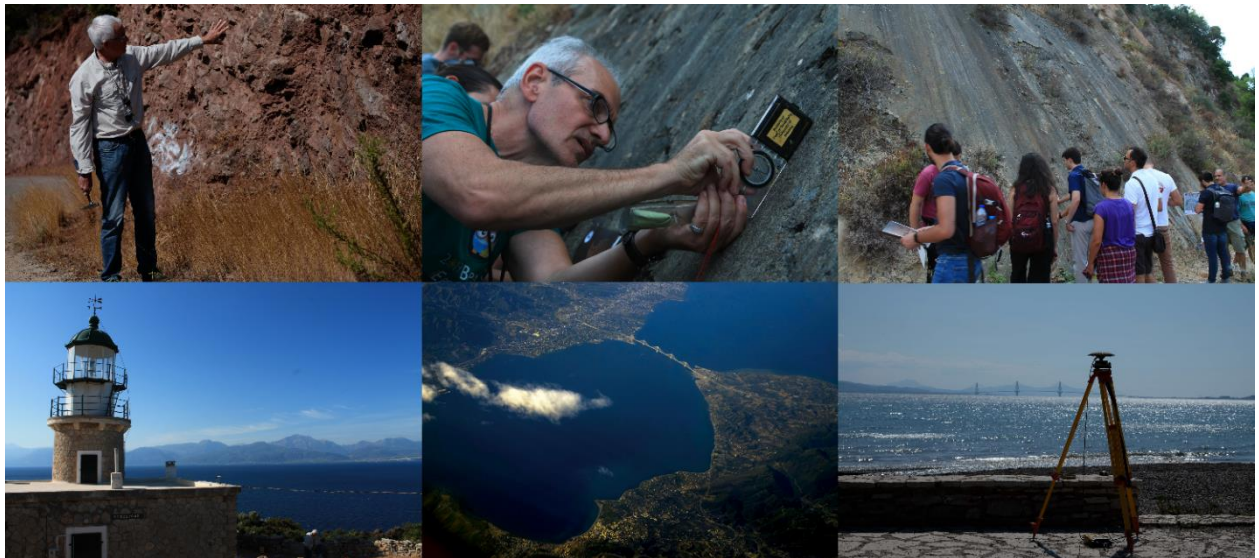




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CRL School 2022

Corinth Rift Observatory



Patras-Nafpaktos, Greece

23-27 September 2022

Welcome!!!

Dear teachers and students, welcome to the 2022 edition of the CRL-School!

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

At the School, methods such as seismology, GPS, SAR interferometry, the methods underlying the ESA-SENTINEL mission, the Geohazards Exploitation Platform (GEP) and paleomagnetism, will be examined from a theoretical point of view as well as from the point of view of their applications and results in the specific areas of 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 general signification.

As every year, this school will comprise a mixture of topical presentations, excursions in the field and hand-on activities. It will take place partly in Nafpaktos, partly in Patras. We foresee that the participants will gain understanding of all these methods and their results and be engaged in discussions about the interpretation of the results and how they can be used in teaching and learning in general Earth Sciences, Chemistry, Physics, Biology and Geology.

In Nafpaktos, the presentations will be done in the Municipality Building, which has been generously proposed to us by the Mayor and the Council of the city of Nafpaktos. In Patras we will be hosts of several departments of the University.

Highlights will be, among others, the educational activities for High School, the dissemination to the general public, the presentation of the seismobox, the hand-on ESA software, the field training sessions and the presentation of cores from the sea bottom. There will be also a presentation of the structural monitoring and geometric control of the Rio-Antirrio bridge.

The Organising/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 continue to offer students and teachers the opportunity 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 and email it back to us,
- To make a presentation of your experiences at the CRL School to a group of your colleagues after your return from Nafpaktos, and
- Teachers, we invite you to send us reports and photographs about how you have used the CRL School information in your classrooms. We also encourage you to write reports on the School in publications specifically intended for geosciences, science and geography teachers.

Important Note!!!

The interaction among the lecturers and the students of the School is considered crucial. It is being performed throughout the full duration of the School and will be depended not only from the type of the presentation/hand on but also from the students' availability, their preparedness and their proactiveness with the corresponding lecturer/chairperson and the Organising/Scientific Committee. We encourage the students and it is foreseen as their duty to initiate communication.

For now, please enjoy your CRL School 2022 in Nafpaktos-Patras! 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 CRL School Organising/Scientific Committee

Acknowledgments

- The European Geosciences Union (EGU) for financial support.
- The Centre National de la Recherche Scientifique (CNRS)
- The municipality of Nafpaktos for logistical support for the lectures given in Nafpaktos,
- Annita Panteleli for her significant help to the organizing committee of CRL School 2022. Her advice contributed to the better organization of the School.
- A special thanks is given to Uni Systems for taking the time and energy to invest in our vision and in our event by sponsoring CRL School 2022.
- And we thank all the speakers who have contributed to the School and their institutions.

CRL School 2022 Organising/Scientific Committee

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George Kaviris



Fotis Danaskos



Angelos Zymvragakis



Roberto Davoli



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Katerina Karampitiani

Corinth Rift Laboratory School – 2022

(Patras-Nafpaktos September 23-27, 2022)

Programme

Friday September 23, 2022

Department of Physics, University of Patras

- 13:00 – 13:30** **Welcome to the CRL School 2022**
13:30 – 14:00 **Why CRL?**
Pierre Briole, CNRS, Paris, France
[CV: page 15, Abstract: page 46]
- 14:00 – 14:30** **Geodynamic setting, large earthquakes and the growth of faults in the western rift of Corinth**
Athanasios Ganas, National Observatory of Athens, Greece
[CV: page 16, Abstract: page 47]
- 14:30 – 15:00** **The geodetic monitoring of the Corinth Rift Observatory with GPS and SAR interferometry**
Pierre Briole, CNRS, Paris, France
[CV: page 15, Abstract: page 48]
- 15:00 – 15:30 Break**
- 15:30 – 16:00** **Seismic Parameters and Microseismicity in the Gulf of Corinth**
Eleftheria Papadimitriou, Aristotle University of Thessaloniki, Greece
Vasileios Karakostas, Aristotle University of Thessaloniki, Greece
[CV: page 17 & 18, Abstract: page 49]
- 16:00 – 16:30** **Large Earthquakes and Focal Mechanisms in the Gulf of Corinth**
George Kaviris, National and Kapodistrian University of Athens, Greece
[CV: page 19, Abstract: page 50]
- 16:30 – 17:00** **Off-shore faults imaging and monitoring in the Corinth Rift**
Maria Geraga, University of Patras, Greece
[CV: page 20, Abstract: page 51]
- 17:00 – 17:30** **Age, origin and history of the rocks that can be found along the north coast of the Corinth Rift, preparation in the classroom of the geological field trip of Sunday morning**
Christian Beck, Université de Savoie, France
[CV: page 21, Abstract: page 52]
- 17:30 Departure to Nafpaktos (Akti Hotel)**

Saturday September 24, 2022

08:30 Departure from Akti Hotel

08:45 – 09:15 Welcome messages

09:15 – 09:45 **Tectonics, structural setting and tectono-sedimentary processes in the Corinth Rift**

Haralambos Kranis, National and Kapodistrian University of Athens, Greece
[CV: page 22, Abstract: page 53]

09:45 – 10:15 **Use of CRL Data for Detailed Seismological Studies**

Anna Serpetsidaki, University of Patras, Greece
[CV: page 23, Abstract: page 54]

10:15 – 10:45 **Historical elements for sciences and observatories**

Fiori-Anastasia Metallinou, National Observatory of Athens, Greece
[CV: page 24, Abstract: page 55]

10:45 – 11:15 Break

11:15 – 13:15 **Hand-on GNSS instruments – learn how to manipulate a GNSS instrument**

Panagiotis Elias, National Observatory of Athens, Greece
Pierre Briole, CNRS, Paris, France
[CV: page 25 & 15]

13:15 – 14:45 Lunch Break

14:45 – 15:45 **Hand on simple seismic software package provided in the CRL portal**

George Kaviris, National and Kapodistrian University of Athens, Greece
Ioannis Spingos, National and Kapodistrian University of Athens, Greece
[CV: page 19 & 26, Abstract: page 56]

15:45 – 17:15 **Presentations by the students**

3mn per student + questions

17:15 – 21:30 Free time

21:30 – 23:00 **Sky gazing (in an area close the hotel Akti that will be announced shortly before)**

Fiori-Anastasia Metallinou, National Observatory of Athens, Greece
[CV: page 24, Abstract: page 57]

Sunday September 25, 2022

08:30 Departure from Akti Hotel

08:30 – 13:30 **Field trip at Psaromita (GNSS and seismic station), geologic stops along the journey**
Athanasios Ganas, National Observatory of Athens, Greece
Christian Beck, Université de Savoie, France
[CV: page 16 & 21]

Arrival at Akti hotel

13:30 – 15:00 Lunch Break

Afternoon: Nafpaktos

15:00 – 15:40 **Earthquakes in the classroom – Part 1**
Francesca Cifelli, Roma TRE University, Rome, Italy
Fotis Danaskos, 8th Junior High School in Chalandri, Greece
[CV: page 27 & 28, Abstract: page 58]

15:40 – 16:10 **Tuned in to the Earth: Using data online at school**
Jean-Luc Berenguer, University Côte d'Azur / EGU, France
[CV: page 29, Abstract: page 59]

16:10 – 16:40 Break

16:40 – 17:10 **The earthquake suitcase**
Vasiliki Kouskouna, National and Kapodistrian University of Athens, Greece
[CV: page 30, Abstract: page 60]

17:10 – 17:40 **Diffusion of Models and Teaching Tools (SEISMOBOX etc) in Hellenic schools**
Fotis Danaskos, 8th Junior High School in Chalandri, Greece
[CV: page 28, Abstract: page 61]

17:40 – 18:10 **Educational Senario using open data**
Kiki Makri, National Observatory of Athens, Greece
[CV: page 31, Abstract: page 62]

Monday September 26, 2022

08:30 Departure from Akti Hotel

School Teachers

08:30 – 12:30 The School teachers will have a class in the 1st High School of Nafpaktos

University Students

09:00 – 09:30 **Physical mechanisms behind seismic site response - Some examples from Aegion**

Olga Ktenidou, National Observatory of Athens, Greece

[CV: page 32, Abstract: page 63]

09:30 – 10:00 **Ground Deformation Studies in Seismic Active Areas combining Local GPS/GNSS and permanent GNSS networks. The Case of Central Ionian Islands and Patras Gulf**

Vasilios Sakkas, National and Kapodistrian University of Athens, Greece

[CV: page 33, Abstract: page 64]

10:00 – 10:30 **Introduction to satellite SAR interferometry**

Panagiotis Elias, National Observatory of Athens, Greece

[CV: page 25, Abstract: page 65]

10:30 – 11:00 Break

11:00 – 11:30 **Static and dynamic gravity investigations within Corinth Rift Laboratory project**

Jan Mrlina, Institute of Geophysics, Czech Academy of Science, (IGCAS) Prague

[CV: page 34, Abstract: page 66]

11:30 – 12:00 **Induced seismicity: Earthquakes caused by human activity**

George Tsoflias, The University of Kansas, USA

[CV: page 35, Abstract: page 67]

12:00 – 12:30 **Quantification of N. Peloponnese shoreline displacement using very high spatial resolution remote sensing data**

Emmanouel Vassilakis, National and Kapodistrian University of Athens, Greece

[CV: page 36, Abstract: page 68]

12:30 – 14:30 Break

14:30 – 15:00 **Platform-based Technology and Earth Observation Services in Response to Geohazards**

Michael Foumelis, Aristotle University of Thessaloniki, Greece

[CV: page 37, Abstract: page 69]

15:00 – 15:30 **The QGIS software a free and powerful geographical information software – Plotting the routes of the morning GNSS survey with that software**

Antonios Mouratidis, Aristotle University of Thessaloniki, Greece

[CV: page 38, Abstract: page 70]

15:30 – 16:00 **The European Space Education Resource Office (ESERO)**

Antonios Mouratidis, Aristotle University of Thessaloniki, Greece

[CV: page 38, Abstract: page 71]

16:00 – 17:30 **Hands-on Geohazard Exploitation Platform**

Michael Foumelis, Aristotle University of Thessaloniki, Greece

[CV: page 37, Abstract: page 72]

Tuesday September 27, 2022

08:30 Departure from Akti Hotel

Laboratory of Seismology, University of Patras

09:30 – 10:00 **Climate and Earthquakes: Recent Research and Potential Contribution of Near Fault Observatories**

Zafireia Roumelioti, University of Patras, Greece

[CV: page 39, Abstract: page 73]

10:00 – 10:30 **Relative Sea level changes in the Corinth Gulf during the late Holocene**

Niki Evelpidou, National and Kapodistrian University of Athens, Greece

Anna Karkani, National and Kapodistrian University of Athens, Greece

[CV: page 40 & 41, Abstract: page 74]

10:30 – 11:00 **Earthquake structural response of Rion Antirion Bridge: 15yrs of continuous structural surveillance through permanent instrumentation system**

Akis Panagis, GEFYRA S.A., Greece

[CV: page 42, Abstract: page 75]

11:00 – 11:30 *Move from Seismology Laboratory to Department of Geology*

11:30 – 12:30 **Recent sedimentary processes in the Gulf of Corinth. Seismic and aseismic turbidites**

Spyros Sergiou, University of Patras, Greece

[CV: page 43, Abstract: page 76]

12:30 – 13:30 **Lunch at the cafeteria near the department of Physics**

13:30 – 14:30 *Drive to the Helike Fault*

14:30 – 16:00 **Visit of the Helike fault near Aigion**

Athanassios Ganas, National Observatory of Athens, Greece

[CV: page 16, Abstract: page 77]

16:00 – 16:30 *Drive to the ancient city of Helike*

16:30 – 18:00 **Visit of the ancient city of Helike**

Dora Katsonopoulou, The Helike Society, Greece

[CV: page 44, Abstract: page 78]

Departures from Aigion to Athens or back to Nafpaktos

End of the CRL School 2022

Participants

Students

A/A	First Name	Last Name	E-mail Address	Affiliation
1	Eleni	Anyfanti	elenanif1305@gmail.com	National and Kapodistrian University of Athens, Dept. of Geology and Geoenvironment, Athens Greece
2	Angela	Ara	ara.angela.99@gmail.com	University of Granada, Dept. of Theoretical Physics and Cosmology, Granada Spain
3	Sophia-Aikaterini	Avgerinou	sophia.avg98@gmail.com	National and Kapodistrian University of Athens, Dept. of Geology and Geoenvironment, Athens Greece
4	Athanasios	Chatziioannou	ath.ch.8@gmail.com	University of the Aegean, Dept. of Geography, Aegean Greece
5	Alina	Coman	coman@inf.ro	University of Bucharest, Doctoral School of Physics, Faculty of Physics, Bucharest Romania
6	Nikolaos	Kalamaras	nickalamaras2486@gmail.com	National and Kapodistrian University of Athens, Dept. of Geology and Geoenvironment, Athens Greece
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10	Aliki	Konsolaki	alidikons@geol.uoa.gr	National and Kapodistrian University of Athens, Dept. of Geology and Geoenvironment, Athens Greece
11	Emmanuela	Konstantakopoulou	emma.kon97@gmail.com	National and Kapodistrian University of Athens, Dept. of Geology and Geoenvironment/National Observatory of Athens, Athens Greece
12	Olivia	Mark	olivia.mark99@outlook.com	Victoria University of Wellington, School of Geography, Environment and Earth Sciences, Wellington New Zealand
13	Grzegorz	Marut	grzegorz.marut@upwr.edu.pl	Wrocław University of Environmental and Life Sciences, Institute of Geodesy and Geoinformatics, Wrocław Poland
14	Nicu Marius	Mihai	nicu.mihai@inf.ro	University of Bucharest, Faculty of Physics, Atmosphere and Earth Physics, Bucharest Romania
15	Hannah	Proffitt	15hproff@ku.edu	University of Kansas, Dept. of Geology, Kansas United States of America
16	Vu	Thi Dung	dung.vu@ingv.it	University of Bologna, Dept. of Physics and Astronomy, Bologna Italy
17	Antriani	Varnava	avarnava@geo.auth.gr	Aristotle University of Thessaloniki, School of Geology, Thessaloniki Greece
18	Angelos	Zymvragakis	anzymvragakis@gmail.com	National and Kapodistrian University of Athens, Dept. of Geology and Geoenvironment, Athens Greece

Teachers

A/A	First Name	Last Name	E-mail Address	Affiliation
1	Gina	Correia	gina_maria@sapo.pt	Agrupamento de Escolas Latino Coelho, Lamego Portugal
2	Fotis	Danaskos	fdanas@yahoo.gr	8th Junior High School in Chalandri, Hellas
3	Luigi	De Filippis	luigidefilippis1@gmail.com	Liceo Spallanzani, Tivoli, Rome Italy
4	Carmen Eva	Hernández Romero	carne.hernandez@creixenterrassa.cat	Creixen Terrassa, Terrassa, Barcelona, Spain
5	Candan	Kafalı	candan26.ck@gmail.com	Küçükkuyu Fernur Sözen Ortaokulu, Küçükkuyu Turkey
6	Kiki	Makri	kikimakri@noa.gr	57th Junior High School of Athens, Athens Greece
7	Gordon	Neighbour	gneighbour@tggsacademy.org	Torquay Girls' Grammar School, Torquay, Devon, UK
8	Sophia	Pavlidou	sophiapvld@gmail.com	2nd Experimental High School of Kilkis, Kilkis Greece
9	Panagiota	Pierrou	nayapierrou@gmail.com	7th High School Chania, Chania Greece
10	Olympia	Tripolitsiotou	olytrip20@gmail.com	5th Middle High School, Palaio Faliro Greece
11	Chrysanthi	Tziortzioti	tziortzio@gmail.com	2nd Standard High School of Athens, Athens Greece
12	Eirini	Varotsou	eirini.varotsou@gmail.com	High School of Arkalochori, Arkalochori Greece

Curricula Vitae



Pierre Briole

Research Director
Ecole Normale Supérieure,
Paris Sciences et Lettres Research University,
Département des Géosciences

briole@ens.fr

Education

1990 Ecole Normale Supérieure de Cachan in applied physics. Agrégation 1983. PhD, University Paris VI, Paris

Career

2007-today Research Director CNRS
Ecole Normale Supérieure/Paris Sciences et Lettres Research University - Département des
Géosciences - Laboratoire de Géologie

2008-2009 09/2008-2009: Directeur des études,
2010-2013 2010-2013: Head of the Department

2004-2007 Research Director CNRS
Institut de Physique du Globe de Paris

2005-2006 Director of the laboratory of Geodesy

1990-2004 Chargé de Recherche CNRS
Institut de Physique du Globe de Paris - Département de Sismologie

1989-1990 Researcher
Institut Géographique National – Laboratoire d’Opto-Electronique et de Micro-
informatique

Research interests

Study of the deformation of volcanoes (Etna, Campi Flegrei, Vulcano (Italy), Piton de la Fournaise (France), Nisyros (Greece), Sakurajima (Japan) and seismic zones (Asal Rift (Djibouti), Gulf of Corinth (Greece), Northern Chile, Umbria (Italy), Algeria, Bulgaria) using various methods, including GPS, radar interferometry, high resolution imaging and local methods (tiltmeter, micro-gravity, ...).

Modelling of ground deformations and interpretation combining tectonic, geodetic, and seismological data.

Development of new technologies (Projects of satellites, ground based radars, robots).

Publications and services

73 articles in journals with peer review, 2951 citations

194 communications in international meetings

3 articles in outreach journals, participation to 4 educational &/or educative movies, several interviews in French radios, several lectures in schools

Coordinator of the “Insegnaci Etna” project <http://ietna.eu>



Athanassios Ganas

Research Director

Institute of Geodynamics, National Observatory of Athens

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Career

2012-2022	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, Hamiel Y, Serpetsidaki A, Briole P, Valkaniotis S, Fassoulas C, Piatibratova O, Kranis H, Tsironi V, Karamitros I, Elias P, Vassilakis E., 2022. The Arkalochori Mw = 5.9 Earthquake of 27 September 2021 Inside the Heraklion Basin: A Shallow, Blind Rupture Event Highlighting the Orthogonal Extension of Central Crete. *Geosciences*, 12(6):220. <https://doi.org/10.3390/geosciences12060220>

Mesimeri, M., Ganas, A., Pankow, K.L., 2022. Multisegment ruptures and Vp/Vs variations during the 2020-2021 seismic crisis in western Corinth Gulf, Greece, *Geophysical Journal International*, Volume 230, Issue 1, Pages 334–348, ggac081, <https://doi.org/10.1093/gji/ggac081>

Since May 2009 he serves as Member of the Greek National Committee for Seismic Hazard Assessment and the National Committee for Seismotectonics. In October 2021 he was elected President of the Geological Society of Greece. 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 and services group of the EPOS project <https://epos-ip.org/>. Since 2021 he is a member of the EPOS TCS-GNSS consortium Board.

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.



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Education

1981 B. Sc. In Geology – University of Thessaloniki, Greece
1984 Ph. D. Thesis in Seismology – University of Thessaloniki, Greece

Career

1985-1990 Research Assistant of the Geophysics Department of the Aristotle University of Thessaloniki
1985-1990 Lecturer
1990-1994 Assistant Professor
1994-2001 Associate Professor

Research interests

Long-term earthquake prediction on the basis of seismicity and probabilistic models
Studies of seismic sequences
Seismotectonics
Fault plane solutions and stress patterns
Source parameters by synthetic seismograms
Time dependent seismicity by the application of the Time Predictable Model.
Fractal analysis of the global seismicity and the seismicity of Greece
Stress evolution by the use of Coulomb Failure Function changes
Statistical Seismology
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.
Bountzis, 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.



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Education

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

Career

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

Research interests

Long-term earthquake prediction on the basis of seismicity and probabilistic models.
Studies of seismic sequences
Seismotectonics
Fault plane solutions and stress patterns
Tsunamis and tsunami hazard
Fractal analysis of the global seismicity and the seismicity of Greece
Stress evolution by the use of Coulomb Failure Function changes
Statistical Seismology
Seismic Hazard Assessment
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.



George Kaviris

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

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Education

- 1994 Graduated from the Faculty of Physics, National and Kapodistrian University of Athens (NKUA)
2003 PhD of Seismology, Section of Geophysics and Geothermics, Department 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 20 MSc and 24 BSc students. I am currently supervising 2 PhD Theses.

I have 191 publications in international scientific journals and congress proceedings. Among my publications for the Gulf of Corinth:

G. Kaviris, P. Elias, V. Kapetanidis, A. Serpetsidaki, A. Karakonstantis, 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. Bufféral, 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.

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.

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.



Maria Geraga

Associate Professor

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

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Education

PhD in Oceanography, Department of Geology, University of Patras, Greece

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,
Grenoble Universe Sciences Observatory (*OSUG*)

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Career

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

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). Besides, 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).

Publications and services

- 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



Haralambos Kranis

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National and Kapodistrian University of Athens
Department of Geology and Geoenvironment

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Education

Degree in Geology National and Kapodistrian University of Athens, Post-graduate Diploma, in Seismology, (International Institute for Seismology and Earthquake Engineering), Ph.D. in Geological Sciences, National and Kapodistrian University of Athens

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



Anna Serpetsidaki

Seismological Laboratory, Geological Department, University of Patras,
Patras, Greece

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Education

1999 BSc Geology, Geological Department, University of Patras, Greece

2004 PhD Seismology, Applied Geology and Geophysics, Geological Department, University of Patras, Greece

2005 Postdoctoral Research, Faculty of Mathematics and Physics, Department of Geophysics, Charles University of Prague, Czech Republic.

Career

2013 – today Faculty Member of Geology Department, Patras University

2000 – 2013 Researcher, Seismological Laboratory of Patras University

Research Interests

Ground Response Analysis, Seismic Hazard, Seismic Source Properties, Moment Tensor, Microseismic networks, Seismotectonics.

Publications and Services

Serpetsidaki, A., Sokos, E., Tselentis, G.-A. A ten year Moment Tensor database for Western Greece (2016) *Physics and Chemistry of the Earth*, 95, pp.2-9.

Serpetsidaki, A., Elias, P., Ilieva, M., Bernard, P., Briole, P., Deschamps, A., Lambotte, S., Lyon-Caen, H., Tselentis, G.-A. & Sokos, E. (2014), New Constraints from Seismology and Geodesy on the Mw=6.4 2008 Movri (Greece) Earthquake. Evidence for a Growing Strike Slip Fault System. *Geophysical Journal International*, 198 (3), pp. 1373-1386.

Serpetsidaki, A., Verma, N. K., Tselentis, G. A., Martakis, N., Polychronopoulou, K., & Petrou, P. (2013). Seismotectonics of Lower Assam, Northeast India, Using the Data of a Dense Microseismic Network. *Bulletin of the Seismological Society of America*, 103(5), 2875-2883.



Fiori - Anastasia Metallinou

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

ametal@noa.gr

Education

- 2009 Ph.D. in Space Physics, Aristotle University of Thessaloniki, National Observatory of Athens. Title of Thesis: “Development and Recovery of Magnetic Storms in Geospace”.
- 2001 M.Sc. Degree in Atmospheric and Environmental Physics, Aristotle University of Thessaloniki, Greece.
- 1998 Diploma in Physics, Physics Department, Aristotle University of Thessaloniki, Greece.
- 2008 Diploma in Classical Singing from the Athens Conservatory “Musical Horizons”.
- 2004 – 2006 Studies in the Faculty of Melodramatic State Conservatory, Thessaloniki, Greece.

Career

- 2014- present Lead Public Outreach Officer at the Thissio Visitor Center of the National Observatory of Athens (located at the historic site in the center of Athens).
- 2010-2013 Research Associate at the Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing of the National Observatory of Athens.

Research interests

Simulation of ion acceleration in the Earth's magnetosphere during magnetic storms and magnetospheric substorms.
Sonification of scientific data describing magnetospheric disturbances.
The use of the “sounds of space” in education, dissemination of Astronomy and the arts.

Publications and services

- F.-A Metallinou, “Pythagoras Redivivus: The Music of the Spheres and it’ s Reification in Modern Astronomy” 10th Congress of the International Society for the Interdisciplinary Study of Symmetry, Adelaide, Australia, 1-6 December 2016.
- E. Rovithis, F.-A Metallinou, A. Floros, “Hearing a magnetic storm: an Educational Interactive Audio Environment”, 8th Pan Hellenic Conference of Acoustics 2016, 3-4 October 2016, Athens.
- 2019: Scientific research, scenario and presentation of the documentary “*The Experiment of Eratosthenes*”, production: Cosmote TV.
- 2018: Scientific research, scenario and voice over of the documentary “*Time of Greece*”, production: Cosmote TV.

Awards and honors

She has received the Research Grant “HRAKLEITOS” with priority in Basic Research of the Ministry of Education of Greece (2002 - 2005) and the award of the “Barbanis Price of Astronomy” from the Aristotle University of Thessaloniki (1995).

She has been a TEDx speaker in 2014, 2018 and 2022. She contributes to the dissemination of Astronomy and Space Physics concepts with public lectures and articles in the media, newspapers, public journals, TV shows, documentaries and activities combining science and art. She has been an invited speaker by educational organizations, private and public schools, laboratory science centers of the Hellenic Department of Education, associations of amateur astronomers, cultural foundations, art and science festivals all over Greece.



Panagiotis Elias

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

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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-today 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 39 peer refereed publications in international journals, and more than 70 presentations in international conferences.

Publications and services

- 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
- 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
- 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>
- Roukounakis N., Elias P., Briole P., Katsanos D., Kioutsioukis 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
- 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.



Ioannis Spingos

PhD Candidate in Seismology
National and Kapodistrian University of Athens
Department of Geology and Geoenvironment
Section of Geophysics and Geothermics

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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.

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



Francesca Cifelli

Associate Professor
Dipartimento di Scienze
Università degli Studi di Roma TRE

francesca.cifelli@uniroma3.it

Education

2003 PhD

1997 Master's degree in Geology

Career

2015-today Associate Professor in Structural geology at the University of Roma TRE

2015-today Non permanent researcher in Structural Geology

2003-2007 Post-doc position

Research interests

Paleomagnetic rotations and structural evolution of curved mountain chains

Extension and dynamics of back-arc spreading in Mediterranean region

Recent tectonics in Central Iran

Neogene tectonic evolution of the Central Anatolian Plateau

Seismic effects in urban areas

Outreach activities

Publications and services

Author or co-author of 50 peer reviewed scientific papers in international and national journals. Participant at several national and international congresses (80 abstracts)

Reviewer of several international scientific journals on structural geology, magnetic fabric, paleomagnetism and tectonic topics.

Participant at several research projects (EU, National, and International).

Member of Educational Committee of Education (CoE) of the European Geosciences Union (EGU) for the organization of the GIFT (Geophysical Information for Teachers) workshop



Fotios Danaskos

Geologist, School Teacher

8th Junior High School in Chalandri, HELLAS

fdanas@yahoo.gr

Education

- 2008 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.
- 2004 National and Kapodistrian University of Athens Hellas, Department of Communication & Media Studies, Annual Teacher Training Seminar, "Professional Identity and Communication Counseling".
- 1994 Technological Educational Institute of Athens Hellas, Faculty of Health and Caring Professions, Physiotherapy Department, BSc.
- 1986 National and Kapodistrian University of Athens Hellas, Department of Geology, Athens, BSc.

Career

- 1997 – 2007 Freelance Physiotherapist
- 1994 - 2013 Physiotherapist School Teacher
- 2013- 2022 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

Member of the team of trainers B on the new curricula and teaching materials in the course Geology - Geography in Secondary Education, MIS 5035543

E.G.U. Education Field Officer



Jean-Luc Berenguer

Science Teacher - Education team member
GEOAZUR Laboratory (University Côte d'Azur)

berenguer@unice.fr

Education

Science Teacher (Biology and Geosciences) in France. Agrégation 'Biology-Geology' (University Aix Marseille)

Career

since 2022 EGU Committee of Education Chair
since 2017 EduMed Observatory project leader - University Côte d'Azur
2017-today IESO 2017 FRANCE - Organization Committee President
2014 - 2022 InSight Education project leader in France
2006 - 2017 French educational seismological network leader
since 1996 Education & Outreach team – UMR Geoazur, University Côte d'Azur
1994 - 2019 Science teacher – International High School Valbonne, France

Research interests

As a science teacher, I am interested in the link between science and society, and in the importance of disseminating scientific culture to the general public and more particularly to school children. I had, since 25 years, the opportunity to set up various educational projects whose objectives were to bring together the world of Research and Education around the geosciences.

Publications and services

Berenguer, J-L., Book, SISMO Collector, DDTM 06, 2020
Berenguer, J-L., Balestra, J., Jouffray, F., Mourau, F., Courboux, F., and Virieux, J.: 25 years of seismology at school in France, Geosci. Commun. Discuss., <https://doi.org/10.5194/gc-2020-32>, 2020.
Balestra J., Berenguer J-L., F. Bigot-Cormier, F. Courboux, L. Rolland, D. Ambrois, M. Van Driel, and P. Lognonné (2020) The InSight Blind Test: An Opportunity to Bring a Research Dataset into Teaching Programs, SRL - doi: 10.1785/0220190137. Volume 91, Number 2A, March 2020
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 , 2017
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.

Awards and honors



French 'Palme Académique' Officer (2018)



Vasiliki Kouskouna

Professor
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Department of Geology and Geoenvironment
Section of Geophysics and Geothermics

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Education

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

Career

2021-today Professor, NKUA
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. (in Greek)
- A. Kourou, M. Panoutsopoulou, O. Vaggelatou, I. Bergiannaki, N. Petropoulos, I. Parcharidis, V. Kouskouna, 2005. "Earthquakes and society – Education, Protection, Recovery". Patakis Editions, 40pp. (in Greek)
- 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*,
- Kassaras I, Kapetanidis V, Ganas A, Tzani 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,
- 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.
- Kouskouna et al. (2022). Projects INFRASEPTEL, KNETSEISRL ACTCIPROL: towards a state-of-the-art centre for the study of earthquakes in Lixouri (W. Kefalonia, Greece). 3rd European Conference On Earthquake Engineering & Seismology, Bucharest, Romania, 2022

Awards and honors

Fulbright Scholar Award (2017)



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

- 2015 PhD, Department of Geology, Aristotle University of Thessaloniki. Prof. Spyridon Pavlides. Study of historical development of geological education in Greece, (Greece).
- 2007 M.Sc., 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).
- 2005 B.Sc., Department of Geology, Aristotle University of Thessaloniki Prof. Michalis Fytikas, Study of geothermal research methods, (Greece).

Career

- 2020 - 2021 Postdoctoral Researcher, Institute and department: Institute of Environmental Research and Sustainable Development of National Observatory of Athens.
- 2019 - 2020 Educator at the school program "Sustainable Planet", Stavros Niarchos Foundation Cultural Center, Athens.
- 2017 - 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.

Publications and services

- Makri Kyriaki, 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>.
- 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.
- Makri Kyriaki, S.B. Pavlides. Classification of contents of Geoscience in secondary curricula in Greece, 1830-2015. 14th International Congress, Thessaloniki, May 2016.
- Makri Kyriaki & 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.



Olga-Joan Ktenidou

Associate researcher

National Observatory of Athens, Institute of Geodynamics

olga.ktenidou@noa.gr

Education

2021 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
2008 National Autonomous University of Mexico, Visiting researcher
2004 Imperial College London, MSc in Soil Mechanics and Engineering Seismology
2003 Aristotle University Thessaloniki, Greece, Diploma in Civil Engineering

Career

2018 – today 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 - today: Head of NOA seismic monitoring and analysis group
2019 - today: Executive Committee of EFEHR (European Facilities for Earthquake Hazard & Risk)
2019 - today: User Feedback Group of EU consortium EPOS (European Plate Observing System)
2018 - today: 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



Vassilis Sakkas

Laboratory Teaching Personnel
National and Kapodistrian University of Athens
Department of Geology and Geoenvironment
Section of Geophysics and Geothermics

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Education

- 1999 Ph.D. in Geophysics - University of Leicester, UK.
Research project: “Combined Transient Electromagnetic and Magnetotelluric study across southern Kenya Rift Valley”
- 1994 BSc in Physics - National and Kapodistrian University of Athens

Career

- 2000-2015 Research Associate in Space Application Research Unit in Geosciences, Department of Geophysics & Geothermics,
- 2015-today Laboratory Teaching Personnel, Department of Geophysics and Geothermics, NKUA

Research interests

Exploration geophysicist with twenty five years experience in field operations and R&D with emphasis on processing and interpretation of multiple geophysical (Electromagnetic, magnetic, gravity, seismic) data to investigate earth's interior.

Great experience in collecting, processing and interpretation of geodetic data (GNSS) and joint interpretation and modelling of GNSS and interferometric data for ground deformation monitoring due to tectonic, seismic, volcanic or manmade (water/oil extraction) reasons. Person in charge of the permanent GNSS stations of NKUA. Expert in processing of GNSS data using Bernese v5.2 software.

Publications and services

- Tzanis, A., Chailas, S., Sakkas, V., Lagios, E., **2020**. “Tectonic deformation in the Santorini volcanic complex (Greece) as inferred by joint analysis of gravity, magnetotelluric and DGPS observations” *Geophys. J. Int.* **220**, 461–489. doi: 10.1093/gji/ggz461
- Sakkas, V., Lagios, E. **2017** "Ground deformation effects from the ~M6 earthquakes (2014–2015) on Cephalonia–Ithaca Islands (Western Greece) deduced by GPS observations” *Acta Geophysica*,65,1,207-222, Springer International Publishing, DOI: 10.1007/s11600-017-0017-x).
- Sakkas, V., Lagios, E., **2015** "Fault modelling of the early-2014 ~M6 Earthquakes in Cephalonia Island (W. Greece) based on GPS measurements” *Tectonophysics*,644,184-196, Elsevier. DOI 10.1016/j.tecto.2015.01.010.

Awards and honors

2017 “Academy of Athens” Reward “Dimitrios Lampadarios” for research publication on geodesy for the paper: «*Fault modelling of the early-2014 ~M6 Earthquakes in Cephalonia Island (W. Greece) based on GPS measurements*» [Tectonophysics, Vol. 644-645 (2015) pp. 184-196].



Jan Mrlina

Senior geophysicist
Institute of Geophysics, Czech Academy of Sciences,
Dept. of Applied Geophysics

jan@ig.cas.cz

Education

MSc. obtained from Charles University in Prague, Faculty of Natural Sciences, Ph.D. received from the same university

Career

- | | |
|-------------|---|
| 1993-recent | Institute of Geophysics: Senior researcher, Head of Gravity group, research projects leader, occasional lecturer abroad |
| 1980-1992 | Geofyzika Brno Co.: Exploration geophysicist, later Head of Gravity Dept. |

Research interests

Application of gravimetry and gravity surveys to oil&gas exploration, other minerals exploration, volcanology, tectonics, geodynamics, geoengineering and archaeology

Publications and services

- Long-term contract with coal mining company for landslide hazard monitoring in open-pit mine. 3 selected papers:
- Mrlina, J. (2004): Structures and tectonics derived from gravity survey around Aigion, Gulf of Corinth, Greece. – *Proceed. 5th Int. Symp. on Eastern Mediterranean Geology*, 14-20 April, 2004, Thessaloniki, Greece, Vol.1, p. 138-140.
- Mrlina, J., Kämpf, H., Kroner, C., Mingram, J., Stebich, M., Brauer, A., Geissler, W.H., Kallmeyer, J., Matthes, H. and Seidl, M. (2009): Discovery of the first Quaternary maar in the Bohemian Massif, Central Europe, based on combined geophysical and geological surveys. – *J. Volc. Geoth. Res.*, 182, 97-112.
- Klanica R., Kadlec J., Tábořík P., Mrlina J., Valenta J. & Kováčiková S., et al. (2020). Hypogenic versus epigenic origin of deep underwater caves illustrated by the Hranice Abyss (Czech Republic) - The world's deepest freshwater cave. *Journal of Geophysical Research: Earth Surface*, 125, e2020JF005663

Awards and honors

- Honorary Member of Myanmar Association of Petroleum Geologists (2017) Platinum Member of EAGE.
- Award of Arabian Association of Geophysics and Astronomy for life-long contribution to the development of gravimetry in Egypt (2021).



George Tsoflias

Professor
The University of Kansas
Department of Geology
1414 Naismith Dr., 354 Ritchie Hall
Lawrence, KS 66045, USA

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Education

I received B.S. (1989) and M.S. (1991) degrees in Geophysics from Virginia Polytechnic Institute and State University, and a Ph.D. (1999) in Geological Sciences from The University of Texas at Austin, USA.

Career

2017 - today	Professor, Applied Geophysics, The University of Kansas, Lawrence KS, USA
2009 – 2017	Associate Professor, Applied Geophysics, The University of Kansas, Lawrence, KS, USA
2003 – 2009	Assistant Professor, Applied Geophysics, The University of Kansas, Lawrence, KS, USA
1999 – 2003	Exploration Geophysicist, US Department of the Interior, MMS, New Orleans, LA, USA
1996 – 1998	Exploration Geophysicist, Jones Energy Ltd., Austin, TX, USA
1991 – 1995	Exploration Geophysicist, Mobil Exploration & Producing US, New Orleans, LA, USA

Research interests

My research has focused on geophysical imaging of fractures and monitoring flow and transport in fractured rocks, geophysical imaging of polar ice sheets, application of geophysical methods to archaeology, and most recently seismic characterization of carbonate reservoirs in Kansas, seismic monitoring of CO₂ storage, and monitoring of induced seismicity in the US midcontinent.

Publications and services

Nolte K.A., Tsoflias G.P., Holubnyak Y., Hollenbach J. and D. Wreath (2022), Designing Monitoring Networks for Local Earthquakes, *Journal of Geophysics and Engineering* (Oxford), Vol 19, p. 75-84, <https://doi.org/10.1093/jge/gxab075>

Liu L., Shi Z.M., Tsoflias G.P., Peng M. and Y. Wang (2022), Detection of Karst Voids at Pile Foundation by Full-waveform Inversion of Single Borehole Sonic Data, *Soil Dynamics and Earthquake Engineering* (Elsevier), Vol 152, 107048, <https://doi.org/10.1016/j.soildyn.2021.107048>.

Nolte K.A. and G.P. Tsoflias (2021), Identifying Direct SP-Converted Waves Constrains Local Induced Earthquake Depths, *Seismol. Res. Lett.* 92, 3801-3810, <https://doi.org/10.1785/0220200385>

Liu L., Shi Z., Tsoflias G.P., Peng M., Liu C., Tao F. and C. Liu (2021), Detection of Karst Cavity Beneath Cast-in-Place Pile Based on Instantaneous Phase Difference of Two Receiver Recordings, *Geophysics*, Vol 86, No 1., p. EN27-EN38, <https://doi.org/10.1190/geo2020-0082.1>

Awards and honors

2021 – 2022 Chancellors Club Teaching Professorship, The University of Kansas

2022 & 2017 Greek Diaspora Fellowship Program, S. Niarchos Foundation, Inst. of Intrntl. Education, Fulbright of Greece

2009 – 2010 Visiting Professorship of Hydrogeophysics, Politecnico di Torino, Italy

2009 Herbette Fellow, Institute of Geophysics, University of Lausanne, Switzerland



Emmanuel Vassilakis

Associate Professor in Remote Sensing & Tectonic Geomorphology
Director of Remote Sensing Laboratory
National and Kapodistrian University of Athens
Department of Geophysics and Geothermics

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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

2021	Associate Professor National and Kapodistrian University of Athens
2016	Assistant Professor National and Kapodistrian University of Athens
2012	Lecturer National and Kapodistrian University of Athens
2003	Researcher National and Kapodistrian University of Athens
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 700 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).



Michael Foumelis

Assistant Professor
Aristotle University of Thessaloniki

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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

2017 – today	Senior Researcher in Remote Sensing at BRGM
2014 – 2017	Earth Observation scientist at ESA-ESRIN
2012 – 2014	Research Fellow at ESA-ESRIN
2010 – 2012	Adjunct Lecturer (Academic staff under contract) at HUA
2006 – 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.



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

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-today 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

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>.
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.
Papageorgiou, E., Foumelis, 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"



Zafeiria Roumelioti

Assist. Prof. of Seismology and Geophysics
University of Patras, Department of Geology

zroumelioti@upatras.gr

Education

- 1997 Diploma in Geology, Aristotle University of Thessaloniki
- 1999 MSc in Geophysics, Department of Geology, Aristotle University of Thessaloniki
- 2003 PhD in Seismology, Department of Geology, Aristotle University of Thessaloniki

Career

- 2019 Assist. Prof. of Seismology and Geophysics, Department of Geology, University of Patras
- 2007 Research/Teaching Staff, Dept of Geology/Dept. Civil Engineering, Aristotle University of Thessaloniki
- 2006 Researcher in Seismology, Institute of Geodynamics, National Observatory of Athens
- 2005 Geologist, Prefecture of Chalkidiki, Northern Greece

Research interests

- Kinematic modeling of earthquake sources
- Variability of strong ground motion due to source and site effects
- Near-fault effects on strong ground motion
- Simulation of strong ground motion using both deterministic (Empirical Green's Functions) and stochastic approaches with emphasis on the incorporation of the finite-source and directivity effects
- Near real-time applications for the computation of earthquake source parameters (fast moment tensors) and shake maps for earthquakes in areas covered by sparse networks
- Study of non-linear site response during earthquakes
- Seismicity studies (relocation, determination of source parameters, seismotectonic implications)
- Seismic Hazard
- Earthquake Early Warning
- Shallow geophysics exploration

Publications and services

- Articles published in peer reviewed, SCI journals: **43**; Full articles in conference proceedings: **38**; Abstracts: **42**
- Greece's National Representative/Review Panel Member for the COST Association Open Calls since 2017, OC_2018-2, OC-2019-1, OC-2021-1, Cost Association, Belgium)
- BoD nominated member of the ORFEUS Executive Committee since July 2022
- Reviewer for 13 international scientific journals and several national and international conferences since 2003



Niki Evelpidou

Professor

National and Kapodistrian University of Athens

Department of Geology and Geoenvironment

evelpidou@geol.uoa.gr

Education

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. 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”.



Anna Karkani

Postdoctoral researcher
National and Kapodistrian University of Athens
Department of Geology and Geoenvironment

ekarkani@geol.uoa.gr

Education

- 2009 BSc in Geology and Geoenvironment, National and Kapodistrian University of Athens
- 2012 MSc in Oceanography and Management of Marine Environment
- 2017 PhD “Study of the geomorphological and environmental evolution of the coastal zone of Central Cyclades”

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

- 2020-2021 Scholarship for postdoctoral research by State Scholarships Foundation
- 2012-2016 Scholarship from National & Kapodistrian University of Athens for PhD studies
- 2014 DAAD scholarship for training on OSL–Optically Stimulated Luminescence on beachrocks



Akis Panagis

Civil Engineer MSc University of Patras

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

2008-today: 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-Vlams, 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-Vlams, 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



Spyros Sergiou

PhD candidate
Laboratory of Marine Geology and Physical Oceanography
Department of Geology
University of Patras

sergiou@upatras.gr

Education

- 2016-today PhD student. PhD thesis: *“Paleoceanographic and stratigraphic investigation in two semi-closed basins during Late Quaternary: The southern Red Sea and the Gulf of Corinth. Effects of sea-level changes and regional climate dynamics”*
- 2015 MSc in Environmental Oceanography, Dep. of Geology, Univ. Patras. Title of MSc thesis: *“Recent sedimentary processes in the Western gulf of Corinth, Greece”*. In co-operation with: University of Savoy (ISTerre - Institut des Sciences de la Terre), France and University of Liege, Belgium.
- 2012 B.Sc. in Geology, University of Patras, Greece

Career

- 2014-today Research Associate in the Laboratory of Marine Geology and Physical Oceanography, Dept. of Geology, University of Patras

Research Interests

Marine geology,
sedimentology,
paleoceanography

Publications and services

- Sergiou S, Geraga M, Rohling EJ, Rodríguez-Sanz L, Hadjisolomou E, Paraschos F, Sakellariou D, Bailey G (2022). Influences of sea level changes and the South Asian Monsoon on southern Red Sea oceanography over the last 30 ka. *Quaternary Research* 1–19. <https://doi.org/10.1017/qua.2022.16>
- Pechlivanidou S, Sergiou S, Geraga M, Gawthorpe R, Antoniou D, Angelopoulou D, Ford M, Fabregas N, (2020). Controls on stratigraphic variability in a semi-closed rift basin over the Late Quaternary, Gulf of Corinth, Greece. *EGU General Assembly 2020*. <https://doi.org/10.5194/egusphere-egu2020-11898>
- McNeill, L.C., Shillington, D.J., Carter, G., Everest, J., ...Sergiou, S., et al, (2019). High-resolution record reveals climate-driven environmental and sedimentary changes in an active rift, *Scientific Reports*, 9 <https://doi.org/10.1038/s41598-019-40022-w>
- Sergiou S, Beckers A, Geraga M, Papatheodorou G, Iliopoulos I, Papaefthymiou H, 2017. “Recent sedimentary processes in the western gulf of Corinth, Greece. Seismic and aseismic turbidites” *Bulletin of the Geological Society of Greece*, 50, 383-391

He is Assistant tutor for undergraduate and graduate courses, and BSc and MSc theses. He has participated in research & industrial projects. He is member in both offshore and onshore science parties of 'IODP Expedition 381- Corinth Active Rift Development' serving as a sedimentologist.

Awards And Honors

VISTA Visiting Scholar 2018, 2019. Department of Earth Science, University of Bergen, Norway.

PhD scholarship of General Secretariat for Research and Technology (GSRT) – Hellenic Foundation for Research and Innovation (HFRI).



Dora Katsonopoulou

Professor of Archaeology
The Institute for Archaeology of Paros
& the Cyclades, President
The Helike Project, Director

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eliki@otenet.gr

Education

- 1990 Ph.D. in Classical Archaeology, Department of Classics, Cornell University
- 1984 Post-Graduate Degree in Byzantine and Modern Greek Studies, Department of Byzantine and Modern Greek Studies, University of Athens.
- 1983 Post-Diploma S.E.L.M.E., Teaching Training Graduate Seminars, Greek Ministry of Education.
- 1973 B.A. in History and Archaeology, Department of History and Archaeology, University of Athens, 1973 (Class Valedictorian).

Career

- 2006-today Adjunct Professor, Classical Civilization, Department of Languages, Literatures and Cultures, Windsor University, Canada.
- 2002-today Instructor, Graduate School in Geoarchaeological Studies, Department of Geology, University of Patras.
- 1996-1998 Assoc. Professor of Classical Archaeology, The College of Southeastern Europe, The American University of Athens.
- 1991-1994 Ass. Professor of Classical Archaeology, The College of Southeastern Europe, The American University of Athens.
- 1988-1990 T.A., Classical Archaeology, Department of Classics, Cornell University
- 1987 Instructor, Modern Greek, Department of Classics, Cornell University.
- 1976–1993 Instructor of Ancient & Modern Greek Literature and History in Public Education
Greek Ministry of Education, Greece.
- 1975–1976 Instructor of Ancient & Modern Greek Literature and History in Private Greek
Education, High School, Aigion, Greece.

Publications and services

- McConnan Borstad, C., S. Garvie-Lok and D. Katsonopoulou 2018. «Diet at Ancient Helike (Achaea, Greece) based on stable isotope analysis: From the Hellenistic to the Roman and Byzantine periods.» *JAS Reports* 18:1-10.
- Kormann, M., Katsonopoulou, D., Katsarou, S., and Lock, G. 2018. «Methods for developing 3D visualizations of archaeological data: a case study of the early bronze age Helike Corridor House.» *STAR: Science & Technology of Archaeological Research*, 3:2, 478-489.
- Katsonopoulou, D. 2018. «Famous Sculptures by Classical Greek Masters in Parion and the Troad». In *International Symposium of Propontis and the Surrounding Cultures – From Prehistory to the End of Antiquity*, 70. Biga-Canakkale.

Awards and honors

- Greek National Scholarship for Academic Achievement, 1970-1973.
- Valedictorian for graduating Class of University of Athens, 1973.
- Valedictorian for graduating Class of Graduate Seminars of Greek Ministry of Education, 1983.
- Cornell University Scholarship, 1986-1990.

ABSTRACTS

Why CRL?

Pierre Briole,

Ecole Normale Supérieure,

Paris Sciences et Lettres Research University, Département des Géosciences

The Western part of the Corinth Gulf presents a high level of micro-seismicity which varies in time. In the early 2000s, the Corinth Rift Laboratory network (CRLnet) was established, now covering a $30 \text{ km} \times 30 \text{ km}$ area in the WGoC, with the installation of a local network around Aigio to follow the seismicity on the Aigio fault. Due to the important seismicity and aiming to a better understanding of the fault system, the network increased progressively towards the west, with the participation of many institutions. The present state of the network was reached in 2013 and allows to address important scientific questions on the deformation of the crust in the area and the potential for large earthquakes:

- Distribution of main faults, migration of the deformation towards offshore faults.
- Near fault damaging in the upper crust.
- Clustering of microearthquakes: what are the dimensions of the related fault segments? How are they connected with the faults that are related with the occurrence of the recent main events?
- How can the observed deformation be explained? What is the part controlled by the seismicity?
- Which is the role of fluids in the micro-seismicity
- How are the faults of the upper crust connected with the large earthquakes?
- Can we observe creeping on low dipping normal faults?

To address these questions, CRLnet comprises 80+ permanent stations, equipped with seismometers, accelerometers, Global Navigation Satellite Systems (GNSS), tide gauges and strainmeters. It enables detailed monitoring of the fluctuations of the intense microseismicity and deformation. The seismicity in the Western Gulf of Corinth is clustered in time and space, with episodic seismic sequences, for example, the 2003–2004 offshore, the 2013 Helike and the 2015 Malamata swarms. GNSS recordings and Interferometric Synthetic Aperture Radar (InSAR) revealed the deformation sources of moderate earthquakes and the likely existence of aseismic slip at shallow depth in some places. In addition, significant research has been performed on fault mapping.

CRL is one of the Near- Fault Observatories (NFO) of the European Plate Observing System (EPOS), and the only with an international status. It is administered and maintained by the Centre National de la Recherche Scientifique (CNRS-France), the National and Kapodistrian University of Athens (NKUA-Greece), the University of Patras (UPAT-Greece), and the National Observatory of Athens (NOA-Greece), with the participation of Charles University Prague (CUP-Czech Republic).

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

Pierre Briole

Ecole Normale Supérieure,

Paris Sciences et Lettres Research University, Département des Géosciences

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. This lecture will also prepare the hand-on GPS instruments presented on Saturday and the GPS observations in the field presented on Sunday

Seismic Parameters and Microseismicity in the Gulf of Corinth

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Aristotle University of Thessaloniki

School of Geology

Geophysics Department

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° 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° , 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.

Large Earthquakes and Focal Mechanisms in the Gulf of Corinth

George Kaviris

National and Kapodistrian University of Athens

Department of Geology and Geoenvironment

Section of Geophysics and Geothermics

The Gulf of Corinth is a “natural laboratory” for seismology and geosciences, as it is characterized by high tectonic activity, with the bulk of 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 the northern and southern sides. GNSS measurements at 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 close to 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 local 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, and some in the Gulf of Corinth, indicate strike-slip faulting.

Off-shore faults imaging and monitoring in the Corinth Rift

Maria Geraga

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Acoustic is fundamental energy to the mapping of seafloor. Sophisticated equipment produces sound waves which radiate in all directions away from the source. When the sound waves moving through water hits the sea floor, some of it is reflected, some is transmitted to the seafloor, some is refracted, and some is scattered. The basic components of a sound wave are frequency, wavelength and amplitude.

Sound energy is used for the acquisition of seismic profiles and for the seafloor topography and texture. During the seismic profiling the transmitted acoustic energy is reflected from boundaries developed by changes in the acoustic impedance of the subsurface geology. Changes in acoustic impedance (density of the medium times the velocity of the sound within that medium) can generally be thought of as changes in density which indicate transitions from one stratigraphic layer to another. The sub-bottom profilers operate at different frequencies and this has an effect on the depth of acoustic penetration into the seabed and the resultant resolution. The reflected acoustic signal is received by hydrophones or by a transducer.

Sidescan sonar is an acoustic device used to provide wide-area, high-resolution 2D images (called "sonographs") of the seafloor. A towing sonar (usually called "tow-fish") emits and later receives the acoustic energy in a specific frequency range. The acoustic energy received by the sidescan-sonar (backscatter) provides information for the morphology of the seafloor and the texture of the sediments covering the seafloor.

During the field trip the students will get experience of modern seafloor surveying techniques. They will have the opportunity to collect subbottom profiling data sets by the operation of a high resolution Chirp sub bottom profiling system (Fig. 1a, c, d) and at the same time to collect side scan sonar data operating a EG&G 272 TD dual frequency (100 and 500 kHz) side scan sonar system (Fig. 1b, c, d). The field trip has been designed to survey areas from the western Gulf of Corinth covering the recent deltaic deposits of Mornos river (Fig.2). The acquired data sets will be processed by sophisticated software for interpretation.

Sources:

1. Fish, J.P. and H.A. Carr, 1991, Sound Underwater Images, A guide to the generation and interpretation of sidescan sonar data, second edition, Lower cape Publishing, Orleans, MA,
2. Trabant, P.K. Applied High-Resolution Geophysical Methods Offshore Geoenineering Hazards; D. Reidel Publishing Company: Boston, MA, USA, 1984; p. 265
<http://www.oceanus.upatras.gr>

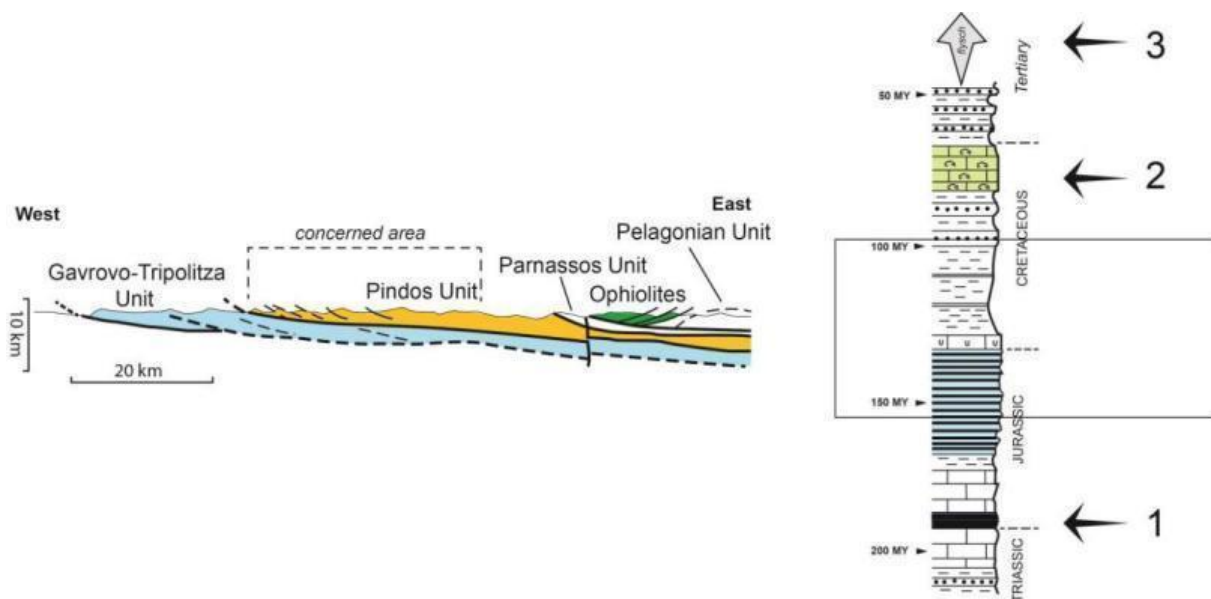
Age, origin and history of the rocks that can be found along the north coast of the Corinth Rift, preparation in the classroom of the geological field trip of Sunday morning

Christian Beck

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

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*.



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

Haralambos Kranis

National and Kapodistrian University of Athens

Department of Geology and Geoenvironment

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.

Use of CRL data for detailed seismological studies

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The rift of Corinth in Greece has been long identified as a site of major importance for earthquake studies in Europe, producing one of the highest seismic activities in the Euro-Mediterranean region. The occurrence of earthquakes of magnitude greater than 5, the north–south extension up to 1.5 cm/year, the frequent seismic swarms, and the destructive historical earthquakes, indicate the Corinth rift as an area of major seismological interest, leading in the last decades to the development of the Corinth Rift Laboratory (CRL, <http://crlab.eu>) project, concentrated in the western part of the rift. The CRL seismological network was installed in April 2000 operating complementary to the existing networks of HUSN (Hellenic Unified Seismic Network) and its primary objective is to provide continuous monitoring of the seismicity and accurate locations of events down to magnitude 1 in order to constrain active structures at depth in this restricted area.

Today the Corinth Rift Laboratory operates a dense seismological array of 11 stations with 2Hz seismometers, 9 stations with broad band seismometers and one antenna of 7 broad band stations. Furthermore, the CRL arrays of gravity stations, tide gauges, GPS stations and meteorology fulfill the objective of continuous monitoring of the area. All seismological stations are transmitted in real time and merged to provide real time earthquake location. The seismological data are available since April 2000 and are both automatically and manually processed in order to study the major events and aftershock sequences but also the seismic swarms, which take place frequently in the area. The various monitoring arrays of CRL have produced new, high resolution, data allowing a better understanding of the seismicity and deformation pattern of the western rift of Corinth, and an improved assessment of the related seismic hazard.

Historical elements for sciences and observatories

Fiori-Anastasia Metallinou

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

The National Observatory of Athens was established in 1842 and it is the first Research Institute in Greece. An important service it used to provide to public, from 1846 until 1964 was the calculation of the “Official Time of Greece”. The “Service of Time” used to be one of the most important services provided by observatories, as well as meteorological measurements and geodynamic studies. During the current talk historical instruments, scientific measurements, data and services provided by an observatory, during the previous centuries, will be presented.

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

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Department of Geology and Geoenvironment

Section of Geophysics and Geothermics

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.

Triangulating the location by using travel-time curves is one of the simplest (and least accurate) methods to find the position of an earthquake. Modern location techniques involve sophisticated software that use tens or hundreds of phase arrivals.

Sky gazing

Fiori-Anastasia Metallinou

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

During this activity we are going to observe the constellations of the night sky and some planets of our solar system. The brightest stars visible by naked eye and their characteristics will be mentioned. The connection between the constellations and the Greek mythology will be presented.

Earthquakes in the classroom: “the seismo-box: do it yourself”

Francesca Cifelli¹ & Fotios Danaskos²

¹ Università degli Studi Roma TRE, Italy

² 8th Junior High School in Chalandri, Greece

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

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

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

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

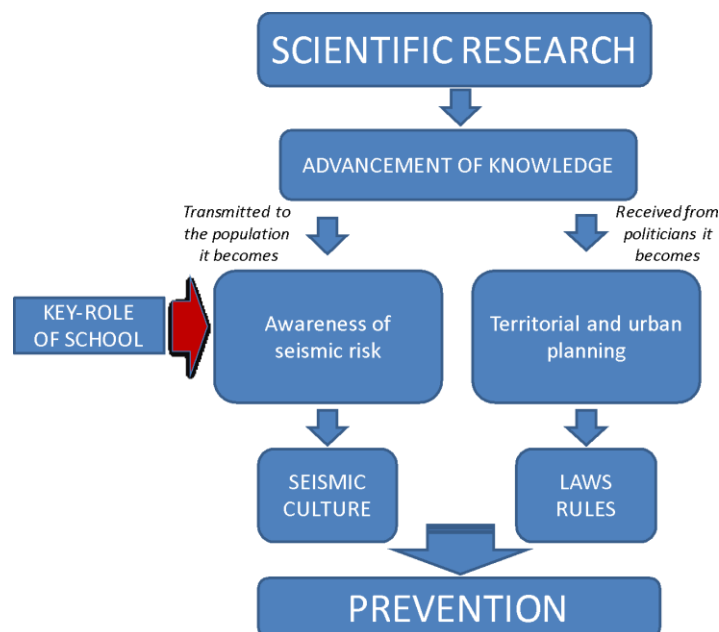


Fig. 1 Modified from Ciaccio and Cultrera ‘Terremoto e rischio sismico’ (Ediesse Ed.)

Tuned in to the Earth: Using data online at school

Jean-Luc Berenguer

GEOAZUR Laboratory (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.

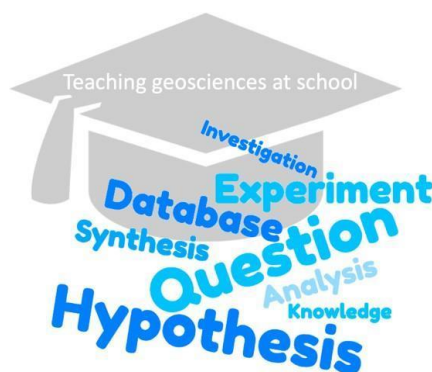
The University Côte d'Azur, with the program called Educational Mediterranean Observatory ("EduMed-Obs", <http://edumed.unice.fr>), focuses on implementing an interface based on a geoscience dataset concerning the Mediterranean basin. EduMed-Obs also provides datasets from research centers. These datasets 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/data-center/seismo/>

and Tectoglob3D, the software online > <https://www.pedagogie.ac-nice.fr/svt/productions/tectoglob3d/>



Tuned in to the Earth : Using data online



The earthquake suitcase

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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.

Results from educational applications to schools in Greece (Athens, Lixouri) and the US (Boulder, CO) are presented.

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

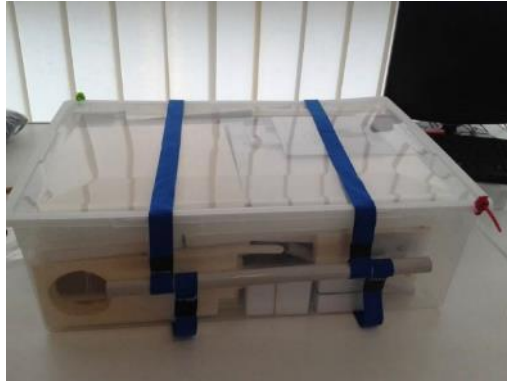
Diffucion of seismobox in hellenic schools

Fotios Danaskos

8th Junior High School in Chalandri, Greece

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.



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.

ARE EARTHQUAKES PREDICTABLE?

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

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' PIANET....

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.

Incorporating the seismobox into school teaching

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.

Physical mechanisms behind seismic site response - Some examples from Aegion

Olga-Joan Ktenidou

National Observatory of Athens, Institute of Geodynamics

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.

Ground Deformation Studies in Seismic Active Areas using Local GPS/GNSS networks. The Case of Central Ionian Islands and Patras Gulf

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Department of Geology and Geoenvironment

Section of Geophysics and Geothermics

Satellite geodesy (GPS/GNSS) and satellite radar Interferometry (InSAR) are the main techniques that are been used over the last few decades to study ground deformation in tectonic active areas. In early 90's the Department of Geophysics and Geothermics of NKUA started to install several local benchmark GPS networks in tectonic active areas of Greece in an effort to study and monitor the ground deformation due to tectonic and seismic forces. On the framework of this work small local GPS networks were established in Patras Gulf (1994) in Cephallonia and Ithaca Islands (2001) and to Zakynthos Island (2005). These networks were designed aiming to study the ground deformation in both local and regional scale. The number of the benchmark stations and their position was selected in a way to fully cover the study areas, measuring the ground deformation along major/regional and minor/local faulting zones and also to study motion of the neotectonics blocks that were defined in the selected areas. The networks were remeasured periodically, and after few re-measurement periods that lasted 5-10 years, provided sufficient evidences of both the regional and local kinematic regime of the study areas. When strong seismic events occurred in the vicinity of the GPS networks the results offered more insight on the activated faults. The displacement vectors associated with the co-seismic motions as well as with the post-seismic relaxation period were the main elements to describe the motions along the seismogenic fault planes, via modelling procedures. Moreover, special effort was given to define pre-seismic displacements that could be associated with the forth coming seismic events, in order to contribute to the earthquake prediction studies.

Based on the GPS results from the local networks in Patras Gulf and in central Ionian Islands regional and local scale motions were detected and interpreted jointly with the tectonic, geologic, seismic and interferometric data that were available aiming to define the seismic status of the study areas. Pre-seismic motion patterns were defined, co-seismic displacements were calculated and post-seismic relaxation behavior was identified in the complex tectonic environment of the western Greece.

Since 2008 in the broader area of Patras Gulf and Central Ionian islands permanent GNSS stations were started to established providing a daily image of the ground motion, and accurately define the velocity field of the area. The data from the permanent GNSS stations were elaborated with the campaign data providing a more detailed image of the ground deformation occurred in this area, as well as the strain filed that is controlled by the local and regional tectonism.

The combination of the satellite geodetic data (GPS/GNSS) with the interferometric results succeed to accurate map the spatial and temporal ground deformation and kinematic status of the Central Ionian and Patras Gulf, providing crucial tools towards the better understanding of the current seismic status of the area. The results are expected to enable the scientists to better evaluate the seismic and associated hazards, in such tectonically active areas and planning processes in respect to minimis damages from future strong seismic events.

Introduction to the Differential SAR Interferometry for measuring ground deformation

Panagiotis Elias

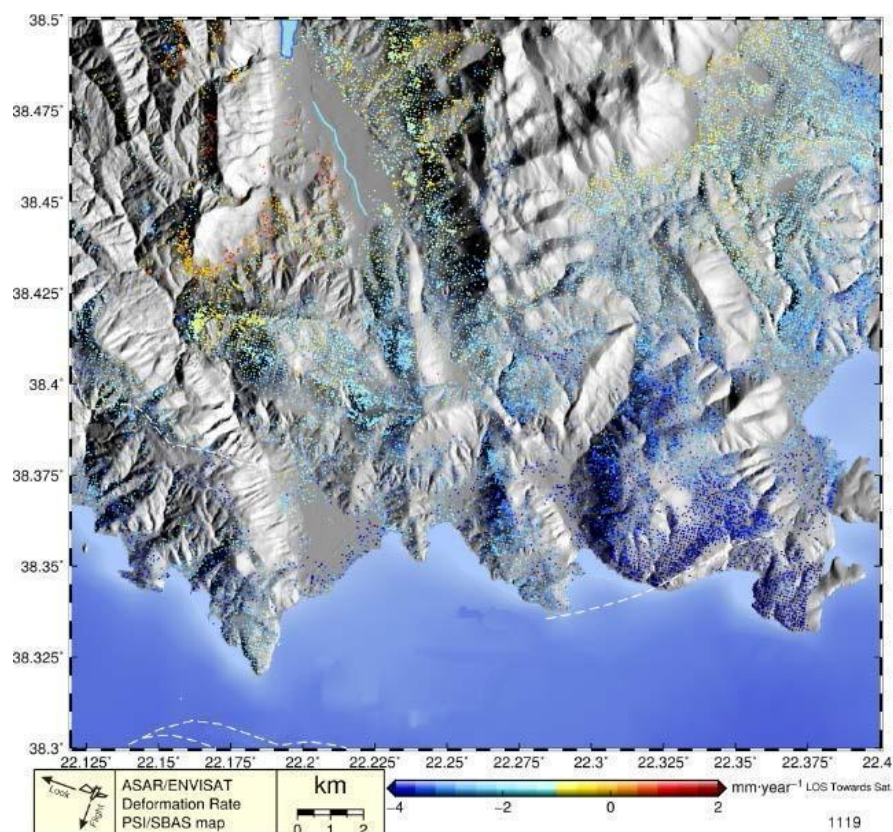
National Observatory of Athens

Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing (IAASARS)

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.

Static and dynamic gravity investigations within Corinth Rift Laboratory project

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Gulf of Corinth in Central Greece (GOC) represents a very active geological structure on the Aegean plate, prolonged in the WNW-ESE direction, with 1 – 2 cm/y of horizontal extension in the N-S direction and high earthquake activity. On the southern coast of the Gulf, there is a set of active normal faults parallel to the axis of the Gulf and dipping to N at about 60 deg angle – Aigion, Helike and Pirgaki. Gravity survey was aimed at location of such structural and tectonic phenomena.

The survey was performed with LaCoste-Romberg gravity meters model D and Graviton EG, with support of GPS instrumentation. Total of 600 points were measured, terrain corrections and other usual reductions were applied. Two reduction densities 2.50 and 2.67 g.cm⁻³ were used to calculate Bouguer gravity anomalies. Co-ordinates were processed in WGS84/UTM, and also in the HGRS87 local Greek system. Adjustment of the GPS network showed a significant northward displacement of a Greek geodetic pillar located NE of Aigion city as a consequence of the coastline collapse during the 1995 earthquake.

We collected 145 rock samples in order to obtain the density and porosity characteristics from laboratory measurements. The two principal rock types were compared, limestone with 2.67 g.cm⁻³ and conglomerate 2.55 g.cm⁻³ (2.45 g.cm⁻³ for the youngest sequence) provide the difference 0.12 g.cm⁻³.

Various processing techniques enabled to prove the existence of transverse faults of NNE-SSW direction that had not been considered before. These faults might have been reactivated, or originated, during the recent extension of the Corinth Rift. Some other indications of density contrasts from filtered gravity data could be explained by faults as well. However, the control analysis of possible effects of topographic features and absolute vertical levels of various types of sedimentary formations is essential. It means that rough topography has strong effect not only in the gravity data processing sense, but also in the geological-interpretative sense. Positive and negative blocks (relative density character) were defined. They show that the mutual position of basement carbonates and young sedimentary rift-related formations is more complicate than a simple regular normal faulting scheme.

We also observed temporal changes of gravity within our network extended between Patras and Corinth. Interesting signals were recorded around Aigion, e.g. in the period 1997-1999 before the exceptional swarm-like earthquake activity that occurred in 2000 – 2001. These signals had the maximum amplitude up to -60 microGal right in the area under study between the Aigion and Helike faults. The negative gravity change could reflect increased tensional stress before the swarm; moreover, it confirmed what we suggested from gravity survey – the existence of active transverse faults, as many of the seismic fault plane solutions showed unusual N-S strike.

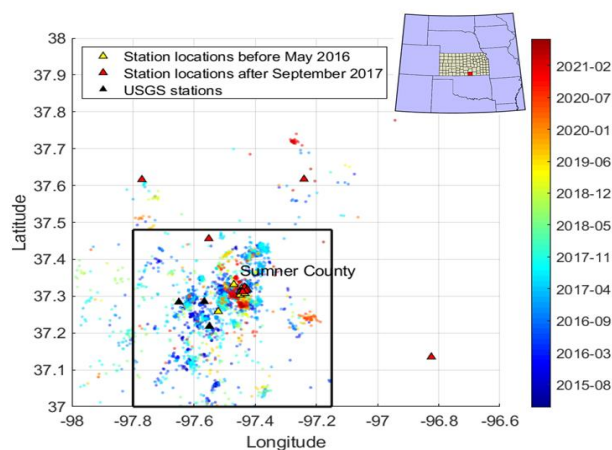
Induced seismicity: Earthquakes caused by human activity

George Tsoflias & Keith A. Nolte

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Certain industrial activities are known to induce earthquakes. Those operations include geothermal energy exploitation, oil and gas extraction, gas storage including CO₂ sequestration, wastewater injection, hydraulic fracturing, mining, and water impoundment in dams. Earthquakes are triggered when human activities disrupt the subsurface stress equilibrium causing failure of optimally oriented, pre-existing faults. While not every industrial operation induces seismicity, and when earthquakes occur the vast majority are small in magnitude not felt by humans, some induced earthquakes have the potential to cause significant damage to infrastructure, disrupt society and even cause injuries and fatalities. Earthquakes exceeding M₅ have been observed around the world in association with human activities. Therefore, it is important to understand the risk of induced seismicity and adopt mitigation measures when industrial activities are planned. Seismic networks are deployed in regions experiencing induced earthquakes, monitoring the level of seismicity and when event magnitudes exceed a threshold set by local governing bodies, industrial operations are ordered to reduce or even cease activities. This approach has been shown to be effective at the local scale where earthquakes occur in the vicinity of industrial operations.

Regions in the central United States are in a tectonic stable setting and have experienced few historic earthquakes. However, since 2010, there has been an unprecedented increase in seismicity which has been attributed primarily to oilfield wastewater disposal in deep wells. While thousands of earthquakes occurred near locations of high fluid injection rates in Oklahoma and Kansas, seismicity was also observed at distances several 10's of km from high-rate injection wells. Monitoring of seismicity in Sumner County, an area ~3,000 km² in south Kansas, offers insights to far field effects of distant wastewater injections. The earthquake catalogue includes 3670 events from April 2015 until June 2021 with M_w ranging from 0.4 to 3.6 and M_c of 1.6. Earthquake activity appears to advance overtime from south to north suggesting a northward advancing fluid pressure front triggering earthquakes along previously unknown faults. The peak of seismicity in Sumner County appears delayed in time by approximately one year compared to earthquakes near injection wells in southern Kansas and northern Oklahoma. Seismicity exhibits spatial and temporal "swarm behavior" with earthquakes occurring in clusters of activity without any consistency in the event sequence with regard to magnitude or depth. Local earthquake observations in Sumner County KS demonstrate that fluid injection operations can have far reaching effects and should be taken into consideration when planning large industrial activities, such as the proposed massive CO₂ sequestration operations for mitigating climate change.



Station and earthquake locations color coded by time of occurrence. Sumner County is outlined in black and shown as red square in the US map insert.

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

Emmanuel Vassilakis

National and Kapodistrian University of Athens

Department of Geophysics and Geothermics

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.

**Platform-based Technology and Earth Observation Services in Response
to Geohazards**

Michael Foumelis

Aristotle University of Thessaloniki

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

The QGIS software a free and powerful geographical information software – Plotting the routes of the morning GNSS survey with that software

Antonios Mouratidis

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.)

Plotting the routes of the morning GNSS survey with QGIS

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.

Hands-on Geohazard Exploitation Platform

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.

Climate and Earthquakes: Recent Research and Potential Contribution of Near Fault Observatories

Zafeiria Roumelioti

University of Patras, Department of Geology

“Earthquake Weather” is the notion of people across times and civilizations that a certain type of weather precedes the occurrence of earthquakes. In the past, the scientific community has repeatedly examined the proposition, without being able to find a solid link between weather and the occurrence of earthquakes, thus placing people’s notion among myths. During the past few years, however, advances in seismological instrumentation and networks and the achievement of long-term monitoring of micro-movements of the earth’s crust through satellite technologies have been revealing hints of truth in this myth. Although the relation is certainly not of a direct cause-effect type, there is considerable evidence that the earth’s atmosphere and its shallow crust interact in ways often imprinted in seismicity catalogues and earthquake records. This is suggested by an increasing number of studies that correlate weather/climate to localized changes in microseismicity and even to the impact of large earthquakes. Near Fault Observatories, with their dense and multidisciplinary monitoring networks, present inherent prerequisites for being valuable contributors toward a deeper understanding of the interactions between atmosphere and lithosphere, their exact mechanism and effects. This potential will be discussed through a review of the pertinent literature and the presentation of example studies.

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

Niki Evelpidou & Anna Karkani

National and Kapodistrian University of Athens

Department of Geology and Geoenvironment

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.

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

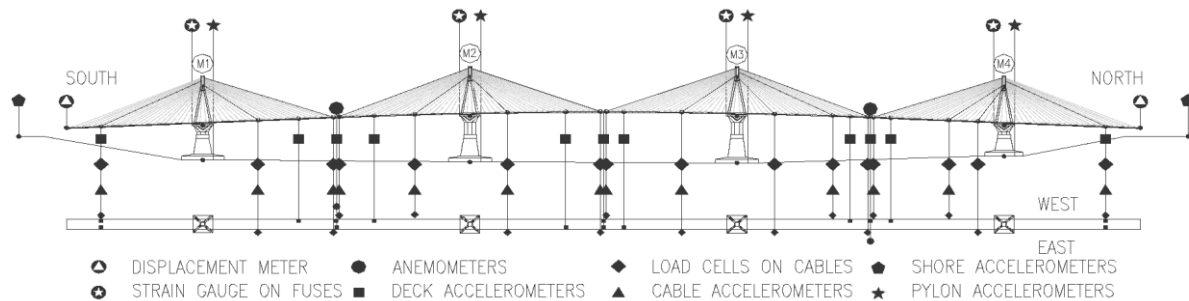
Akis Panagis

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 8th 2006 Kythira Event).

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



Rion Antirion Bridge SHM Instrumentation

Recent sedimentary processes in the western Gulf of Corinth, Greece: seismic and aseismic Turbidites

Spyros Sergiou

Laboratory of Marine Geology and Physical Oceanography

Department of Geology

University of Patras

The Corinth rift is counted among the most active tectonic grabens in the world, with extension rates up to 15 mm/yr (Western part). These high extension rates are associated with very strong seismic events that are, occasionally, responsible for submarine mass movements. These movements, their consequential bottom currents, and the differential river-discharging sediment accumulation in the whole gulf, strongly affect the modern marine sedimentary processes. The definition and understanding of these processes is the main aim of this project. This is attempted through via sedimentological, mineral and geochemical analyses on two gravity sediment cores from a WE submarine canyon (10 km long, 3 km wide) that lies in the Western tip of the gulf. The general sedimentation motif reveals the presence of hemipelagic deposits which are occasionally interrupted by sandy turbidites. A number of these turbidites correlate with past seismic events. The sedimentation rates range between 2.57 mm/yr in the western part and 0.67 mm/yr in the eastern part.

Field trip to the Helike fault

Athanassios Ganas

Institute of Geodynamics, National Observatory of Athens

The Helike fault is the most prominent high-angle, normal fault on the south side of the western Gulf of Corinth (Fig. 1). It is well visible in satellite images, air-photos, DEMs and it forms impressive footwall landscapes. Its seismic potential is $M=6.8$ (Doutsos and Poulimenos, 1992) and its probabilistic rupture forecast for the next 30-yr is among the highest in this region of central Greece (Ganas et al., 2014). It is divided into two north-dipping segments with a right step near the exit of the gorge of the Kerynitis river (Koukouvelas et al 2001; Pavlides et al. 2004). The western fault segment bounds a thick sedimentary basin (a few hundred metres) and it has cut across incised streams, however the fault scarp is less pronounced. The eastern fault segment has a total length 24-26 km (20 km onshore and 4-6 km



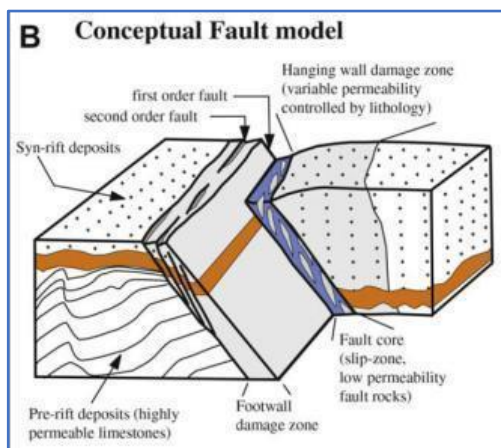
offshore). It ruptured on 26 December 1861 during the famous Helike earthquake that created surface breaks for a distance of 13 km (mapped from Julius Schmidt, then NOA Director) with a vertical displacement up to 1 m. Paleoseismological data showed that the eastern segment was activated three times during the last 2000 years, including that of the 1861 event. The event magnitude was estimated at $M=6.7-6.8$ and most probably they occurred sometime between 190BC-110AD the former, and around 600AD the latter. Based on the radiocarbon dating of the sediments the slip rate increased dramatically after a strong earthquake event near 1400BP. The faster slip rate evidently increased the sedimentation rate. The average slip rate on the fault over the past 2000 years is estimated at about 1.5 mm/year while the horizontal extension accommodated from this fault is about 1 mm/year. The field visit will focus on scarp morphology (Fig. 2; sketch by Koukouvelas and Papoulis), fault plane geometry and kinematics of one prominent site (Kalanteri), to the east of village Selinountas.

Figure SEQ Figure * ARABIC 1. Field view of the eastern Heliki fault. Source: helikeproject.gr

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https://en.wikipedia.org/wiki/Johann_Friedrich_Julius_Schmidt

Figure SEQ Figure * ARABIC 2. Fault scarp model of the Helike fault. Not to scale

Visit of the ancient city of Helike

Dora Katsonopoulou

The Institute for Archaeology of Paros & the Cyclades

In the winter of 373/372 BC, a violent earthquake struck the southwest shore of the Gulf of Corinth and destroyed and submerged the Classical city of Helike. Helike was founded in the Mycenaean period by Ion, the leader of the Ionian race and became the capital of the Twelve Cities of ancient Achaia. The patron god of Helike, Poseidon Helikonios, god of the sea and the earthquakes, was worshipped in his famous pan-Hellenic sanctuary located in the area of Helike (Katsonopoulou 1999). In the 8th c. BC, Helike founded Sybaris in South Italy, the most famous Greek colony of the West. The city of Helike remained important in the Archaic and Classical periods until it was destroyed and lost by the earthquake of 373 BC, widely discussed by many ancient writers (Katsonopoulou 2005a). Few decades before its destruction, Helike struck her own coinage. Three bronze coins of Helike are known --two in the Berlin Museum, a third recently auctioned in Vienna--, showing on the obverse a fine Classical head of Poseidon and on the reverse the trident flanked by two dolphins in heraldic position.

Eratosthenes, a philosopher and mathematician of the 3rd c. BC, visited the area of Helike about 150 years after its destruction and talked with ferrymen who recounted to him the story of the bronze statue of Poseidon submerged in the poros. The term poros generally interpreted as indicating the Corinthian Gulf, was rightly re-interpreted by Katsonopoulou (1995) as referring to a lagoon formed in the area of Helike following the seismic event of 373 BC. The lagoon which Eratosthenes saw in the 3rd c. BC, had become partly dry land when the traveler Pausanias visited the site in the 2nd c. AD. In the remaining part of the lagoon, however, one could still see submerged ruins of the city, as Pausanias reports. The mention of submerged ruins in the area of Helike persists until the Middle Byzantine period (9th-10th c. AD). Today, the entire area of the ancient lagoon is completely covered under river-borne sediments.

The discovery of the lost city of Helike has been pursued by many archaeologists and researchers in the past. The most insistent attempt was made by the late Spyridon Marinatos between 1950-1973. Marinatos (1960) has stated that “with the excavation of Helice a great new light would be shed on both public and private life during the best period of Classical Greece”.

Fifteen years after the end of the earlier inconclusive attempts, Dora Katsonopoulou (archaeologist) and Steven Soter (physicist) launched the Helike Project to locate and reveal the site of ancient Helike. First in 1988, an underwater sonar survey was carried out in collaboration with the oceanographer Paul Kronfield. The results showed no evidence of ruins of a city underwater. Consequently, since 1991 the search was shifted on land by using bore hole drilling (Soter & Katsonopoulou 1999). Since 1994 we employed geophysical surveys in collaboration with the University of Patras, the Radar Solutions International, the University of Oklahoma and the University of Thessaloniki (Soter & Katsonopoulou 2005). In 1995, excavations in the Klonis Field in Rizomylos brought to light a large Roman building, the first ever found in the coastal plain of Helike since the earliest research began in the middle of the 20th century (Katsonopoulou 1998).

Systematic excavations of the Helike Project started in 2000. The first trial trenches opened on the basis of evidence from topographical studies, bore holes and geophysical surveys, revealed buried remains in various locations along the plain dated on the basis of the excavation finds to the Early Bronze Age, Late Bronze Age, Geometric, Classical, Hellenistic, Roman and Byzantine periods (Katsonopoulou 2005b and report below).

Continuation of our excavations between 2001-2011 resulted in a number of important discoveries in the Helike area.

The Early Helladic settlement. In the middle of our area of investigations, in the contemporary village of Rizomylos, we brought to light the remains of a well-preserved coastal EH settlement, the first ever found in Achaia. Large rectilinear buildings flanking the sides of cobbled streets, including a rare type of building known as “corridor house”, came to light preserving their rich contents, especially the pottery, intact. The assemblage of associated pottery includes a variety of shapes, such as two-handled bowls (kraters), pedestal-footed cups, cooking pots, narrow-necked jars, bass bowls, rim-handled and neck-handled tankards, flat-based cups, jugs, pyxides, wide-mouthed jars, one-handled and two-handled

cups, and large pithoi decorated with finger-impressed, rope and overlapping disk bands decorations. Decorated pottery includes solidly painted and pattern-painted decoration Dark-on-Light with intersecting horizontal and vertical lines, zigzag, cross-hatching and paneled patterns. Incised “potter’s marks” were found on pottery fragments. Remains of seeds were found inside some of the recovered vases. Among the rich pottery assemblage, we also discovered a rare drinking cup, a depas amphikypellon, with an engraved symbol above its base. For the unique Helike Early Helladic depas cup, see Forsen J. (2010). Our EH finds also include pointed bone tools, stone tools, objects of obsidian and flint for cutting and scraping activities, and terracotta objects, such as spindle whorls and spools. We also collected a great number of sea shells and animal bones. New outstanding walls, 0.80 m wide, preserved to the impressive height of 1.10 m came to light with the 2011 excavations at the EH site in Rizomylos. Recovered pottery was once again amazingly abundant including complete vases. Other finds from the excavated rooms include terracotta spindle whorls, stone tools, chipped stone artifacts, sea shells and animal bones. Among the most significant new finds from the EH settlement in 2011, we note an exceptional architectural feature found in one of the excavated rooms. It is a thick-walled, pi-shaped clay structure, 0.70 m high, found in a room where many storage vessels were discovered arranged in clusters around and near it suggesting that it might have served as a storage closet of some kind.