

1509 MARMARA EARTHQUAKE SYMPOSIUM PROGRAM

**INTERNATIONAL SYMPOSIUM ON
HISTORICAL EARTHQUAKES AND CONSERVATION OF MONUMENTS AND SITES
IN THE EASTERN MEDITERRANEAN REGION
500TH ANNIVERSARY YEAR OF THE 1509 SEPTEMBER 10, MARMARA EARTHQUAKE**

10 – 12 SEPTEMBER 2009

**Istanbul Technical University
The Faculty of Architecture
Taşkışla 127, Taksim
İSTANBUL – TURKEY**

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THE EARTHQUAKE OF 10 SEPTEMBER 1509, THURSDAY ~ 10 P.M.

The development of human civilization in the Eastern Mediterranean region has been profoundly influenced by earthquakes and associated tsunamis since earliest recorded history (Ambraseys 2002, 2009; Guidoboni and Ebel, 2009; Guidoboni et al., 1994; Nur and Burgess, 2008). Earthquakes continue to have a major influence on social development as demonstrated by the devastating impact of recent earthquakes in Armenia (1988), Iran (1992, 2003), and Turkey (1992, 1999). Ambraseys (2001) emphasizes the need for systematic and consistent analysis of historical earthquake data and sets an example of the earthquake of 10 September 1509, which was associated with an inferred 70 ± 30 -km long offshore fault break in the Sea of Marmara (M_w 7.2 ± 0.3) and with widespread damage in Istanbul and the adjacent region. Information about the effects of the 1509 earthquake is available from both Turkish and occidental sources. The period is a little too early for ample Ottoman archival evidence and too late for Byzantine. Furthermore, the Marmara Sea region is a densely populated and fast developing part of Turkey, which includes greater Istanbul, a megacity of about 13 million inhabitants. This region was seismically active during the twentieth century, with two large earthquakes in 1912 (M_s 7.3) and 1999 (M_s 7.4), which raises the question of short- and long-term seismicity that must be addressed in any realistic assessment of the earthquake hazard in this populous area. Although Earth scientists and engineers are aware of the value of historical data and are alert to their inherent limitations, the effects of these limitations are seldom examined (Guidoboni et al., 1994; Guidoboni and Comastri, 2005; Guidoboni and Ebel, 2009). In addition, another important issue is that the historical details must be assessed in the perspective of the actual social, economic, and political situations at the time of the event.

This symposium is aimed at bringing together scientists from around the world and from the Eastern Mediterranean region to assess current understanding of earthquake generation processes with emphasis on those physical factors that control earthquake locations, timing, and magnitude. The *Symposium* will be held in Istanbul on the 500th anniversary year of the 1509 Marmara earthquake during 10-12 September 2009 at The Faculty of Architecture, Istanbul Technical University.

Therefore we would like to welcome the participants from all over the world to enjoy all the benefits that the "International 1509 Marmara Earthquake Symposium" and Istanbul will provide.

Prof.Dr. Tuncay Taymaz
Chairman
International Symposium on the 1509 Marmara Earthquake
Istanbul Technical University, Turkey

References

- Ambraseys, N.N. (2001). The Earthquake of 1509 in the Sea of Marmara, Turkey, revisited, *Bull. Seism. Soc. Am.* 91, no. 6, 1397 - 1416.
- Ambraseys, N.N. (2002). The Seismic Activity of the Marmara Sea Region over the Last 2000 Years, *Bull. Seism. Soc. Am.* 92, no. 1, 1 - 18.
- Ambraseys N.N. (2009). Earthquakes in the Eastern Mediterranean and the Middle East: a multidisciplinary study of 2000 years of seismicity, *Cambridge University Press*, 800 pages, ISBN-13: 9780521872928.
- Guidoboni, E., Comastri, A. and Triana, G. (1994). *Catalogue of Ancient Earthquakes in the Mediterranean Area up to the 10th century*. Istituto Nazionale di Geofisica, Rome, 504 pages, ISBN 88-85213-06-5.
- Guidoboni, E. and Comastri, A. (2005). *Catalogue of Earthquakes and Tsunamis in the Mediterranean area from the 11th to the 15th Century*. Istituto Nazionale di Geofisica e Vulcanologia-SGA, Bologna, 1037 pages, ISBN 88-85213-10-3.
- Guidoboni, E. and Ebel, J.E. (2009). Earthquakes and Tsunamis in the Past: A Guide to Techniques in Historical Seismology, *Cambridge University Press*, 602 pages, ISBN-13: 9780521837958.
- Nur, A. and Burgess, D. (2008). Apocalypse: Earthquakes, Archaeology, and the Wrath of God, *Princeton University Press*, 324 pages, ISBN-13: 978-0691016023.

10 SEPTEMBER 2009 – THURSDAY	
TAŞKIŞLA – HALL 127	
09:00 – 10:00	Arrival of Participants / Registration / Refreshments
10:00 – 10:15	Welcome and Symposium Opening Talks
	<i>Introduction: The Earthquake of 10 September 1509, $M_w \sim 7.5$</i> Tuncay Taymaz (Istanbul Technical University, Turkey)
SYMPOSIUM OPENING LECTURES	
10:15 – 11:15	The Debates about Earthquake Physics and Societal Impact Amos Nur (Stanford University, USA)
11:15 – 12:15	The Multidisciplinary Study of Historical Earthquakes Nicholas N. Ambraseys (Imperial College, London, UK)
12:15 – 13:30	LUNCH BREAK
SCIENTIFIC SESSIONS	
TAŞKIŞLA – HALL 127	
SESSION A	
EARTHQUAKES, HISTORY AND ARCHAEOLOGY	
Chairpersons	Susan E. Hough (USGS-Pasadena and CalTech, USA) Tuncay Taymaz (Istanbul Technical University, Turkey)
ARCHAEOSEISMOLOGY, PALAEOSEISMOLOGY AND PREHISTORIC EARTHQUAKES	
13:30 – 14:00	Neotectonics of the Marmara Region and Development of Consequent Morphology Yücel Yılmaz (Kadir Has University, İstanbul, Turkey)
14:00 – 14:30	The Seismic Future of Cities on the Southern Edge of the EuroAsian Plate Roger Bilham (CIRES and Geological Sciences, University of Colorado, USA)
14:30 – 15:00	Manifesting Earthquakes in the Archaeological Record Mehmet Özdoğan (Istanbul University, Turkey)
15:00 – 15:30	Sizing-Up Historical Earthquakes Susan E. Hough (USGS Pasadena and CalTech, USA)
15:30 – 16:00	TEA – COFFEE – REFRESHMENTS BREAK
16:00 – 16:20	Palaeo-Earthquake Record and Slip Rates on the North Anatolian Fault James F. Dolan (University of Southern California, USA)
16:20 – 16:40	Recurrent Nature of Earthquake Sequences along Large Continental Faults Mustapha Meghraoui (EOST-IPG Strasbourg, France)
16:40 – 17:00	Extreme Seismic Events: from Basic Science to Preventive Disaster Management Alik Ismail-Zadeh (Geophysical Institute, University of Karlsruhe, Germany)
17:00 – 17:20	Active Fault Slip-Rates in Mongolia from Cosmogenic ^{10}Be and Luminescence Dating Edwin Nissen (University of Cambridge, UK)
17:20 – 17:40	Tree-Ring Dating of Earthquakes on Active Faults in Italy and Turkey Rosanna Fantucci (Studio Geologi Associati, Montefiascone, Italy)
17:40 – 18:00	Slip Distribution and Rupture Characteristics of the 1912 Earthquake Sequence (M_w 7.4 and M_w 6.8) along the Ganos Segment of the North Anatolian Fault (Turkey) Murat Ersen Aksoy (EOST-IPG Strasbourg, France)
18:00 – 18:10	Concluding Remarks and Discussions
18:30 – 21:30	Symposium Welcome Cocktail / Dinner @ ITU – TAŞKIŞLA GARDENS

11 SEPTEMBER 2009 – FRIDAY

SCIENTIFIC SESSIONS

TAŞKIŞLA – HALL 127

SESSION B
CRUSTAL DEFORMATION, EARTHQUAKE RECURRENCE TIMES AND EARTHQUAKE CLUSTERING

Chairpersons **Robert Reilinger** (Massachusetts Institute of Technology, USA)
 Jean-Mathieu Nocquet (CNRS-Géosciences Azur, France)

09:00 – 09:30 Arrival of Participants and Refreshments
09:30 – 10:00 Kinematics of the Mediterranean: a synthesis
 Jean-Mathieu Nocquet (CNRS-Géosciences Azur, France)
10:00 – 10:30 Comparing GPS and Geologic Deformation Rates in the Arabia-Africa-Eurasia Zone of Plate Interaction
 Robert Reilinger (Massachusetts Institute of Technology, USA)

10:30 – 11:00 **TEA – COFFEE – REFRESHMENTS BREAK**

Chairperson **Robert Reilinger** (Massachusetts Institute of Technology, USA)
CRUSTAL DEFORMATION AND THE EARTHQUAKE CYCLE

11:00 – 11:20 Rates of Active Faulting at the Eastern Boundary of the Arabia-Eurasia Collision
 Richard Walker (University of Oxford, UK)
11:20 – 11:40 Possible Transient Strain Accumulation along the North Anatolian Fault (NAF): Precursor or Artifact?
 James F. Dolan (University of Southern California, USA)
11:40 – 12:00 Continuous GPS Observations of Inter-seismic Strain Accumulation along the Hellenic Subduction Zone
 Michael Floyd (University of Oxford, UK / University of California, Riverside, USA)
12:00 – 12:20 Ongoing İzmit-Düzce Postseismic Deformation: what our numerical models can and cannot explain
 Elizabeth Hearn (The University of British Columbia, Canada)
12:20 – 12:40 Slip Partitioning and along Strike Variation of Slip Rates in the Marmara Sea Fault System from GPS and Numerical Modeling
 Oliver Heidbach (German Research Centre for Geosciences, Potsdam, Germany)
12:40 – 13:00 Contemporary Stress Field of the Marmara Sea Fault System from Observation and 3D Numerical Modeling
 Tobias Hergert (IPG-Paris, France / University of Karlsruhe, Germany)

13:00 – 14:30 **LUNCH BREAK – POSTERS**

11 SEPTEMBER 2009 – FRIDAY**SCIENTIFIC SESSIONS****TAŞKIŞLA – HALL 127****Chairperson** **Jean-Mathieu Nocquet** (CNRS-Géosciences Azur, France)**CRUSTAL DEFORMATION AND THE EARTHQUAKE CYCLE**

- 14:30 – 14:50** Gravity Field Model of Turkey as Deduced from Surface Gravity Measurements and Satellite Data
Ali Kılıçoğlu (Turkish General Command of Mapping, Ankara, Turkey)
- 14:50 – 15:10** Gravity Anomalies and Crustal Structure of Turkey
Aydın Büyüksaraç (Cumhuriyet University, Sivas - Turkey)
- 15:10 – 15:30** Tectonic Significance and Earthquake Potential of SW Anatolian Shear Zone
İbrahim Çemen (Oklahoma State University, USA)
- 15:30 – 15:50** Recent Constraints on the Deformation of Central Anatolia: GPS implications
Bahadır Aktuğ (Turkish General Command of Mapping, Ankara, Turkey)

15:50 – 16:15 **TEA– COFFEE – REFRESHMENTS BREAK****SESSION C****EARTHQUAKE AND TSUNAMI PREDICTABILITY AND EARLY WARNING SYSTEMS****Chairpersons** **Tuncay Taymaz** (Istanbul Technical University, Turkey)
Ahmet C. Yalçiner (Middle East Technical University, Ankara - Turkey)**TSUNAMIS**

- 16:15 – 17:00** Recent Tsunamigenic Earthquakes in the Aegean Sea
Emile A. Okal (Northwestern University, Illinois, USA)
- 17:00 – 17:20** Methods of Evaluation of Tsunami Risk
Efim Pelinovsky (Russian Academy of Sciences, Nizhny Novgorod, Russia)
- 17:20 – 17:40** Tsunami Model Study Using JRC-SWAN and NOAA-SIFT Forecast Methods
Alessandro Annunziato (EU-JRC, Ispra-Italy)
- 17:40 – 18:00** Earthquake Cycle Anomalies in the Aegean Arc
Stathis C. Stiros (Department of Civil Engineering, University of Patras, Greece)
- 18:00 – 18:20** A Challenging Question behind Ship Wrecks in Ancient Theodosius Harbour of Yenikapı (Istanbul): Was It Storm Surge or Tsunami?
Ayşen Ergin and Ahmet C. Yalçiner (Middle East Technical University, Turkey)
- 18:20 – 18:30** **Concluding Remarks and Discussions**

18:30 – 21:30 **Symposium Dinner @ ITU – TAŞKIŞLA GARDENS – CENTRAL COURT**

12 SEPTEMBER 2009 – SATURDAY

SCIENTIFIC SESSIONS

TAŞKIŞLA – HALL 127

SESSION C

EARTHQUAKE AND TSUNAMI PREDICTABILITY AND EARLY WARNING SYSTEMS

Chairperson **Ahmet C. Yalçiner** (Middle-East Technical University, Ankara - Turkey)

EARTHQUAKE EARLY WARNING SYSTEMS

09:00 – 09:30 Arrival of Participants and Refreshments

09:30 – 10:00 On the Early Warning and Rapid Response Systems
Mustafa Erdik (BU-KOERI, Çengelköy, Istanbul, Turkey)

10:00 – 10:30 17 Years of Surface Deformation of Megacity Istanbul (Turkey) Measured Through Advanced DInSAR Analysis
Riccardo Lanari (National Research Council, Napoli, Italy)

10:30 – 11:00 **TEA – COFFEE – REFRESHMENTS BREAK**

Chairperson **Tuncay Taymaz** (Istanbul Technical University, Turkey)

11:00 – 11:20 A First Deep Seismic Survey in the Sea of Marmara (NW Turkey)
Alfred Hirn (Institut de Physique du Globe de Paris, France)
On behalf of SEISMARMARA-2001 Leg-1 Team

11:20 – 11:40 High Resolution Multichannel Imaging of Basin Growth along a Continental Transform: the Marmara Sea along the North Anatolian Fault in NW Turkey
Michael Steckler (Lamont-Doherty Earth Observatory, Palisades, New York, U.S.A)
On behalf of TAMAM-2008 Team

11:40 – 12:00 Structural Investigation of the Marmara Region Obtained from Gravity, Magnetic and Seismic Data
Abdullah Ateş (Ankara University, Turkey)

12:00 – 12:20 The Marmara Fault Patterns Based On Historical Earthquakes
Cenk Yaltırak (Istanbul Technical University, Turkey)

12:20 – 12:40 Crustal Structure of Eastern Marmara from 2D and 3D Gravity and Magnetic Models
Attila Aydemir (Turkish Petroleum Corporation, Ankara, Turkey)

12:40 – 13:00 The Ambient Noise Multi-Arrival Tomography of Turkey and Surrounding Regions
Tuncay Taymaz (Istanbul Technical University, Turkey)
On behalf of ANU-ITU-NORSAR Team

13:00 – 14:00 **LUNCH BREAK – POSTERS**

12 SEPTEMBER 2009 – SATURDAY

SCIENTIFIC SESSIONS

TAŞKIŞLA – HALL 127

SESSION D

STRATEGIES FOR THE CONSERVATION OF HISTORIC MONUMENTS AND SITES

Chairperson **Zeynep Ahunbay (Istanbul Technical University, Turkey)**

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| 14:00 – 14:30 | Earthquakes and Preservation of Cultural Heritage in Turkey
Zeynep Ahunbay (Istanbul Technical University, Turkey) |
| 14:30 – 15:00 | 1766 Marmara Earthquake and its Impact on the Monuments of Istanbul
Deniz Mazlum (Istanbul Technical University, Turkey) |
| 15:00 – 15:30 | 1999 Kocaeli-Düzce Earthquakes and Assessment of Post-Disaster Interventions to Damaged Monuments in Istanbul
Feridun Çılı (Istanbul Technical University, Turkey) |
| 15:30 – 16:00 | Safety Evaluation and Guidelines for Seismic Protection of Historical Structures
Gülay Altay (Kandilli Observatory and Earthquake Research Institute, Istanbul) |
| 16:00 – 16:30 | Structural Stability Evaluation of Nemrut Monuments, Eastern Turkey
Ahmet Türer (Middle East Technical University, Turkey) |

16:30 – 17:00 **TEA – COFFEE – REFRESHMENTS BREAK**

17:00 – 17:45 **DISCUSSION** **TAŞKIŞLA – HALL 127**

THE MARMARA FAULT PATTERNS AND SCENARIOS

– TO BE ANNOUNCED –

17:45 – 18:00 **CLOSING REMARKS**

POSTERS

POSTER SESSIONS

TAŞKIŞLA – HALL 102

1. **Burçak Baydar and Ayşe Kaşlılar** (Istanbul Technical University, Turkey)
Investigation of Seismic Q Parameter Variations around the North Anatolian Fault in the Western İzmit Bay (NW Turkey)
2. **Adıyaman, H.E., Beck, S.L., Zandt, G., Biryol, C.B., Warren, L.M., Özacar, A.A. and Taymaz, T.**
(University of Arizona, USA)
The NAF Experiment: Lithospheric Structure of the Central North Anatolia From S-wave Receiver Function Analysis
3. **Murat Erduran** (Karadeniz Technical University – KTU, Trabzon, Turkey)
Teleseismic Inversion of Crustal S-wave Velocities beneath the Isparta Station
4. **Murat Erduran, Brigitte Endrun and Thomas Meier** (Karadeniz Technical University, Turkey)
Continental vs Oceanic Lithosphere beneath the Eastern Mediterranean Sea: Implications from Rayleigh-Wave Dispersion Measurements
5. **Özcan Çakır** (Nevşehir University, Turkey)
Theory on the Multi-Level Fast Multi-Pole Method for Forward Modeling the Multiply Scattered 2.5-D Teleseismic Surface Waves
6. **H. İlyas Çağlar** (Istanbul Technical University, Turkey)
Imaging Crustal Electrical Structure of SW Anatolia in Conjunction with Active Tectonics
7. **Regina DeWitt, Alexander R. Simms, Ibrahim Çemen et al.** (Oklahoma State University, USA)
Dating Active Fault Terraces with LuCIDD, a Luminescence Instrument with Confocal and Imaging Units for Dating of Rock Surfaces
8. **Seda Yolsal and Tuncay Taymaz** (Istanbul Technical University, Turkey)
Earthquake Source Scaling Relationships and Tsunami Generation in the Eastern Mediterranean Region Obtained by Slip Distribution and Rupture Modeling Studies
9. **Yeşim Çubuk and Tuncay Taymaz** (Istanbul Technical University, Turkey)
Active Tectonics of Bala-Sırapınar (central Turkey) and Surroundings: Time Domain Moment Tensor Inversion of Moderate Earthquakes Occurred during 2005-2008
10. **Yeşim Çubuk and Tuncay Taymaz** (Istanbul Technical University, Turkey)
Active Tectonics of Çameli-Göhlisar (SW Turkey) and Surroundings: Time Domain Moment Tensor Inversion of Moderate Earthquakes Occurred during 2005-2008
11. **Serkan Irmak and Tuncay Taymaz** (Kocaeli University, Turkey)
Source Mechanisms of Recent Moderate Earthquakes Occurred in Honaz-Denizli Graben (western Turkey) Obtained by Regional Broadband Waveform Inversion
12. **Gonca Örgülü** (Istanbul Technical University, Turkey)
A Decline in Normal Fault Activity beneath the Marmara Sea and its Association with Extinction of Pull-Apart Models

13. **Erşan Türkoğlu and Martyn Unsworth** (The University of Alberta, Canada)
A Magnetotelluric (MT) Investigation of the Arabia – Eurasia Collision Zone in Eastern Anatolia
14. **Arda Özacar, C. Berk Biryol, Hande E. Adıyaman et al.** (Middle East Technical University, Turkey)
North Anatolian Fault (NAF) Passive Seismic Experiment: Continental Lithospheric Deformation along a Major Strike-Slip Fault
15. **Statish C. Stiros** (University of Patras, Greece)
Clustering of Earthquakes along the North Anatolian Fault during 4th Century
16. **Murat Ersen Aksoy et al.** (EOST-IPG Strasbourg, France)
Palaeoseismic investigation along the 1912 Ganos fault segment at Güzelköy, Yörgüç and Yeniköy – North Anatolian Fault, Turkey
17. **Ziyadin Çakır, Volkan Karabacak, Mustapha Meghraoui, Erhan Altunel, Önder Yönlü and Ahmet Akoğlu** (Istanbul Technical University, Turkey)
Creeping Along the İsmetpaşa Section of the North Anatolian Fault Observed with SAR Interferometry and LIDAR
18. **Yıldız Altınok, Bedri Alpar, Cenk Yaltırak and Nafiye Kıyak** (Istanbul University, Turkey)
Investigations of Historical Earthquakes and Tsunamis in the Gulf of Saros, NW Turkey
19. **İrem Elitez, Cenk Yaltırak and Remzi Akkök** (Istanbul Technical University, Turkey)
Morphotectonic Evolution of the Middle of Burdur-Fethiye Fault Zone: Acıpayam, Gölhisar and Çameli Area, SW Turkey
20. **Mevlûde Bakır** (Istanbul Technical University, Turkey)
Impact and Consequences of Byzantine Earthquakes in Constantinople and Its Vicinity: 342-1454 A.D
21. **Alpaslan Hamdi Kuzucuoğlu** (Istanbul University, Turkey)
A Passive Conservation Method to Protect the City Walls of Istanbul against Vandalism
22. **Luis F. Ramos** (University of Minho, Department of Civil Engineering, Guimarães, Portugal)
Dynamic Identification and Monitoring of Historical Masonry Structures
23. **Ricardo S. Barros et al.** (University Fernando Pessoa, Portugal)
Reinforcement Methodology Applied in Buildings Damaged by the Azores Earthquake of 9 July 1998
(Ricardo S. Barros, João Guerra, Daniel V. Oliveira and Humberto Varum)
24. **Ricardo S. Barros et al.** (University Fernando Pessoa, Portugal)
Finite Element Analysis of an Old Building Façade and a Proposal for Reinforcement
(Ricardo S. Barros, Umut Almaç, Andrea Grazini, Daniel V. Oliveira and Humberto Varum)
25. **Yasemin D. Aktaş et al.** (Middle East Technical University, Ankara, Turkey)
Structural Behaviour of Timber Frame Ottoman Traditional “Hımsı” Houses: frame loading experiments
26. **Fusun Ece Ferah** (Istanbul Technical University, Turkey)
1755 Lisbon (Portugal) Earthquake and Protection of Cultural Heritage from Future Earthquakes

27. **Gülsün Tanyeli** (Istanbul Technical University, Turkey)
1894 Marmara Earthquake and its Impact on the Monuments of Istanbul
28. **Umut Almaç** (Istanbul Technical University, Faculty of Architecture, Turkey)
Preliminary Observations on Structural Condition of a Byzantine Monument in Historic Peninsula of Istanbul: Pantokrator Church (Zeyrek Camii)
29. **Hüseyin Gökalp** (Karadeniz Technical University, Trabzon, Turkey)
Three-Dimensional P- and S- Wave Velocity Structure Beneath The Eastern Turkey
30. **Derya I. Dilmen, Ahmet C. Yalçiner et al.** (Middle East Technical University, Ankara, Turkey)
Tsunami Modeling and Inundation Mapping for Fethiye Town, SW Turkey
31. **Leonardo Seeber** (Lamont-Doherty Earth Observatory, Palisades, New York, U.S.A)
Basins beyond Bends along Continental Transforms in NW Turkey and southern California: asymmetrical and time-transgressive growth
32. **Christopher Sorlien** (Institute for Crustal Studies, University of California at Santa Barbara, USA)
Seismic Stratigraphic late-Quaternary Climate Cycle Age Model for the North Anatolian Fault System in southern Marmara Sea, Turkey
33. **Hermann M. Fritz** (Georgia Institute of Technology, Savannah, GA, USA)
Landslides and Landslide Generated Tsunamis
34. **Seda Yolsal and Tuncay Taymaz** (Istanbul Technical University, Turkey)
Source Mechanism Parameters of June 19, 2009 Earthquake (M_w 5.6) Occurred in the vicinity of Rhodes-Dodecanese Islands (Eastern Mediterranean)