SAKARYA UNIVERSITY

Faculty of Engineering

Department of Geophysical Engineering

SAKARYA UNIVERSITY

Department of Geophysical Engineering

Research Projects

Project Title: Experimental Investigation of Geophysical Techniques in the Characterization, Monitoring & Mapping Hydrocarbon (LNAPL) Contaminated Sites

Duration : 12/2019 – 2/2021

Scope

- ✓ Electrical Resistivity and Ground Penetrating Radar (GPR) investigation of soil contaminated with hydrocarbons (LNAPL)

Goals: We aim to find answers to the following questions:

- ✓ Investigation of the differences in Geophysical signatures between one time contamination and semi-continuous
- ✓ Investigation of the effects of seasonal variations in the succesful application of Geophysical
- ✓ Comparison of the effectiveness of the two geophysical techniques: electrical resistivity tomography vs GPR in delineation and mapping of contaminated sites.

Method/Work Packages

- ✓ Preparation of experimental setup.
- ✓ Controlled contamination of experiment tanks with used engine oil,
- ✓ Geophysical data acquisation, data processing and modeling.
- ✓ Cleaning up contaminated medium and experimental setup.

Funding Institution, Project No : **TÜBİTAK-1001, Project No:119Y193**

Research Team

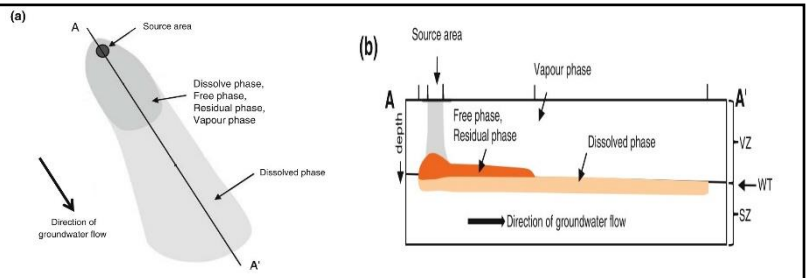
Principal Investigator: **Prof. Dr. Levent GÜLEN**
Researcher: **Dr. Öğr. Üyesi Ertan PEKŞEN (KOÜ),**
Students: **Hafiz Mohammed NAZİFİ**, **Arş. Gör. Ertuğrul Gürbüz**

Output

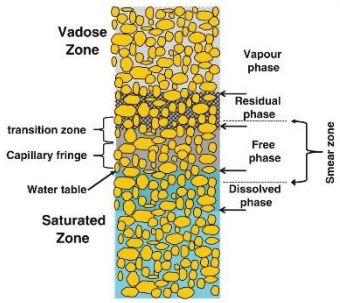
- ✓ PhD Thesis,
- ✓ Publication of papers (SCI),
- ✓ Papers in refereed journals,
- ✓ Presentations in International conferences,

Technological Preparedness Level: 2

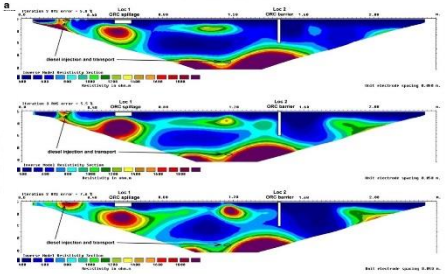
The results obtained in this project will be used to delineate and map contaminated industrial sites and to offer decontamination protocols.



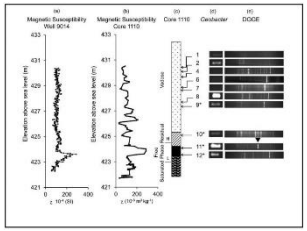
a-)LNAPL contamination model (map view), (b) Cross-sectional view of the contamination model (Atekwana ve Atekwana 2010).



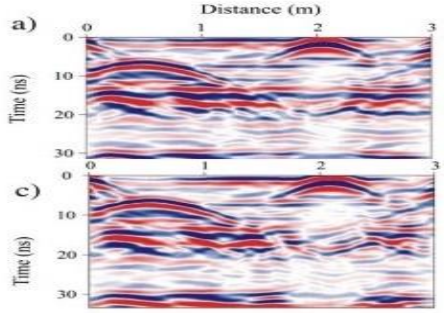
Schematic representation of various phases of LNAPL (Atekwana ve Atekwana 2010)



An example of electrical resistivity tomography results (Sentenac et. al., 2015).



An example of magnetic susceptibility (Beaver et. al., 2015).



An example of GPR results (Bertolla et al.,2015).

Project Title: Earthquake Model of the Middle East (EMME) Project

Duration : 09/2010-09/2014 (completed)

Scope

- ✓ Provide a platform for Earthquake experts from regional countries for collaboration and improving the capacity,
- ✓ Create a living hazard and risk model in conformance with national developments and new international standards,
- ✓ Develop tools for reliable and applicable Earthquake risk mitigation strategies to decision makers and government officials.

Method/Work Packages

- ✓ WP1: Earthquake Catalogue, Coordinator: Mehdi ZARE, IEEE, Iran.
- ✓ WP2: Actıve Faults & Seismic Sources, Coordinator: Levent GÜLEN, SAU, Turkey.
- ✓ WP3: Ground Motion Prediction Equations, Coordinator: Sinan Akkar, METU, Turkey.
- ✓ WP4: Seismic Risk Assessment, Coordinator: Mustafa Erdik, KOERİ, Turkey.
- ✓ WP5: City Scenarios, Coordinator: Rasheed JARADAT, YU, Jordan.

Funding Instution, Project No : Japan Tobacco Company

Research Team

Principal Investigator: Prof. Dr. Domenico Giardini, ETHZ, Switzerland.
Coordinator: Prof. Dr. Levent GÜLEN
Researchers: Prof. Dr. Murat Utkucu, Dr. Dinçer Köksal
Students: Hilal Yalçın, Yiğit İnce

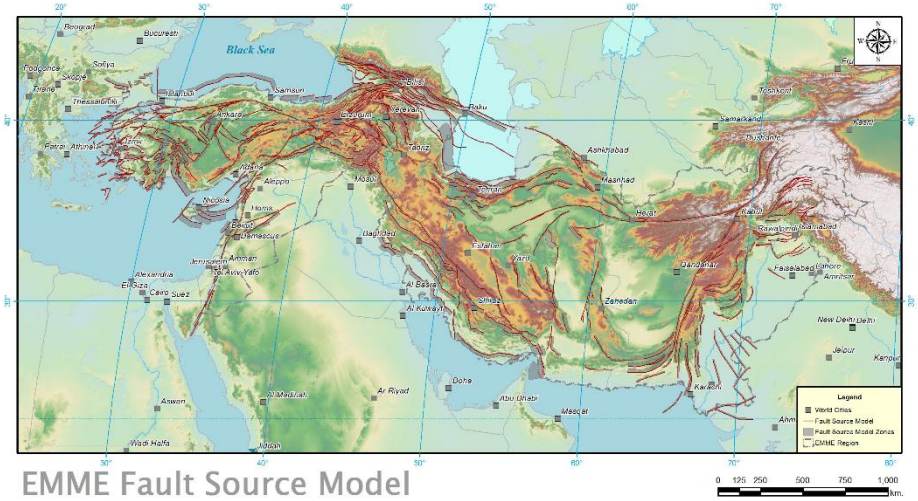
Output

- ✓ MSc thesis,
- ✓ SCI papers,
- ✓ Papers in refereed jounals,
- ✓ Presentations in international meetings,
- ✓ Development of new software packages.

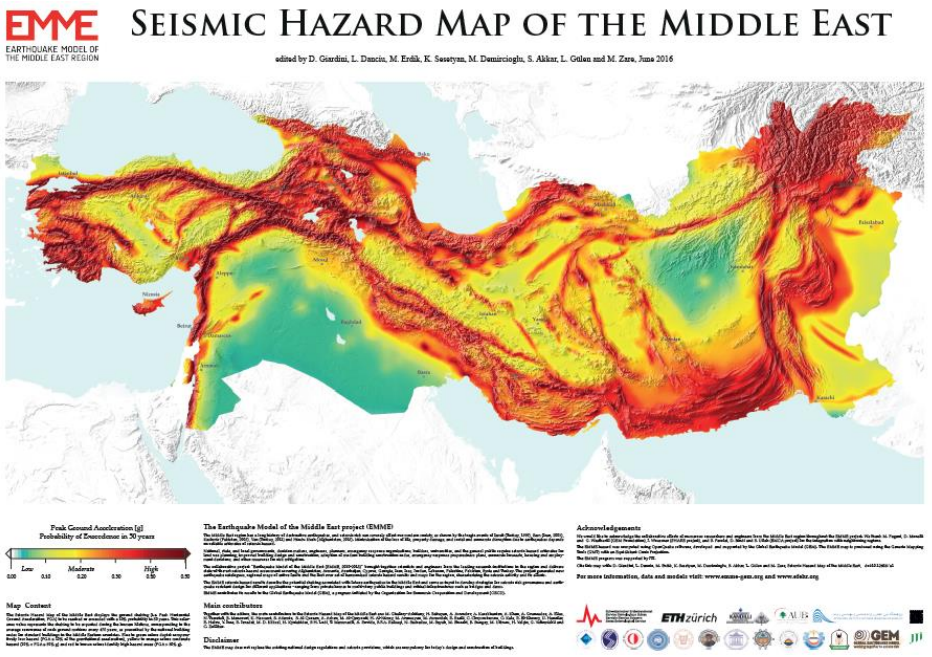
Technological Preparedness Level: 6

First digital seismic hazard map for the Middle East region covering 12 countries.

Web Address: www.emme-gem.org



EMME Fault Source Model



Project Title: Fault Lab Project

Duration : 08/2012-08/2016 (completed)

Scope

- ✓ Seismic imaging of the lower crust,
- ✓ Analysis of the micro-Earthquake activity along the North Anatolian Fault,
- ✓ Obtaining 3-D velocity structure of the crust,
- ✓ Geodynamical modeling of the viscoelastic strain in the seismic cycle,
- ✓ Seismic Tomographic imaging of the crust and mantle in the region.

Method/Work Packages

- ✓ WP1: Setting up a dense seismic network in Sakarya with 70 instruments.
- ✓ WP2: Data collection and processing for 2 years.
- ✓ WP3: Micro Earthquake activity and the state of stress in the crust
- ✓ WP4: Geodynamical modelling.
- ✓ WP5:Seismic Tomography

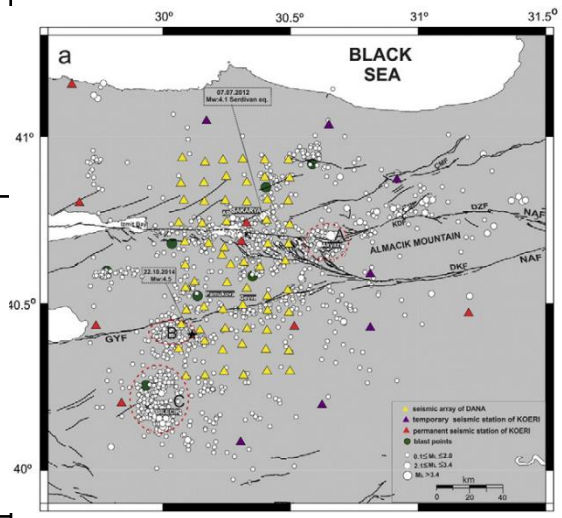


Figure-1 Map of the seismic station network and the recorded micro-seismiciy in the Sakarya region.

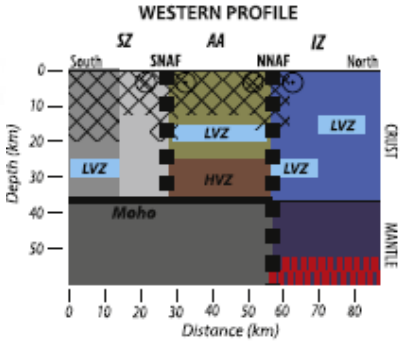
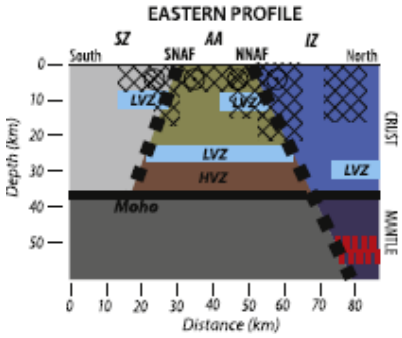


Figure-2. Vertical cross-sections along the North Anatolian Fault Zone showing the structure of the upper , lower crust and the mantle down to 60 km depth.



Funding Institution, Project No : NERC, UK.

Research Team

Principal Investigator: Prof. Dr. Sebastian Rost, University of Leeds, UK .

Researchers: Prof. Dr. Levent GÜLEN, Prof. Dr. Murat Utkucu, SAU
Prof. Dr. Niyazi Türkelli, BU, Kandilli Rasathanesi
Prof. Dr. Greg Houseman, University of Leeds, UK .

Output

- ✓ PhD Thesis,
- ✓ MSc thesis,
- ✓ SCI papers,
- ✓ Papers in refereed journals,
- ✓ Presentations in international conferences,

Technological Preparedness Level:

Web Adresi:

Project Title: Real-time Aftershock Forecasting in Turkey (RAFT) **Duration :** 08/2016-08/2019

Scope

- ✓ Development of algorithms for real-time aftershock forecasting,
- ✓ Testing the success of these algorithms with data obtained from past earthquakes,
- ✓ Set up of a seismic network following a medium/big earthquake in Turkey immediately
- ✓ Real-time aftershock forecasting application in Turkey using the data obtained from this seismic network.

Method/Work Packages

- ✓ WP1: Procurement and testing
- ✓ WP2: Testing of forecasting algorithms,
- ✓ WP3:Rate and state density/stress forecasts,
- ✓ WP4: Operational training
- ✓ WP5: Field Trial

Funding Institution, Project No : TÜBİTAK 216M378 Katip Çelebi-Newton

Research Team

Principal Investigators: Prof. Dr. John McCloskey, Univ. of Edinburgh, Prof. Dr. Ali PINAR, BU-Kandilli Rasathanesi

Researchers: Prof. Dr. Levent GÜLEN, Prof. Dr. Murat UTKUCU

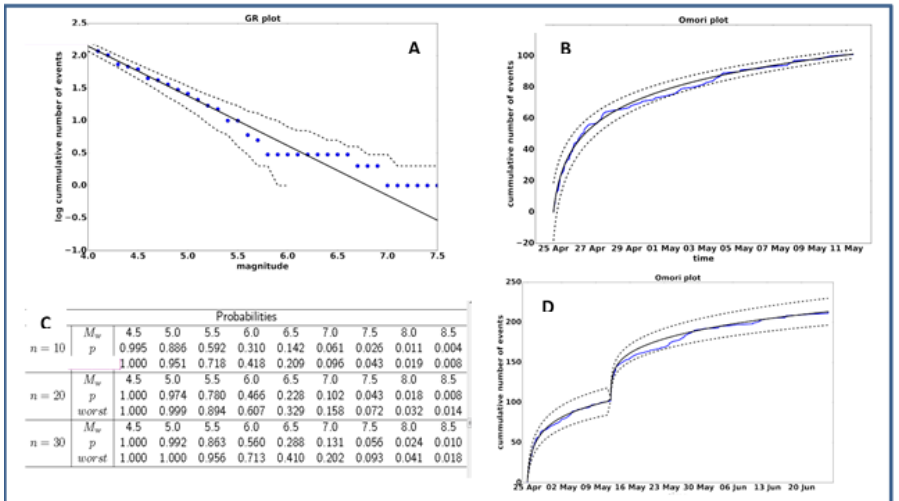
Students: Hilal YALÇIN, Serap KIZILBUĞA

Output

- ✓ PhD Thesis,
- ✓ MSc Thesis,
- ✓ Presentations in international conferences,
- ✓ Software development.

Technological Preparedness Level:

Web Adresi:



		Probabilities								
	M_w	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5
$n = 10$	p	0.995	0.886	0.592	0.310	0.142	0.061	0.026	0.011	0.004
	worst	1.000	0.951	0.718	0.418	0.209	0.096	0.043	0.019	0.008
	M_w	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5
$n = 20$	p	1.000	0.974	0.780	0.466	0.228	0.102	0.043	0.018	0.008
	worst	1.000	0.999	0.894	0.607	0.329	0.158	0.072	0.032	0.014
	M_w	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5
$n = 30$	p	1.000	0.992	0.863	0.560	0.288	0.131	0.056	0.024	0.010
	worst	1.000	1.000	0.956	0.713	0.410	0.202	0.093	0.041	0.018

Figure 1. Sample forecasts during the Nepal sequence. A) the Gutenberg Richter relationship, B) best estimate of the fit to the Omori law does lines represent 1σ uncertainties, C) calculated earthquake probabilities for n days For the morning of 12th of May 2015. D) As B) for 25 June after the Kodari aftershock.

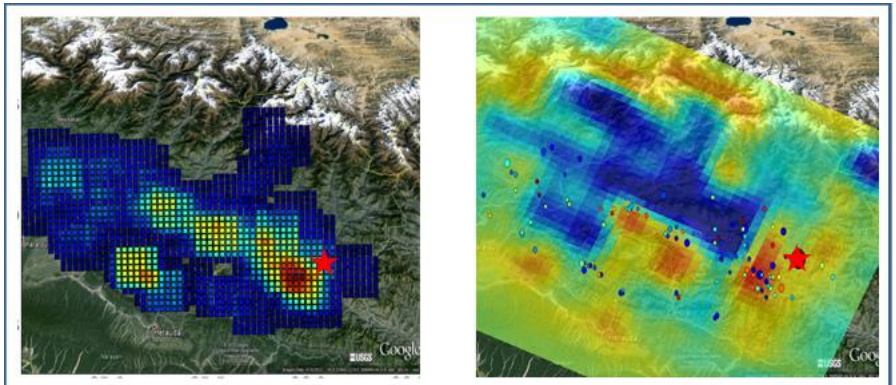


Figure 2. Event density (A) and stress (B) in Nepal on 12 May 2015. The M = 7.3 Kodari event, which occurred that day, is indicated by the red Star. Coloured circles on the stress map indicate aftershocks up to that time coloured according to occurrence time with blue being earliest and read being most recent. These diagrams formed a part of the aftershock reports which were automated and updated every day towards the end of the Nepal sequence.

Project Title: Modeling of the Isparta Basin by Geophysical methods and generation of the Seismic Hazard Map of the region

Duration : 03/2015-05/2017(completed)

Scope

- ✓ Characterization of the geometry of the Isparta Basin, Simulation of the propagation of Seismic waves in the basin sediments and generation of the Seismic hazard map of the region
- ✓ Preparation of guidelines for urban tranformation Project based on Seismic hazard map,
- ✓ Sharing the Project results with government and interested private sector..

Method/Work Packages

- ✓ Literature Research, geological and Geophysical data acquisition,
- ✓ Data processing and obtaining 3-D model of the Isparta Basin,
- ✓ Simulation of the propagation of Seismic waves in the basin sediments and generation of the Seismic hazard map of the region

Funding Institution, Project No : TÜBİTAK, 114Y836

Research Team

Principal Investigator: Dr. Öğr.Üyesi .Günay Beyhan
Researchers: Prof. Dr. Murat Utkucu, Doç. Dr. Haluk Selim , Doç. Dr. Zakir KANBUR
Students: Ali Silahtar ve Emrah Budakoğlu

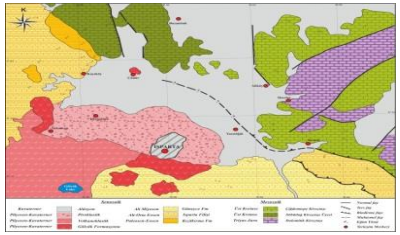
Outputs

- ✓ PhD Thesis,
- ✓ SCI paper,
- ✓ Papers in refereed journals,
- ✓ Presentations in international conferences,

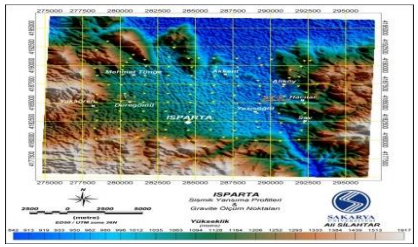
Technological Preparedness Level : 3

1.Geological mapping and Geophysical data acquisition

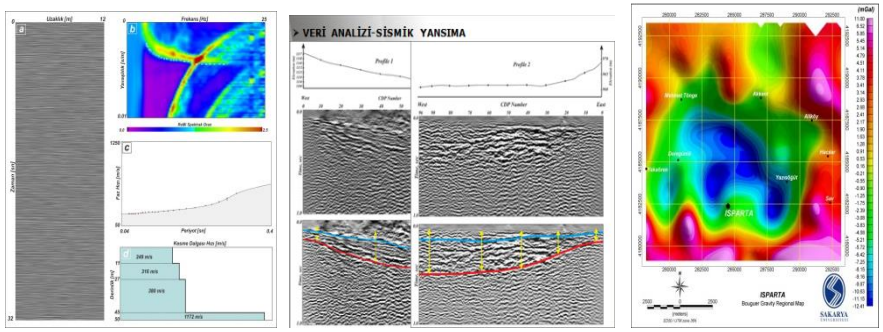
Geological map of the region



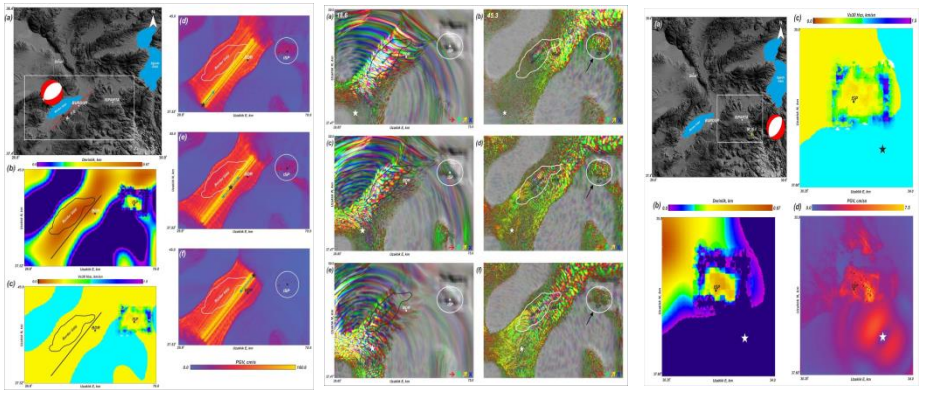
Location map of the study region



2.Geophysical data processing and modeling of the Isparta Basin



3.A scenario earthquake Simulation for the Isparta Basin



Project Title: **Bathymetry & Fault Map of the Sapanca Lake and Characterization of the bottom sediments**

Duration : **10/2011-11/2014**

Scope

- ✓ Generation of high-resolution bathymetry map of the Sapanca Lake,
- ✓ Detailed mapping of the segments of the North Anatolian Fault in the Sapanca Lake,
- ✓ Characterization of the sediments of the Sapanca Lake and investigate clues about past earthquakes,
- ✓ Investigation of the geological evolution of the Sapanca Lake.

Method/Work Packages

- ✓ Generation of high-resolution bathymetry map of the Sapanca Lake,
- ✓ Seismic reflection data acquisition along many profiles in the Sapanca Lake,
- ✓ Getting sediment samples from the bottom sediments ,
- ✓ Seismic data processing and interpretation,
- ✓ Characterization of sediment samples,
- ✓ Mapping fault segments within the lake basin and modeling the geological evolution of the Sapanca Lake.

Funding Institution , Project No: Turkish National Geodesy & Geophysics Union-UDP-03-010

Research Team

Principal Investigator: Prof. Dr. Levent GÜLEN

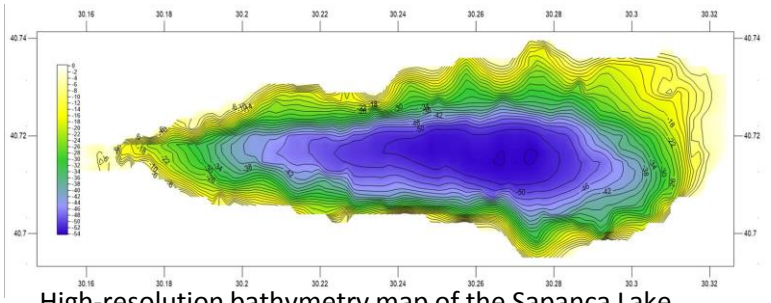
Researchers: Prof. Dr. Emin Demirbağ, Prof. Dr. Namık Çağatay, Doç. Dr. Murat Utkucu

Students: Arş. Gör. Eray Yıldırım, Arş. Gör. Hilal Yalçın, Arş. Gör. Burak Yalamaz

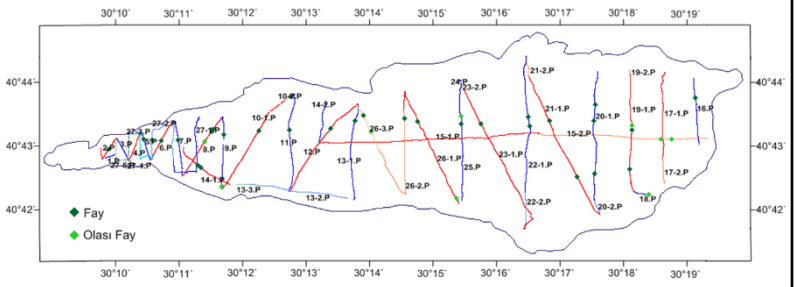
Outputs

- ✓ MSc Thesis
- ✓ Papers in refereed journals,
- ✓ Presentations in National and International scientific meetings,

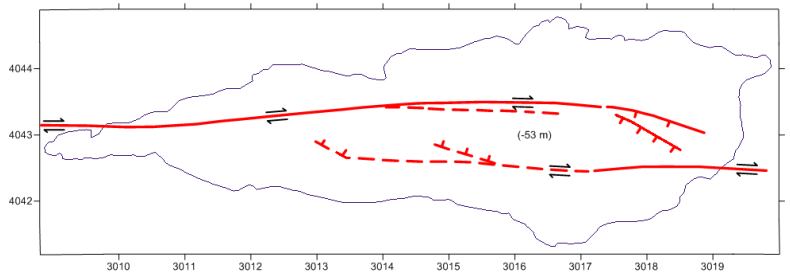
Technological Preparedness Level: 3



High-resolution bathymetry map of the Sapanca Lake generated in this project



Map of the seismic reflection profiles in the Sapanca Lake.



Map of the North Anatolian Fault segments within the Sapanca Lake. This fault geometry indicates that the Sapanca Lake was formed along the North Anatolian Fault Zone as a pull-apart basin.

Project Title: Site Selection and Design of the Sakarya Emergency and Disaster Coordination Center

Duration : 10/2011-06/2012

Scope

- ✓ The lack of a Emergency & Disaster Coordination Center in Sakarya is unacceptable and this requires an immadiate action,
- ✓ Site selection for the Sakarya Emergency & Disaster Coordination Center from the four proposed potential sites,
- ✓ Design of the Sakarya Emergency & Disaster Coordination Center buildings and site ,

Method/Work Packages

- ✓ Visit existing Emergency & Disaster Coordination Centers in Turkey (Kocaeli, Antalya, Denizli & Van) and study them for design ideas,
- ✓ Select the best site among the proposed 4 potential sites based on geological and geophysical site investigations,
- ✓ Building design of the Sakarya Emergency and Disaster Coordination Center

Funding Institution, Project No : Sakarya Government Administration

Research Team

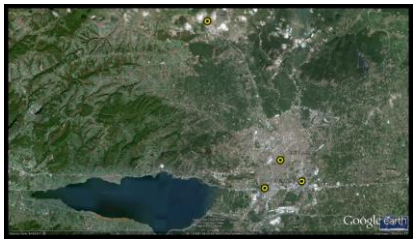
Principal Investigator: Prof. Dr. Levent GÜLEN

Researchers: Prof. Dr. Harun Taşkın, Prof. Dr. Kemalettin Yılmaz, Prof. Dr. Cemalettin Kubat, Yrd. Doç. Dr. M. Dinçer Köksal, Yrd. Doç. Dr. Günay Beyhan, Yrd. Doç. Dr. Özer Uygun

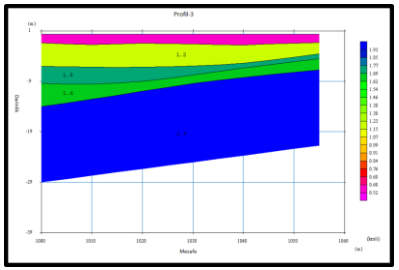
Outputs

- ✓ Papers in refereed books,
- ✓ Presentations in National Scientific conferences.

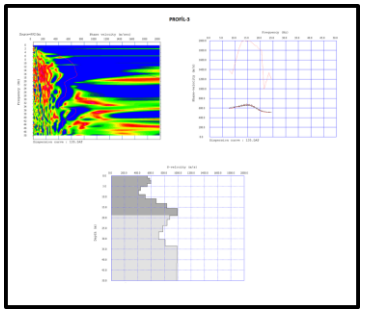
Technological Preparedness Level: 3



Location map of the 4 potential sites to be evaluated for the Sakarya Emergency and Disaster Coordination Center.



Seismic refraction & P-wave model (Bayındırlık site)



Seismic -MASW dispersion graph and S wave depth section.

Sakarya Emergency and Disaster Coordination Center Building and site design.

SAKARYA UNIVERSITY

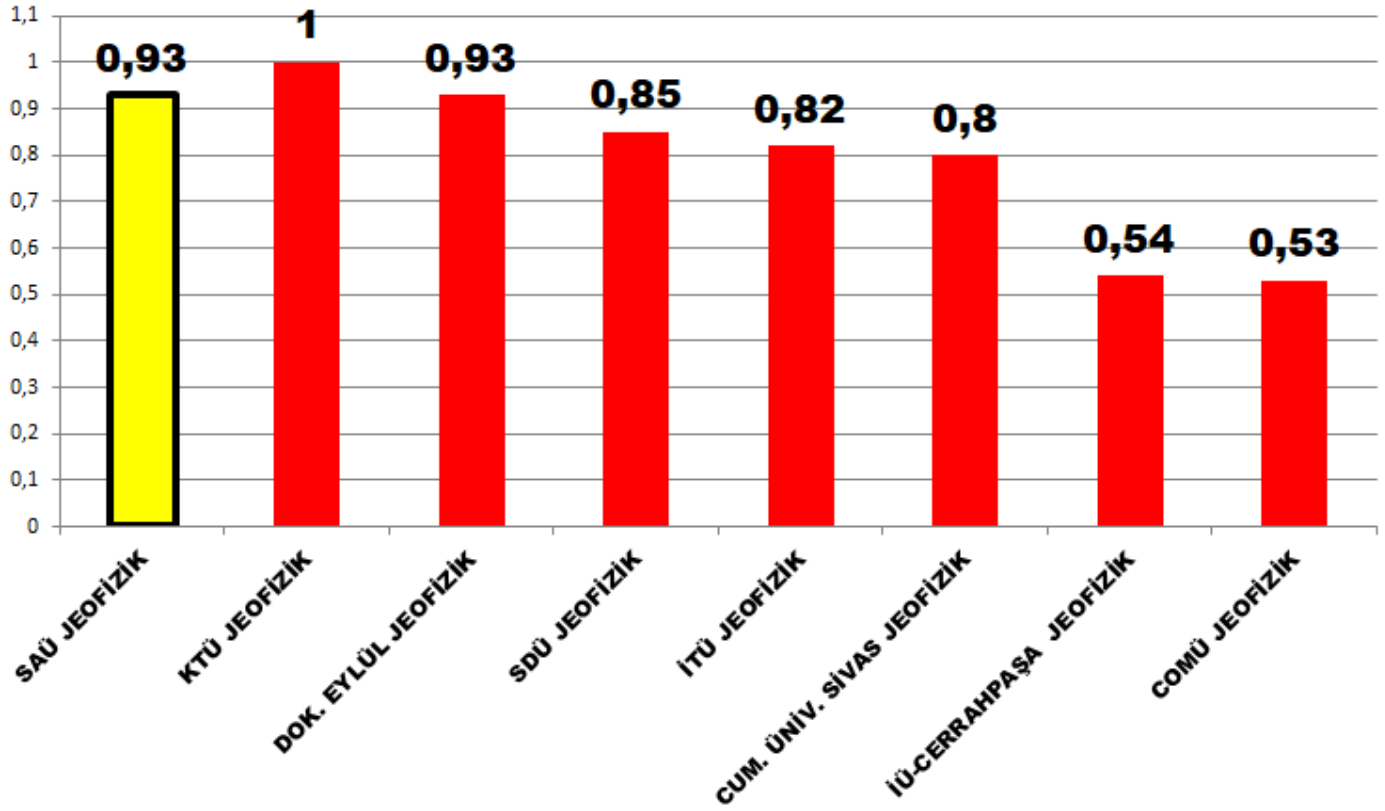
Department of Geophysical Engineering

SCI/SCI-E Publications

Department of Geophysical Engineering
Publications and Citations
(2014-2018)

Name, Surname	National	International (SCI)	International(Other)	Citation
Prof. Dr. Levent Gülen	6	8	4	246
Prof. Dr. Gündüz Horasan	1	3	0	102
Prof. Dr. Murat Utkucu	1	9	0	77
Dr. Öğr. Üye. Şefik Ramazanoğlu	0	2	1	0
Dr. Öğr. Üye. Ayhan Keskinsezer	0	3	4	40
Dr. Öğr. Üye. Günay Beyhan	0	5	3	104
Dr. Öğr. Üye. Can Karavul	2	5	1	10
Dr. Öğr. Üye. Mahir Işık	0	0	0	4
Dr. Öğr. Üye. M. Dinçer Köksal	0	0	0	0
Dr. Arş. Gör. Emrah Budakoğlu	4	3	0	32
Dr. Arş. Gör. Ali Silahtar	2	1	2	8
Arş. Gör. Hilal Yalçın	3	4	1	45
Arş. Gör. Hasan Karaaslan	1	2	0	1
Arş. Gör. Ertuğrul Gürbüz	1	0	0	0
TOTAL	21	45	16	669

Comparison of Geophysical Engineering Departments in Turkey İn terms of publications (SCI-Scopus) per faculty member in one year (2014-2018)



SAKARYA UNIVERSITY

Department of Geophysical Engineering

Public Service/ Social Responsibility Activities

Project Title: Earth Sciences in Life (TÜBİTAK-4004 Nature Education and Science Schools) **Duration :** 05/2018-01/2019

Scope

- ✓ Educate high school students in Sakarya about the importance of Earth sciences
- ✓ Educate high school students in Sakarya about Disaster preparedness,
- ✓ Fill in the high school curriculum gap regarding the Earth Sciences education and provide education regarding disasters to increase awareness as well as teach what to do before, during and after disasters (earthquakes, fires, floods, hurricanes, lanslides, first-aid etc.)

Method/Work Packages

- ✓ Earth Science and disaster preparedness education in class,
- ✓ Teaching fundamental geological and geophysical concepts with hands on experiments in class/laboratory and in the field,
- ✓ Organize a trip to the Museum of Natural History, Energy Park and Turkish Geology Park at MTA in Ankara.
- ✓ Organize a trip to the Disaster Education Center in Bursa.

Funding Institution, Project No : TÜBİTAK-4004, 118B290

Instructors

Principal Instructor: Prof. Dr. Levent GÜLEN
Instructors: Arş. Gör. Ali Silahtar, Arş. Gör. Emrah Budakoğlu, Arş. Gör. Hilal Yalçın, Arş. Gör. Ertuğrul Gürbüz, Hafız Mohammed Nazifi.

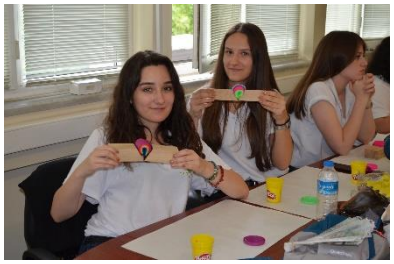
Output

- ✓ Evaluation of students questionaries,
- ✓ Evaluate the before and after test results to measure the success of the project,

Technological Preparedness Level:

Earth Science and Disaster Preparedness Education in class

Seismic refraction experiment in the field



Hands on Tectonic deformation experiments

Building shaking experiments during earthquakes

Trip to the Museum of Natural History at MTA in Ankara.

Trip to the Disaster Education Center in Bursa

Prof. Dr. Levent Gülen, SASGEM Conference-SAU, (2017, 2018, 2019)
Seismicity of Turkey and Living Securely with Earthquakes.

Prof. Dr. Levent Gülen Düzce Earthquake Workshop Conference, Düzce University,
12 November 2015.

Prof. Dr. Levent Gülen, 1999 17th Anniversary of the İzmit Earthquake Conference,
Yalova University, 18 July, 2016.

Prof. Dr. Levent Gülen, 6th Anniversary of the Van Earthquake: Earthquake and Urban Transformation Workshop Conference, 23-24 October 2017, Double Tree by Hilton Hotel, VAN. Seismicity of Turkey and 23 October 2011 Van Earthquake (Mw=7.2).

Prof. Dr. Levent Gülen Düzce Earthquake Workshop Conference, Düzce University,
14 November 2017.

Prof. Dr. Levent Gülen, Sakarya Machine Manufacturers Union Conference Series,
Seismicity of Sakarya & Turkey and Living Securely with Earthquakes,
15 November 2017.

Prof. Dr. Murat Utkucu, 20th Anniversary of the 1999 İzmit Earthquake Activities, Sakarya, 17 July, 2019.

Prof. Dr. Murat Utkucu, Düzce Earthquake Workshop Conference, Düzce University, 12 November 2019.

SAKARYA UNIVERSITY

Department of Geophysical Engineering

Cooperation with Government and Other Stakeholders

Prof. Dr. Levent Gülen, Consultant, International Atomic Energy Agency (IAEA),

Prof. Dr. Levent Gülen, Consultant, Kandilli Observatory & Earthquake Research Institute,

Prof. Dr. Levent Gülen, Consultant, Ministry of Development of Turkey,

Prof. Dr. Levent Gülen, Consultant, Akkuyu Nuclear Power Plant Project,

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