the 19 July 2019 Mw5.1 earthquake west of Athens. J Seismol, <https://doi.org/10.1007/s10950-021-09990-3>.
- Kouskouna V, Ridge H, Young D, Olafson E, Gazouli M (2021). Building Partnerships for Building Resiliency in Traumatized Youth. we4DRR (women exchange for Disaster Risk Reduction) virtual Gen. Ass. 16/6. Poster
- Kouskouna V, Dakis M, Ridge H, Young D, Gazouli M, Olafson E (2021). Teaching Social-Emotional learning through an earthquake lesson. 37th ESC2021 virtual, 19-24/9.

### **Awards and honors**

Fulbright Scholar Award (2017)





## **Fotios Danaskos**

Geologist, School Teacher

8<sup>th</sup> Junior - Senior High School in Chalandri, HELLAS

fdanas@yahoo.gr

### **Education**

- **National and Kapodistrian University of Athens Hellas**, School of Education/University College London Institute of Education, M.A. Education and Human Rights direction Special Education, MSc. 2008.
- **National and Kapodistrian University of Athens Hellas**, Department of Communication & Media Studies, Annual Teacher Training Seminar, "Professional Identity and Communication Counseling", 2004.
- **Technological Educational Institute of Athens Hellas**, Faculty of Health and Caring Professions, Physiotherapy Department, BSc, 1994.
- **National and Kapodistrian University of Athens Hellas**, Department of Geology, Athens, BSc, 1986.

### **Career**

1997 – 2007      Freelance Physiotherapist  
1994 - 2013      Physiotherapist School Teacher  
2013- 2020      Geologist School Teacher

### **Research interests**

- Researcher «Recording the symptoms of pain in the joints of the spine and upper and lower limbs of students in Vocational Secondary School, 2005.
- Member of the research group "Pattern of Child Status in Primary and Vocational Secondary School, 2005

### **Publications and services**

- Member of the Writing Team for the course "Introduction to Physiotherapy", of the of the Assistant Physiotherapists 2nd class of the TVES of Health and Welfare Sector, Pedagogical Institute 2001.
- Member of the Jury Team for the Workshop on "Supervised Practice in Welfare Services" Round 1, Class 2 TVES, of Health and Welfare Sector, Pedagogical Institute 2001.
- Member of the Curriculum Development Team of the Assistant Physiotherapists of the TVES. 2000.
- Participation in C.R.L. 2018
- Presenting SEISMOBOX in C.R.L.2019
- Co-Presenting SEISMOBOX in INSEGNACI ETNA 2019

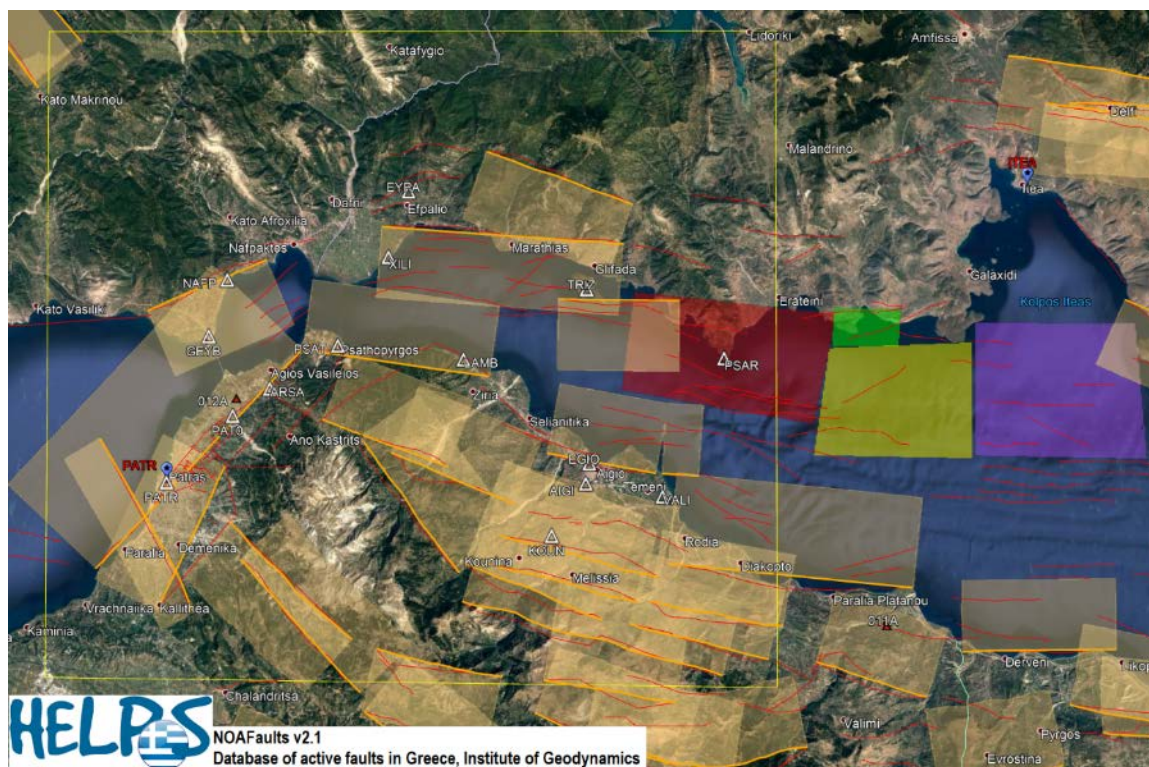
# Abstracts

## Tectonics, large earthquakes and the growth of faults in the western rift of Corinth

Dr Athanassios Ganas

*National Observatory of Athens, Institute of Geodynamics, Athens, 11810 Athens, Greece,*  
[aganas@noa.gr](mailto:aganas@noa.gr)

The western Gulf of Corinth (see Figure below) has not experienced a strong earthquake since 1995 (the  $M_w=6.5$  event of Aigion on 15 June 1995), although the Gulf is extending fast (over 12 mm/yr of N-S extension from continuous GPS data spanning a period of 10+ years) and its seismic history since 1769 exhibits twelve (12) shallow events with  $M>6.0$ . The lecture will present the latest results across several disciplines indicating: a) the existence of normal fault zones with varying activity, b) the continuation of the 1995 low-angle fault towards the west (Psathopyrgos area) and east (Galaxidi), c) new GNSS results mapping crustal extension near major faults d) unexplored kinematic links to the Gulf of Patras, the Rio-Movri strike-slip fault and the Ionia-Akarnania block. The uniqueness of the Corinth rift is revealed by the updated geological & geophysical datasets (active fault maps, fault geometry, fault slip rates, trenching data on past earthquakes, historical and instrumental seismicity, strain rate data) and recent models for earthquake generation processes suggested from observed seismicity patterns, magnitude-frequency distributions and calculated earthquake rates for individual faults.





# **The geodetic monitoring of the Corinth Rift Observatory with GPS and SAR interferometry**

Panagiotis Elias

*National Observatory of Athens*

Since 1990 the deformation of the western rift of Corinth is monitored using the Global Positioning System (GPS) technique. In the first decade the observations were made during campaigns and since 2001 a permanent network has been gradually installed in the area. This network is nowadays composed of ~30 stations. The campaign network was also gradually developed and it gathers now more than 200 points. The western rift of Corinth is the fastest extending area in Europe and one of the fastest in the world. In my presentation, I will show the main results obtained in the last three decades and I will explain the basics of the GPS observation technique.

## **The Corinth Rift through the use of marine remote sensing techniques**

Maria Geraga

The science of underwater sound is called ocean acoustics. The role of this science is very great, because of all the energy types discovered so far, the sound energy spreads in the water at the greatest distance providing a powerful tool for studying the ocean. Acoustic techniques can acquire detailed geologic information about the sea floor, such as seabed topography, sediment composition and distribution and underlying geologic structure. Underwater acoustics uses a variety of instruments such as single beam and multibeam echo sounders to obtain the seafloor topography, side scan sonar systems to obtain textural information on the seabed and profilers to acquire the seismic stratigraphy of the seafloor.

All the above acoustic techniques have been applied at the Gulf of Corinth which is an active rift. Corinth Rift is young, non-volcanic and is characterized by high extension rates and high levels of seismicity. Corinth's high rates of tectonic activity, high sediment fluxes, closed drainage system and preservation of the syn-rift record make it a unique laboratory for the study of extension, sedimentation and paleoenvironment in a young rift.

Over the past 20 years, a high density of seismic reflection data has been established which together with the onshore studies furthered our knowledge regarding the development and evolution of the Corinth Rift. The acquired data was fundamental for the IODP Expedition 381. IODP Expedition 381 drilled in October-December, 2017 aiming to record a continental rifting and to investigate the relative roles of and feedbacks between tectonics, climate, and eustasy in sediment flux, basin evolution, and basin environment.

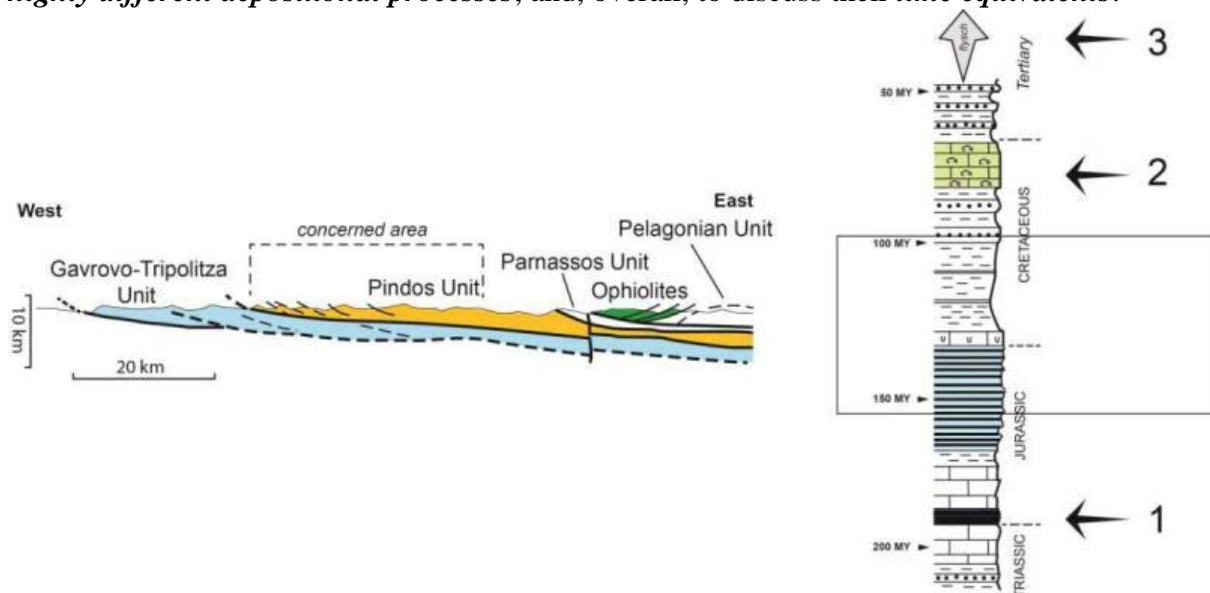
The presentation will include principles of marine remote sensing techniques and their application at the Gulf of Corinth.

## Age, origin and history of the rocks that can be found along the north coast of the Corinth Rift

Christian Beck  
Université de Savoie, France

The Corinth Rift (CR), which separates Peloponnese from “Continental” Greece, represents a major morphological discontinuity crosscutting the so-called Hellenic Chain (or Hellenides). This main extensional structure and its set of deep-rooted normal faults developed during the last 5 MY and probably most actively during the 2 last MY. The CR was overprinted, without any apparent inheritance and almost orthogonally, upon a much older collisional mountain chain system which long and complex story began at the Paleozoic/Mesozoic boundary (250 MY ago) resulting into huge horizontal shortening by mean of major thrusts (see oversimplified section here below). The whole plate tectonics evolution (birth and disappearance of the Tethyan Ocean) will be presented in order to precise the geodynamic setting of the different formations which will be observed on outcrops.

Both the CR's northern and southern sides exhibit a large variety - in age and in lithology - of sedimentary rocks; additionally, in its eastern part, basic volcanic rocks and oceanic lithosphere remnants (ophiolites) are present. The northern CR coast from Antirion to Itea is mainly concerned by the Pindos Unit's Triassic to Oligocene pile. Several outcrops (numbered on the here-below lithostratigraphic succession), ranging from upper Triassic to Paleocene, will be provided to illustrate *highly different depositional processes*, and, overall, to discuss their *time equivalents*.



## **Lessons-learned from the two recent tsunamis in Greece: the May 2, 2020 south Crete, and October 30, 2020 Samos-Aegean tsunamis**

Nikos Kalligeris

Institute of Geodynamics, National Observatory of Athens

In year 2020, Greece was impacted by two tsunamis generated by the  $M_w = 6.6$  south Crete earthquake on May 2, 2020, and the  $M_w = 7.0$  Samos-Aegean earthquake on October 30, 2020. The south Crete tsunami caused minimum flooding and was mostly observed in harbors along the southeastern coast of Crete and the island of Chrysi, whereas the Samos-Aegean tsunami caused substantial damage in the Izmir Province along the Turkish-Aegean coast and along the northern coastline of Samos island. The short tsunami arrival times left a small effective time window for tsunami warning, testing the capabilities of Tsunami Service Providers and National Tsunami Warning Centers operating in the eastern Mediterranean, tsunami preparedness at the national and local levels, and most importantly tsunami awareness of the local population. We present findings from post-tsunami reconnaissance field campaigns and hydrodynamic simulation results. The presentation will conclude with the lessons-learned from these two tsunami events, from a tsunami-warning perspective, but also in terms of the national strategy to reduce tsunami risk in Greece moving forward, including the implementation of the international Tsunami Ready initiative.

## **Large Earthquakes and Focal Mechanisms in the Gulf of Corinth**

Dr. George Kaviris

Assistant Professor of Seismology-Seismic Anisotropy,

Section of Geophysics and Geothermics, Department of Geology and Geoenvironment, National and Kapodistrian University of Athens

The Gulf of Corinth is considered a “natural laboratory” for seismology and geosciences, given that it is characterized by high tectonic activity, with the bulk of the earthquakes occurring close to its western border. Active normal faults, oriented in an approximately E-W direction, dominate in the Gulf of Corinth. Regarding the morphology of the gulf, it is an E-W trending asymmetric graben, with the major active faults outcropping at the southern coast and dipping north, resulting in a long record of rifting in the center of the gulf and an upward displacement of the main footwalls at both northern and southern sides. GNSN measurements in the Gulf of Corinth have revealed a high extension rate in a NNE-SSW direction, which increases from the east to the west, i.e. from 11 mm/yr to 16 mm/yr.

Since the historical era, moderate to strong earthquakes have occurred in the western part of the Gulf, including destructive ones, as the 373 BC Helike earthquake that was accompanied by a tsunami wave. Large events have also occurred during the instrumental period, causing severe damage to urban areas in the broader region, e.g. Eratini,  $M=6.3$ , 1965; Antikyra,  $M=6.2$ , 1970; Galaxidi,  $M=5.8$ , 1992; Aigion,  $M_s=6.2$ , 1995. Regarding the eastern part of the gulf, large earthquakes are also present, however more rare. In 1981, on February 24, 25 and March 4, a seismic sequence with three major earthquakes of surface magnitudes  $M_s = 6.7$ , 6.4 and 6.4 occurred in the Alkyonides Gulf, causing significant damage to Athens. It is worth noting that the seismicity in the WGoC is mostly expressed through the occurrence of seismic swarms, as the one that occurred in Helike in 2013.

The intense seismicity in the Gulf of Corinth has resulted to the installation of a permanent network in the area, with stations belonging to the Hellenic Unified Seismological Network (HUSN). Furthermore, the international initiative of the Corinth Rift Laboratory (CRLN) has greatly increased the density of local station coverage and has led to the prompt provision of seismological data to the scientific community.

Data recorded in the gulf are used in a daily basis to locate earthquakes with high resolution. This permits the identification of seismogenic faults through seismological observations, in combination with GNSS and tectonics.

Another important application of the recorded waveforms is the determination of focal mechanisms. This is achieved either with the well-known method of first-motion P-wave polarities, enabled by the dense station coverage, or through waveform modeling and moment tensor inversion (especially for the stronger events). The majority of the reliable fault-plane solutions indicate normal faulting in an approximate E-W direction, in agreement with the major active faults. However, focal mechanisms in NW Peloponnesus indicate strike-slip faulting.

## Seismic Parameters and Microseismicity in the Gulf of Corinth

Karakostas Vassilis & Papadimitriou Eleftheria

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The Gulf of Corinth is one of the most seismically active areas in the Mediterranean area, associated with extensional crustal faulting. The Gulf has the general shape of an asymmetric half-graben with the southern footwall being uplifted. Its western end is connected through the Rio–Antirrio strait to the Gulf of Patras, which does not have any major faults comparable to the ones affecting the Gulf of Corinth. The eastern part truncates the Megara basin through a complex pattern of faults with a more NE–SW strike. The geodetically measured N–S extension is about 15 mm/yr in the western part, around Rio, and about 10 mm/yr in the eastern part, around Corinth. A comparison between several GPS surveys measured over shorter duration gives slightly higher values, but with the same difference between the western and eastern ends of the Gulf. It therefore seems clear that the present deformation is relatively well confined in the center of the Gulf on a very narrow deforming zone.

Information on the strong ( $M \geq 6.0$ ) earthquakes in the study area is available for more than 25 centuries. They may be considered as characteristic ones, associated with certain fault segments independently of their epicentral uncertainties. Their occurrence rate reveals that all  $M \geq 6.0$  earthquakes are included in the regional catalog since 1700 AD, and they occur in clusters. The dimensions of the fault segments do not exceed 20 – 25 km, which implies an upper limit for the magnitude of the earthquakes that can occur on an individual fault segment. The last  $M \geq 6.0$  earthquake to rupture the area occurred in 1995 and is associated with Aigion fault segment.

Accurate determination of the source parameters of microseismicity is crucial in understanding the seismicity evolution. The spatial and temporal evolution of the abundant low magnitude shocks can be used to define thoroughly the seismotectonic properties of the area which are related with the occurrence of strong earthquakes. We use the P and S phase picks of the recordings at the stations of the Hellenic Unified Seismological Network (HUSN), which is rather dense in the broader area particularly in the central and western part of the gulf. Initially shocks are located by the hypoinverse program using a one dimension local velocity model of the P waves, the  $V_p/V_s$  ratio and travel time corrections to take into account lateral heterogeneities of the model. Then, the double difference technique is applied to relocate the events. In the final step, cross-correlation differential travel times derived from phase-picked data and waveform cross-correlation are included. Jointly relocated data have reliable relative positions. Focal mechanisms based on the first motion polarities exhibit mostly normal faulting on almost E–W striking nodal planes. For the  $M > 3.0$  moment tensor solutions are determined. Both, the spatial distribution of the earthquakes and their focal mechanisms, show a dominant strike of  $270^\circ$  in the westernmost part changing to  $270^\circ - 290^\circ$  at the center of the Gulf, perpendicular to the almost N–S extension of the rift. Further to the east, a gradual change in fault orientation is observed. In the easternmost part, the strike becomes  $240^\circ$ , in agreement with the geometry of the rift.

The spatial and temporal evolution of the microseismicity is thoroughly investigated and remarkable characteristics, among which similarities and differences have been found. To better understand the microseismicity evolution both the seismicity rate change and the static stress changes due to the coseismic slip of the stronger earthquakes are examined. Since the early days of detailed seismic monitoring of the area, frequent earthquake clusters or swarms have been recorded. These swarms are mostly located in the western part of the study area, in shallow depths and associated with different north or south-dipping fault segments. The seismicity in the shallow north-dipping seismic zone is continuous and free of earthquake clusters, probably defining the boundaries between brittle and ductile layers.



## **Tectonics, structural setting and tectono-sedimentary processes in the Corinth rift**

Haralambos Kranis

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The Gulf of Corinth (GoC) Rift, one of the most active continental rifts worldwide, which develops within the broader plate convergence context of the Hellenic Arc. Extension and strain localization within the overriding Aegean Plate has led to the formation of this rapidly extending domain. The available data so far point to its inception at ca (?)5 Ma most probably linked to two interrelated processes, namely (i) the onset of the pronounced curvature of the Hellenic Arc; (ii) the propagation of the North Anatolian Fault into the Aegean domain.

The GoC rift has developed in two phases, namely the Rift 1 phase, from 5.0-3.6 to 2.2-1.8 Ma and Rift 2, from 2.2-1.8 Ma to present. Rift 1 is recorded in a >3 km thick syn-rift succession, (Lake Corinth) which shows upward deepening from fluvial to lake-margin conditions and finally to sub-lacustrine, deposited in a 30 km-wide zone of distributed normal faulting. Rift 2 marks a 39 km northward shift in the locus of rifting, accompanied by footwall and regional uplift, which destroyed Lake Corinth in the central and eastern parts of the rift, while giant Gilbert deltas in the west built into a deepening lake depocenter in the hanging-wall of the newly developing border fault system. Self-organization and strain localization along co-linear border faults are considered to be responsible for the growth, linkage and death of normal faults during these two rifting phases. The major Patras dextral strike-slip fault controls the interaction between the GoC and the Patras rifts; this led to the opening of the Rio Straits at c. 400-600 ka.

The overall landscape and stratigraphic evolution of the rift was strongly influenced by factors related to structure of the Hellenide fold and thrust basement, which controlled regional palaeotopographic variations and local antecedent drainage, the latter especially visible at the southern shoulder of the rift. Along-strike, regional topography north and south of the rift is relatively high in the west, compared to the east; this exerted a first-order control on the depositional environments during rifting. The majority of sediment to the CoC rift has been supplied by north-flowing antecedent catchments on the southern flank. However, the contribution of S-flowing catchments appears to be increasing over time.

On a crustal scale, the extensional thinning of the Hellenide nappe stack, which is observed in the Peloponnesos, is overprinted by the high-angle normal faulting that controls the GoC rift inception and evolution. The interplay between these two processes is another major factor and geochronological and structural data are sought to further constrain rift evolution.

## **Hand on simple seismic software packages provided on-line in the CRL portal**

Dr. George Kaviris

Assistant Professor of Seismology-Seismic Anisotropy,

Ioannis Spingos

MSc Seismologist, PhD Candidate

*Section of Geophysics and Geothermics, Department of Geology and Geoenvironment, National and Kapodistrian University of Athens*

### **Topic 1: Introduction to Phase Picking with SeisGram2K**

Accurately identifying and determining the arrivals of seismic phases is one of the fundamental analysis routines in seismology. From event location to seismic tomography, arrival times of different phases (commonly called “picks” in the seismological community) form the basis of most advanced processing techniques and statistical analyses. In this exercise, we will learn to identify the arrivals of longitudinal (P) and shear (S) waves in local recordings of the Corinth Rift Laboratory Network. We will then use their arrival times to locate an earthquake. The goal of this exercise is to pick the arrival times of P and S phases in at least three stations and, then, find the epicenter of the earthquake.

### **Topic 2: Introduction to Shear-wave Splitting with Pytheas**

The properties of shear-wave splitting (the polarization direction of the fast shear-wave –  $\phi$  – and the time-delay –  $t_d$ ) can be acquired by analysing waveforms of local earthquakes. The density of the seismological network in the Western Gulf of Corinth provides a vast wealth of available data. In the current exercise, we will use the *Pytheas* software to determine the splitting in the upper crust of the Gulf of Corinth. The goal of this exercise is to measure splitting from local waveforms recorded by stations of the Corinth Rift Laboratory Network in the Western Gulf of Corinth.

# **Global Positioning System: from the planning of a monitoring network to the data analysis and the interpretation of the relative results**

Antonio Avallone

*Istituto Nazionale di Geofisica e Vulcanologia*

During the last two decades, the scientific community observed a growing number of permanent GPS networks developed for monitoring the evolution of the deformation in active tectonics and volcanic areas. This development was performed at different spatial scales depending on the investigated target, i.e. from a single fault system or a volcano to regional or plates kinematics. Furthermore, thanks to the continuous technical development of the instrumentation, the frontiers of the studies on the deformation have been pushed also at different temporal scales, i.e. from years for the detection of long-term strain accumulation to seconds (and even below) for observing and modeling earthquake sources or dike intrusions and for early warning applications. The capability to observe a target geophysical phenomenon (i.e. plate movement, earthquake deformation or ground motion, volcanic deformation) strongly depends on the effort for planning the monitoring network and on the characteristics of the chosen instrumentation. Further steps are represented by the data analysis and the interpretation of the results. Different GPS data analysis strategies can be adopted for monitoring the deformation of a given target (Precise Point Positioning, Double-Difference, Real-time Kinematic). All of these strategies have their advantages and disadvantages, in terms of noise level (and then accuracy) and reliability with respect to the investigated phenomenon, that should be taken into account for an actual, aware and rigorous interpretation of the obtained results and products. In this presentation, some examples of science-driven GPS monitoring networks will be shown, from their conceptualization to the instrumentation. Examples of data analysis strategies, related accuracies and results will be also described.

# Introduction to the Differential SAR Interferometry for measuring ground deformation

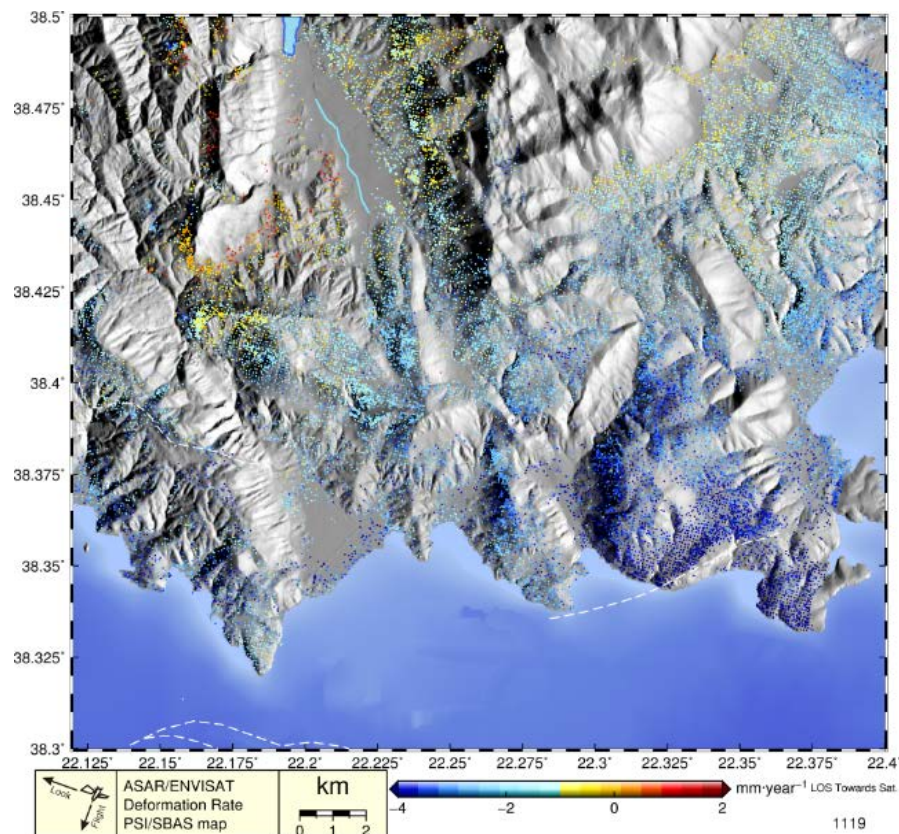
Panagiotis Elias

*National Observatory, Athens, Greece*

How can we measure a seismic fault buried many kilometres under the ground from 600km away? How can we map a displacement of a few mm or cm from such distances? The technological advancements of the recent decades in the remote sensing permitted the sensing and measuring of the deformation of the earth crust due to earthquakes, aseismic tectonic processes, volcanoes and landslides but also to manmade activities. How can we link the deformation of the surface to the fault in depth through modelling? The basics of the satellite Synthetic Aperture Radar (SAR) characteristics and properties of its provided data as well as the basics for differential and multi-temporal interferometry methodologies will be presented. Links with the presentation of GNSS will be shown. We will focus on the case of the Corinth Rift Observatory area and present our findings so far.

The Corinth Rift is one of the narrowest and fastest extending continental regions worldwide and has one of the highest seismicity rates in the Euro-Mediterranean region. At its western termination, several active faults are located beneath the city of Patras and the surrounding area, a region of major socio-economic importance to Greece.

Apart from moderate earthquakes striking often, additional non sudden geological phenomena, such as slow and continuous ground displacements, are occurring. Both are being provoked by the movement of the tectonic plates. In many cases slow displacements are part of the seismic cycle occurring before an earthquake.



Velocity map produced from ASAR/ENVISAT Multitemporal interferograms of Psaromita and Galaxidi area in the North Gulf of Corinth. The coast of Central Greece is moving away from the coast of North Peloponnesus with a maximum velocity of about 1.5 cm per year.

# **A Geospatial Intelligence Application Based on SAR Interferometry to Support Immediate Post-seismic Infrastructure Inspections: The Case of Earthquakes in the Balkan Peninsula**

Issaak Parcharidis

Harokopio University of Athens/ Dep. of Geography

Despite substantial increases in our understanding of geophysical hazards, the rates of loss from them have increased progressively over time, largely because of increased societal exposure. Specifically, earthquake risk is increasing globally more or less in direct proportion to exposure in terms of the population and the human built environment. Although some areas' exposure to earthquake risk is heavily monitored due to high-tech monitoring capabilities, some others are often most poorly monitored although they may have greater exposure to risk.

Space-borne SAR interferometry is a technique that produces 3D topographic data of Earth's surface directly from two SAR images. An extension of the basic technique, called differential SAR interferometry, allows measurements of land deformation very precisely with millimetre resolution. It has various applications in the fields of seismology, volcanology, slope instabilities, crustal dynamics and land subsidence.

The basic principle of geospatial intelligence (GEOINT) is to organize and combine all available data around a geographical location on Earth and then exploit it in order to prepare products that can be easily used by planners, emergency responders and decision makers.

A co-seismic deformation map can be a useful tool for post-disaster infrastructure assessment. It can serve as a graphical reference providing crucial information to prioritize on-site inspections after an earthquake event. A co-seismic deformation map can be also a useful tool for post-disaster infrastructure assessment. In addition, the extracted deformation from the map at each location in combination with layers of knowledge about local exposure can be used in the structural retrofit analysis of infrastructure as a permanent imposed deformation along with the seismic actions applied based on current regulations.

The objective of this study is to contribute to post-seismic impact immediate assessment on exposure including critical infrastructure based on SAR interferometric motion map production using open and free data of Sentinel 1 and ESA's SNAP software as well as local exposure data as a vector layer from open sources. The Durres (Albania) M=6.4 of 26/11/2019, Zagreb (Croatia) M=5.4 22/03/2020 and Parga-Kanalaki (Greece) M=5.6 23/03/2020 earthquakes in the Balkan Peninsula have been investigated as case studies.

Regarding SAR scenes used for InSAR processing free SAR scenes from Sentinel 1 A & B satellite have been used. Sentinel1 is designed to operate in four modes, Strip Map (SM), Interferometric Wide (IW) swath, Extra Wide (EW), and Wave (WV) with IW to be the standard image mode product following the novel Terrain Observation with Progressive Scans (TOPS) acquisition mode. The systematic availability of the new Sentinel-1 A & B satellites with SAR images provides the geohazards scientific community with a large amount of image acquisitions.

For the interferometric processing the SNAP software has been used including the SNAPHU offering unwrapping capabilities. ESA SNAP is a free software distributed under GNU license. Developed and supported by ESA, first of all aims to offer efficient, public tool for raster satellite data processing (optical and radar).

The CORINE Land Cover (CLC) inventory, open and free access, was used to map the main urban centers boundaries in the affected areas. The 2018 version was funded by Copernicus and was produced in less than 1 year using Sentinel 2 images (Landsat-8 gap-filling) with geometric accuracy:  $\leq 10$  m, Min. mapping unit/width: 25 ha / 100 m, Geometric accuracy, CLC: better than 100 m and Thematic accuracy, CLC:  $\geq 85\%$ . As another main source concerning mapping and geo-location of linear infrastructure the OpenStreetMap has been used. For the rest, specifically for critical infrastructure like hospitals, bridges, cultural heritage sites, dams, schools and road-tunnels certified sources have been used and, in some cases, have been validated with Google Earth very high-resolution satellite imagery.

The obtained wrapped interferograms are of good quality and contain the phase difference, between master and slave images, produced by the main seismic event. In order to obtain the absolute value of displacement, wrapped interferograms (deformation in radians) have been unwrapped and transformed from phase radians into motion (meters). In these products (unwrapped interferograms) phase fringes have disappeared and absolute motion in Line of sight (LOS) is recovered.

Over the displacement maps the digitized exposure (urban boundaries, airports, dams, schools, bridges, cultural Heritage sites and monuments etc) has been overlapped in order to calculate the deformation that occurred at every exposure (in form of polygon, line or point). In this way it was possible to estimate the extent of the ground deformation for which particular exposure data are displayed.

Sentinel-1A and Sentinel-1B, sharing the same orbital plane and featuring a short repeat cycle of 6 days within a narrow orbital tube, optimized, production of interferograms with high interferometric coherence globally, for SAR interferometry science and applications. This imagery can be used for precise terrain deformation monitoring over landslide, seismic or subsidence areas by providing regular and frequent interferometric observations for operational purposes.

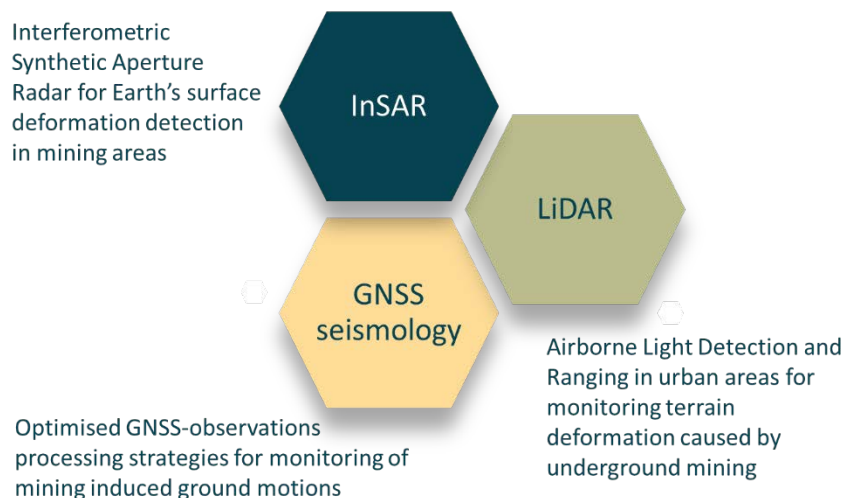
The immediate future task is to transfer this geospatial intelligence application to devices (smartphones, tablets or pads). It could thus, in synergy with integrated GPS capabilities, be an operational tool to guide teams performing infrastructure integrity assessments after strong seismic events. The first attempt was made in the case of the Durres (Albania) earthquake in Albania, the use and control was carried out by a team of scientists (engineers and geologists) who visited the affected area a few days after the earthquake. The system worked and the team of scientists demanded more interactivity between the system and the team's members.

## **GATHERS project – MSc and PhD training on monitoring and modelling the Earth's surface deformations and seismic risk**

Maya Ilieva

Institute of Geodesy and Geoinformatics, Wrocław University of Environmental and Life Sciences,  
Wrocław, Poland

The H2020 CSA project GATHERS is devoted to scientific networking, mobility and partnership in research excellence between European leaders in three Earth monitoring topics:



The coordinator of the project is the Wrocław University of Environmental and Life Sciences (UPWr). Partners are the Technical University in Delft, Netherland (InSAR), the Technical University in Vienna, Austria (LiDAR), and La Sapienza University of Rome, Italy (GNSS seismology). Together we supervise MSc and PhD students working in the three main disciplines in GATHERS. The goal is to support the rise of a new generation of young researches who will improve the methodology for terrain deformation monitoring and modelling, who will understand better the challenges of integration of different geodetic techniques, and who will expand the scientific network in Europe.

Despite the difficulties associated with the pandemic, we managed to accomplished the first cycle of PhD training in hybrid mode and the first results are already on preparation and even published. Like this study on GNSS seismology - the first known study to analyse mining tremor using the high-rate GNSS technique:

Kudłacik, I., Kapłon, J., Lizurek, G., Crespi, M., Kurpiński, G. (2021). High-rate GPS positioning for tracing anthropogenic seismic activity: The 29 January 2019 mining tremor in Legnica-Głogów Copper District, Poland. *Measurement*, Vol 168, ISSN 0263-2241, <https://doi.org/10.1016/j.measurement.2020.108396>.

We will enlarge the frames of the GATHERS family through several events in the next three years: two hackathons – one on GNSS seismology and one on LiDAR, three summer schools comprising the three techniques together, workshops, roadshows and B2B meetings. More information can be found on [www.gathers.eu](http://www.gathers.eu).



# **Geographical Information Systems (GIS) – Introduction to QGIS**

Antonios Mouratidis – Georgia Karadimou

*Aristotle University of Thessaloniki*

- Introduction and overview of a GIS
- Issues and constraints of using a GIS
- Open source GIS – QGIS
- Demonstration of QGIS for handling 2D and 3D geospatial information from various sources (satellite imagery, Digital Elevation Models, GNSS data etc.)
- The future of GIS

## **Relative sea level changes in the Corinth Gulf during the late Holocene**

Niki Evelpidou, Anna Karkani

*Faculty of Geology and Geoenvironment, National and Kapodistrian University of Athens*

Remains of past sea levels, such as tidal notches, benches, beachrocks, etc. may provide valuable information for the investigation of relative sea level changes of eustatic and/or tectonic origin. Tidal notches are usually formed in limestone cliffs in the mid-littoral zone, are well known as precise sea-level indicators and they can attest to the modality of sea level change (rapid or slow) allowing to identify palaeo-seismic events.

In this presentation, we focus on case studies of earthquake-driven coastal changes from the Corinth Gulf, where impacts of past earthquakes can be traced mainly through tidal notches. A reanalysis of published measurements of submerged and uplifted tidal notches in the Corinth Gulf may provide useful indications concerning the long-term tectonic trends that are active in the study area.

# **Quantification of N. Peloponnese shoreline displacement using very high spatial resolution remote sensing**

Emmanuel Vassilakis

*Assoc. Professor in Remote Sensing & Tectonic Geomorphology, NKUA*

The radical displacement of the shoreline during time is one of the most important factors to be taken under consideration when designing infrastructure along the coastal zones. Serious changes in the topography along the southern Corinth Gulf shoreline, as well as severe erosion phenomena have been recorded and therefore it is an ideal location for studying coastline displacement.

The area selected for the application of the described methodology is a very characteristic segment of the Corinth Gulf and has an overall length of 12 km. It lies between the Town of Sykea (east) and the Town of Kamari (west) including the entire waterfront of the Town of Xilokastro, where significant residential and tourist development has occurred during the last decades.

This methodology aims to quantify the shoreline displacement rate by involving the processing of different remote sensing data types such as historical aerial photographs, satellite imagery and unmanned aerial system image data, as long as in-situ observations for validating the geo-statistic calculations. Several photogrammetric techniques were used in order to ortho-rectify, co-register and homogenize a quite dense time series of remote sensing data acquired from 1945 to 2017, representing a rapidly relocating coastal zone at the southern part of Corinth Gulf. All images were digitally processed and optically optimized in order to produce a highly accurate representation of the shoreline at the time period of each acquisition.

The data were imported into a Geographic Information System platform, where they were subjected to comparison, measurements and eventually geo-statistical analysis. High erosion rates were calculated, reaching the order of 0.18 m/year on average whilst extreme rates of 0.70 m/year were also observed in specific locations leading to the segmentation of the coastal zone according to its vulnerability and consequently the risk for further development as well as the effectiveness of measures already taken by the authorities.

All the steps of the applied methodology will be described in this presentation, as it introduces a simple but very convenient way of combining a dataset containing all the available shoreline traces throughout a given time period, in order to quantify its displacement rate for certain segments and therefore evaluate the risk or vulnerability of a coastal zone.

# **Ground acceleration produced by earthquakes and their local amplifications depending on the properties of the underlying soils. Case study the city of Aigion (W. Corinth Gulf)**

Ioannis Kassaras, Assistant Professor

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## **Abstract**

Earthquake hazards caused the most deadly natural disaster in the last two decades, resulting in over 800,000 deaths and 1.7 million injuries. The issue is particularly crucial nowadays, as manifested by extremely high losses during several recent seismic crises (i.e. Sumatra, 2004; Haiti, 2010; Christchurch, 2011; Japan, 2011; Nepal, 2015). Reason for this is in particular (a) the rapid urbanization of large parts of the population, resulting in growth of cities towards areas susceptible to earthquake hazards, (b) the economically driven reduction of the suburban construction behavior, as largely viewed in less-developed countries, (c) the increasing exposure into technological hazards in the developed countries, i.e. nuclear power plants (as it happened in the Fukushima nuclear plant during the 2011 Japan earthquake).

Such disastrous earthquake phenomena have proven that the generic provisions of the seismic codes, underestimate the seismic hazard potential in earthquake prone areas, and so, crisis management planning is often unrealistic, thus ineffective. Remedy to this is the reconsideration of seismic codes on the basis of small-scale risk models taking into account the local seismic potential, the site's structural and societal vulnerability, and also site conditions. In other words, site-specific estimates are prerequisite towards a tailored seismic risk assessment that will guide through effective risk mitigation policies and disaster management measures.

During the last years, our working group has elaborated intense work on seismic risk assessment in several Greek cities, targeting site-specific models and allowing for tailor-made management actions in case of a crisis. We present the core and the outcome of the applied methodologies, indicating pros and cons, and highlighting future perspectives. Our approach includes: (a) Deterministic seismic hazard assessment based on the stochastic simulation of ground motion taking into account the areas' seismotectonics and site conditions. To this, new data concerning the location, geometry, and the seismic potential of faults, together with free-field ambient noise recordings have been collected through numerous field surveys; (b) Vulnerability assessment of elements at risk informed by newly created observed damage databases and in-situ observations; (c) Development of physical risk models including structural damage, and economic loss for several earthquake scenarios.

## Case study

Our basic example is a scenario-based seismic risk assessment for the earthquake prone city of Aigion (W. Corinth Gulf). Within this approach, the stochastic finite-fault method is applied towards simulation of strong ground motion for three near-field earthquake scenarios, capable of occurring given the well-established seismotectonics of the area. The three scenarios are: (a) a repetition of the June 15<sup>th</sup> 1995 (Mw=6.4) devastating earthquake, (b) a repetition of the December 26<sup>th</sup> 1861 historical earthquake of Mw=6.7, and (c) an earthquake of Mw=6.0 on the nearest Aigion Fault, underlying the city. The stochastic model parameterization is validated by comparisons with available recordings from permanent accelerometric stations. Site amplification is approximated by the use of ambient noise Horizontal-to-Vertical-Spectral-Ratios (HVSr) derived from in-situ free-field measurements in Aigion.

The structural exposure model of the city is developed on a building-by-building level through in-situ inspection, census data, and satellite navigation tools. The macroseismic method of RiskUE-LM1 is applied for the estimation of the structural vulnerability of 3216 inspected buildings in Aigion, based on the vulnerability classes per EMS-98 and semi-empirical indexes, accounting for the buildings' typology and structural characteristics.

Three scenarios of structural damage are presented on a building block scale, in terms of EMS-98 Damage Grades and their probability of occurrence. The obtained risk assessment indicates that the northeastern and

partly the southern part of Aigion are more susceptible to damage, in accordance with the real damage distribution from the most recent devastating M6.4 1995 earthquake, the site amplification inferred from HVSr, and the macroseismic vulnerability of the constructions.

In conclusion, the current building stock of Aigion demonstrates significantly enhanced seismic behavior compared to the pre 1995-era, due to rehabilitation after the 1995 earthquake, strengthening post-earthquake interventions to damaged buildings of 1995 and replacement of vulnerable ones with new constructions. Despite unavoidable uncertainties intrinsic to both the method and data, being open to future improvements, the inferred seismic risk assessment provided realistic and consistent results, thus allowing its exploitation towards loss evaluation and mitigation purposes for the city of Aigion.

### Perspectives

Future improvements that fall in with, and/or are beyond the global state-of-the-art, include: (a) Implementation of technological capabilities of remote sensing towards buildings' inventory and vulnerability assessment; (b) Socioeconomic impact analyses towards the mitigation of risk, enhancement of preparedness and resilience of the social and economic fabric, and (c) Applications for near real-time damage assessment.

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## **Physical mechanisms behind seismic site response - Some examples from Aegion**

Olga-Joan KTENIDOU

*National Observatory of Athens*

This short lecture will show us how analyzing a large number of earthquakes recorded at a seismic station can reveal particular characteristics of that site's seismic response. Coupling such an analysis of recorded data with numerical tools -where the site's geometry and soil properties are modeled in 2 dimensions as a grid and a seismic input is propagated through it- can help us validate our observations on the data and explain the physical mechanisms behind the observed site response.

We will look at examples from a study performed on over 500 earthquake records from a vertical array of accelerometers in Aegion, Greece. The array is installed inside an alluvial basin and it includes five stations all at different depths, so as to record ground motion in various kinds of soil as well as in the underlying rock. Aegion, which is situated in the Gulf of Corinth, is a location of high seismicity and so during a few years, hundreds of earthquakes were recorded by this array. The array was installed inside the basin in order for the recordings to shed light on how this complex geological feature affects seismic ground motion at the surface, which in turn can affect the seismic response of the structures and infrastructure in the vicinity.

We estimate site effects using the technique of empirical spectral ratios, with and without a reference site (standard and horizontal-to-vertical spectral ratio). We find significant site amplification which cannot be accounted for by 1D model predictions, and also a significant difference between the two horizontal components. These are indications that the response is dominated by 2D effects, due to strong surface waves generated at the basin edge and propagating laterally towards its interior. Our numerical model simulations corroborate the results of our empirical data analysis and can help inform us about the geological features that cause the various features of the site response. The strongest amplification takes place in the direction parallel to the basin edge, and is up to 2 times higher than in the perpendicular direction. We link this to the nature of surface waves, the Love waves generated being stronger than the Rayleigh waves. We also consider different time windows to study the effect on different wave packages, such as S-waves and coda.

Finally, we make some comparisons with the way the European seismic design code (Eurocode-8) addresses and -of necessity- simplifies such complex phenomena. We compute soil-to-rock amplification factors for peak ground acceleration and find they are significantly higher than what is predicted by current design codes. With that opportunity, we make a short overview of the limitations in predicting complex ground motion based on simple proxies.



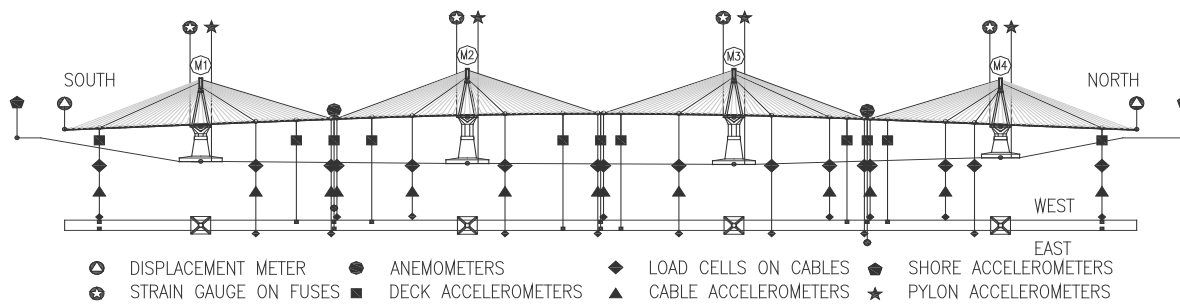
# Earthquake structural response of Rion Antirion Bridge: 15yrs of continuous structural surveillance through permanent instrumentation system

Akis PANAGIS  
GEFYRA SA

Rion-Antirion Bridge is a multi-span cable-stayed bridge with a total deck length of 2,252m fully suspended from the pylons top located on an area of significant seismicity (West Corinth Gulf). During structural design phase unique solutions were implemented to mitigate consequences of a major earthquake event and to allow significant ground displacement without extensive restoration actions.

Rion Antirion bridge in in operation since 2004 and over this period more than 30 earthquake events, yielding to noticeable structural excitation, have been recorded through the instrumented monitoring system that is permanently installed. The intensity of events ranges from small events at the vicinity of the structure –having epicenter distance less than 10 km to major events at an epicenter distance exceeding 250 km (JAN 8<sup>th</sup> 2006 Kythira Event).

Current presentation discusses the structural response of Rion Antirion Bridge focusing on apparent differences observed for different earthquake events while JUN 08<sup>th</sup> 2008 Achaia-Ilia EQ consequences are extensively presented since this was the most severe event up to now.



Rion Antirion Bridge SHM Instrumentation

## **The Geohazards Lab initiative**

Michael Foumelis

*Aristotle University of Thessaloniki*

Presentation of activities under the CEOS Geohazards Lab initiative enabling the greater use of EO data and derived products to assess geohazards and their impact.

## **Hosted Processing Services on GEP**

Michael Foumelis

*Aristotle University of Thessaloniki*

Demonstration of online processing services available on the Geohazards Exploitation Platform (GEP) for mapping and monitoring geohazards.

## **Tuned in to the Earth: Using data online at school**

Jean-Luc BERENGUER

*Geoazur, University Côte d'Azur*

Today, seismic activity in the Mediterranean basin is well recorded by a large number of sensors. For several years now, these databases have been easily accessible to the general public and especially to the educational world.

Schools host also seismometers for educational purposes and contribute to increase the databases. Numerous educational seismological networks exist, particularly around the Mediterranean (France, Greece, Italy, Portugal ...).

The installation of seismometers in schools promotes learning based on original records. Such learning makes students familiar with scientific data.

The University Côte d'Azur, with the program called Educational Mediterranean Observatory ("EduMed-Obs", <http://edumed.unice.fr>), focuses on implementing an interface based on a geoscience dataset concerning the Mediterranean basin. EduMed-Obs also provides datasets from research centers. These datasets are intended not only for middle and high schools, but also for university students.

The aim of this practical workshop is to show, through some examples, the resources (data, software) available for teaching. We will work on some case studies to show how, quite easily, we can use real data online to study earthquakes. Classical and less classical activities will be discussed such as the location of an epicentre, the site effect, the structure of the globe revealed by the seismic waves ...

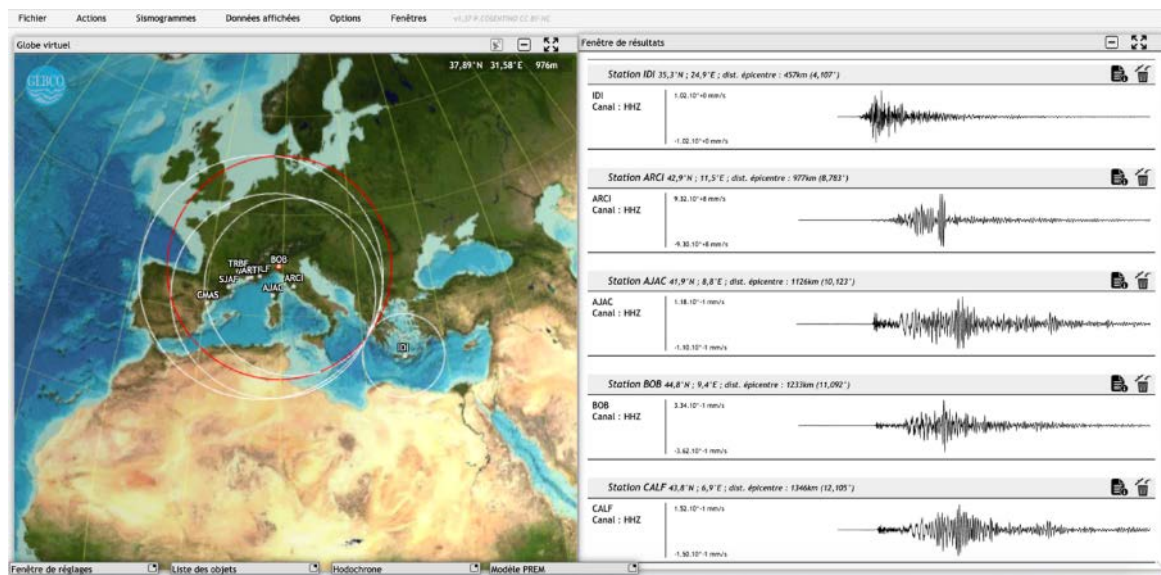
We will use :

the Edumed-Obs seismo data-center >

<http://edumed.unice.fr/fr/data-center/seismo>

and Tectoglob3D, the software online >

<https://www.pedagogie.ac-nice.fr/svt/productions/tectoglob3d/>



## **The European Space Education Resource Office (ESERO)**

Antonios Mouratidis

*Aristotle University of Thessaloniki*

The European Space Education Resource Office (ESERO) project is the European Space Agency's (ESA's) main way of supporting the primary and secondary education community in Europe, in order to tackle the decreasing number of young people deciding to take up STEM-related (Science, Technology, Engineering and Mathematics) studies and careers.

ESERO uses space related themes and the genuine fascination felt by young people for space to enhance school pupils' literacy and competence in STEM-related subjects. The ESERO project also highlights the associated applications from space and raises awareness of the large range of career prospects in the space domain.

Tailored to the specific educational needs of the various Member States, the ESERO mainly offers an annual series of training sessions for both primary and secondary school teachers, in partnership with national educational authorities, institutes and networks.

Currently ESA has established several ESERO national offices which cover many ESA Member States, such as: Austria, Belgium, Czech Republic, Denmark, Germany, Ireland, Luxembourg, Finland, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden and UK.

The purpose of this presentation is to provide an overview of the ESERO, with a focus on the opportunities offered to the primary and secondary education communities.



## Study of the "breathing" of Etna volcano through GPS beacons and seismometers.



Diane Carrer - Jean-Luc Bérenguer



*teacher in International High School - Geoazur, University Côte d'Azur  
EDUMED, France*

### Hands on activity based on GPS data (EDUMED Database) – Estimated duration : 30 ‘

During this session, we will explore Mount Etna, the highest active volcano in Europe.

This session will focus on two types of data: GSP data and seismological data.

We will learn how to use a free scientific database, accessible to all, and for all levels (high school, college or university) : the Edumed Observatory Database.

We will discover how to use the GPS data recorded by GPS beacons placed all around Etna.

This network of GPS beacons is accessible from the following EDUMED portal:

<https://edumedobs.maps.arcgis.com/apps/dashboards/47d44dbc36af457c9df4f4e6d85527e3>

Thanks to these GPS data, we will be able to understand movements of the volcano during the winter of 2021, marked by numerous volcanic eruptions.

This volcanic crisis has been very well recorded by GPS, and we will try to characterize the type of ground movements, which are part of **inflation and deflation cycles**.

We will then draw a parallel with the seismological data, accessible from the EDUMED database:

<http://edumed.unice.fr/data-center/seismo/>

We will see if we can distinguish classical earthquakes and volcanic lava eruptions.

Finally, we will conclude by modelling **Etna in foam**.

Using syringes and red colored liquid, we will model (at college level) the inflation and deflation cycles of the volcano, and thus the filling and emptying of the magma chamber.

***We look forward to seeing you online !***

## **Incorporating the seismobox into school teaching**

Dr Kiki Makri,

*National Observatory of Athens.*

The use of appropriate teaching tools is essential for the implementation of classroom teaching. The input of the seismobox at schools can be used for the introduction of the basic principles of geology/seismology and science. Its success depends on the contribution to the familiarization of students with scientific processes, such as the observation, classification, measurement, communication, predictions, drawing conclusions, hypotheses, interpretation, and model construction. In this way, in addition to cognitive skills, students will also acquire psychomotor skills.

But how can we use seismobox in the classroom and in making teaching successful? As a teaching tool, we can classify the seismobox as a model. The model is the simplification of a reality. The purpose of its use is to support the interpretation of phenomena and to describe or predict real situations. The construction of the seismobox must be done by the teacher in collaboration with the students. Through this work, examples and good practices for the use of seismobox in classrooms will be presented.

## **The earthquake suitcase**

Dr. Vasiliki Kouskouna

*Associate Professor, National and Kapodistrian University of Athens*

The **Earthquake Suitcase**, an educational system for information about - and familiarization with – earthquakes, was designed and integrated in the Laboratory of Seismology, Department of Geology and Geoenvironment, National and Kapodistrian University of Athens.

The multiple goals achieved with this educational module are to educate the schoolchildren on what an earthquake is, where, how and why earthquakes occur, and the preventive measures that can be taken. The schoolchildren gain experience through earthquake simulation, familiarize themselves with the feeling of an earthquake, and learn to take the necessary self-protection measures.

The educational material is included in the “Earthquake Suitcase”, which contains interactive educational toys, an experiential shake table for earthquake simulation, a model accelerometer recording in real time the simulation, books, leaflets and an earthquake emergency bag.

The training is conducted by the specialized staff of the project’s scientific team. During the training and, in collaboration with the educators in charge, the effectiveness of the earthquake suitcase is evaluated, with the schoolchildren drafting their own individual emergency plan.

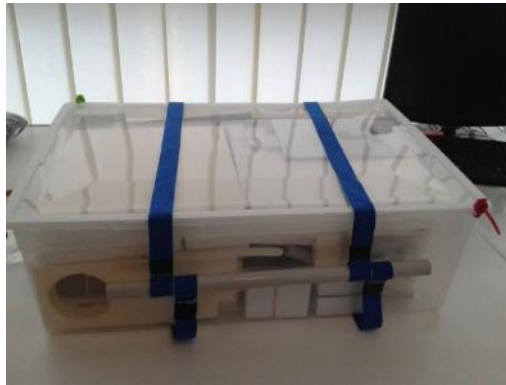
The project was sponsored by the Hellenic Petroleum Group and the US State Department.

# DIFFUCION OF SEISMOBOX IN HELLENIC SCHOOLS

Fotis Danaskos

## EARTHQUAKES IN MEDITERANEAN COUNTRIES

Teaching the Geology course at my school and implementing each year, in the context of the implementation of Environmental Programs, programs focused on Geosciences, we dared with my students to participate in the CRL WORKSHOPS.



We tried to give simple answers to the main questions that trigger this phenomenon.

### 1. WHAT IS AN EARTHQUAKE?

Most of the people believe that an earthquake is a shake of the surface of the Earth as a result of the sudden movement of the ground. During this release of energy seismic waves travel in the Earth's lithosphere.

### 2. ARE EARTHQUAKES PREDICTABLE?

These are the questions everybody asks: When, where, and how big the next earthquake will be?

### 3. CONSEQUENCES OF AN EARTHQUAKE?

Which houses are more susceptible to ground vibrations and what kind of house should I have in order not to be scared

*No, they are all at risk!!*

But for all these questions the answers come from Plates Tectonics  
THE EARTH IS a 'RESTLESS' PLANET....

Using the know-how and knowledge gained in CRL 2018, we built our uploaded SEISMOBOX and replica / models of the tectonic plates.

**The main goals i tried to explain using the SEISMO-BOX are:**

- Stimulate students (citizens of tomorrow) to the knowledge of earthquake as a natural phenomenon
- To sensitize students to the consequences that an earthquake may have on buildings in relation to the type of soil (rock) on which buildings are constructed and the type of buildings itself.

- To raise awareness of school teachers to use new educational techniques in order to educate students.

Then, respecting our commitment, as a group and school, to creators and sponsors of SEISMOBOX (CRL - EGU), we began disseminating this educational material to partner schools.

Through the implementation of our environmental programs, we have spread SEISMOBOX to four schools in Hellas and hope to reach every school in our country through the OSOS platform.



In relation to the educational level of our students we focused on the best teaching performance and it was done with the purpose to understand the phenomenon of earthquakes and the impact on human structures.