



United Nations  
Educational, Scientific and  
Cultural Organization

Organisation  
des Nations Unies  
pour l'éducation,  
la science et la culture

Organización  
de las Naciones Unidas  
para la Educación,  
la Ciencia y la Cultura

Организация  
Объединенных Наций по  
вопросам образования,  
науки и культуры

منظمة الأمم المتحدة  
للتربية والعلم والثقافة

联合国教育、  
科学及文化组织



**NERA**



# Reducing Earthquake Losses in the Extended Mediterranean Region

**UNESCO-RELEMR  
XXXV International Workshop**

28-31 October 2013

Fuengirola (Malaga), Spain



United Nations  
Educational, Scientific and  
Cultural Organization

Organisation  
des Nations Unies  
pour l'éducation,  
la science et la culture

Organización  
de las Naciones Unidas  
para la Educación,  
la Ciencia y la Cultura

Организация  
Объединенных Наций по  
вопросам образования,  
науки и культуры

منظمة الأمم المتحدة  
للتربية والعلم والثقافة

联合国教育、  
科学及文化组织



**NERA**

# Reducing Earthquake Losses in the Extended Mediterranean Region

**UNESCO-RELEMR  
XXXV International Workshop**

28-31 October 2013

Fuengirola (Malaga), Spain

**United Nations Educational, Scientific and Cultural Organization – UNESCO**  
**U.S. Geological Survey – USGS**  
**Real Instituto y Observatorio de la Armada in San Fernando – ROA**  
**Network of European Research Infrastructures for Earthquake Risk Assessment and Mitigation**  
**– NERA**

Editorial coordinators: Frederick Simon  
Jose Martín Davila  
Jair Torres

Cover photo credit: Badaoui Rouhban

For further information, please contact:

Cross-Cutting Thematic Unit on Disaster Risk Reduction  
Natural Science Sector  
UNESCO  
1, rue Miollis  
75732 Paris cedex 15 France  
Phone: + 33-1-45 68 41 22  
Fax: + 33-1-45 68 58 21  
E-mail: [j.torres@unesco.org](mailto:j.torres@unesco.org)

The authors are responsible for the choice and presentation of facts contained in this publication and for the opinions expressed therein, which are not necessarily those of UNESCO and do not commit the Organization. The designations employed and the presentation of the material throughout this publication do not imply the expression of any opinion whatsoever on the part of UNESCO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.



## Foreword

The XXXV International Workshop on Seismicity and Earthquake Engineering in the Extended Mediterranean Region, an activity of the programme on Reduction of Earthquake Losses in the Extended Mediterranean Region (RELEMR) will be held in Fuengirola (Malaga), Spain, on 28 October to 31 October 2013. The sessions of the workshops will discuss the essential need and benefits for data exchange, bilateral collaboration and results in this area from past work. Furthermore, the standardization of data format and a review of their analysis will be discussed. Two special sessions will be held during the meeting, one on the MERC Dead Sea Rift Seismological Network Project and the other one on Data Exchange. During the sessions participants will be requested to comment on real-time seismic data exchange and about the status of their networks and their data needs.

The workshop will also feature a presentation of “An Earthquake Early Warning System for the Ibero-Maghrebian Region”. Additionally general presentations in seismology, geology and earthquake engineering will be presented.

This brochure contains a compilation of abstracts of presentations made available prior to the workshop. It is hoped that it will serve as a good basis for the proceedings of the workshop. We express our appreciation to the authors of these abstracts.

The content of this brochure does not necessarily reflect the views of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

Paris, 21 October 2013



Alexandros Makarigakis, Ph.D  
Chief of Unit  
Cross-Cutting Thematic Unit on  
Disaster Risk Reduction  
UNESCO, Paris



United Nations  
Educational, Scientific and  
Cultural Organization



**NERA**

## XXXV International Workshop on Seismicity and Earthquake Engineering in the Extended Mediterranean Region

Fuengirola (Malaga) Spain  
28 - 31 October 2013

### **Saturday, 26 October 2013**

MERC participants arrive in Malaga

### **Sunday, 27 October 2013**

Non-MERC participants arrive in Malaga

#### **09:00 – 18:00 MERC Project Meeting**

Participants from Jordan, Israel, and Palestine meet to discuss joint MERC-funded project including, but not limited to, real-time seismic data exchange.

18:00 – 20:00 Registration

### **Monday, 28 October 2013**

08:30 – 09:30 Registration

#### **Opening Ceremony**

#### **09:30 – 10:30 Opening Ceremony,**

**Chair: Jose Martin Davila**

- Capt. Dr. Miguel Vallejo Carrion, Real Instituto y Observatorio de la Armada
- Admiral of Spanish Fleet
- Dr. Michael Foose, USGS
- Dr. Alexandros Makarigakis, UNESCO

**Introduction of Participants**

**Logistical announcements**

**10:30 – 11:00 Coffee/tea break**

#### **First Session**

**11:00 – 13:00**

**Keynote Presentation**

**Chair: Eleni Georgiou Morisseau**

11:00 – 12:00

***Jose Martin Davila and Antonio Pazos***

*Geosciences activities of ROA focusing on Seismic studies at the Ibero-Maghrebian Region*

12:00 – 13:00

***Elisa Buforn***

*An Earthquake Early Warning System for the Ibero-Maghrebian region*

**13:00 – 14:00 Lunch**

## Second Session

**14:00 – 16:00 Special Session on Data Exchange – I**      **Chair: Rémy Bossu**

14:00 – 15:30 **Introduction**

### **Workshop Objectives:**

- to collect data exchange needs from network operators,
- present technical solutions to implement these exchanges,
- illustrate the benefits of such exchanges through existing collaborations
- promote bilateral collaborations
- establish a implementation plan for interested parties

15:30 – 16:00 **Presentation by participants** of the status of their networks and their data needs. A PowerPoint template has been proposed to interested parties. Interested parties were invited to contact Rémy Bossu or Torild Van Eck in advance ([bossu@emsc-csem.org](mailto:bossu@emsc-csem.org); [vaneck@knmi.nl](mailto:vaneck@knmi.nl))

15:30 – 15:40 **Cyprus**, by Stelios Nicolaidis

15:40 – 15:50 **Egypt**, by Abuo El-Ela Amin Mohamed

15:50 – 16:00 **Greece**, by Nikolaos Melis and Ilias Papadopoulos

**16:00 – 16:20 Coffee/tea break**

## Third Session

**16:20 – 18:00 Special Session on Data Exchange – II**      **Chair: Torild Van Eck**  
Presentation by participants (Continuation)

16:20 – 16:30 **Israel**, by Lea Feldman

16:30 – 16:40 **Jordan**, by Waseem Allan

16:40 – 16:50 **Lebanon**, by Rachid Jomaa

16:50 – 17:00 **Libya**, by Elmelade Abdala

17:00 – 17:10 **Malta**, by Matthew R. Agius

17:10 – 17:20 **Morocco**, by Nacer Jabour

17:20 – 17:30 **Portugal**, by Fernando Carrilho

17:30 – 17:40 **Spain**, by Antonio Pazos

17:40 – 17:50 **Sudan**, by Indira Mahmoud

17:50 – 18:00 **Tunis**, by Atef Bouallegue

18:00 – 18:10 **Turkey**, by Doğan Kalafat

18:10 – 18:20 **United Arab Emirates**, by Hussian Alhajeri

18:20 – 18:30 **France**, by Pascal Roudil

**18:30**              **Free Night**

**Tuesday, 29 October 2013**

#### **Fourth Session**

##### **Contributed Papers**

**Chair: Beatrice M.Sole Giambastiani**

09:00 – 09:15 **Nikolaos. S. Melis, I.S. Kalogeras and C.P. Evangelidis**  
*The Hellenic Seismic Network (HL): Recent Developments, Upgrades and Responsibilities*

09:15 – 09:30 **Ilias Papadopoulos and Filippos Vallianatos**  
*The Hellenic Seismological Network of Crete. An Operational facility in South Aegean (Greece)*

##### **Special Session on Data Exchange – III**

**09:30 – 10:45 Torild Van Eck**  
*Status of waveform exchanges in Europe*

**10:45 – 11:00 Coffee/tea break**

#### **Fifth Session**

**11:00 – 13:00 Special Session on Data Exchange – IV** **Chair: Torild Van Eck**

- Presentation by participants (Continuation): **Algeria, Oman, Palestine, and Saudi Arabia, to be confirmed**
- Discussion

**13:00 – 14:00 Lunch**

#### **Sixth Session**

**14:00 – 16:00 MERC Dead Sea Rift Seismological Network Project I**  
**Chair: Rami Hofstetter**

**Discussion Topic:** The recently approved project's goal is to build a virtual Dead Sea Rift Seismological Network (DSRSN) that will encompass all existing seismological networks in the region. The first step will be to merge the Jordanian, Palestinian and Israeli seismic networks. Doing this will provide substantial benefits to seismologists, engineers, geologists, and public authorities. These benefits include:

- Facilitate the development of a reliable earthquake catalog that can be applied to various engineering studies, i.e. improved hazard assessment and building codes.
- Facilitate more accurate epicenter and magnitude determinations which can be reported to civil authorities and the public;
- Facilitate better definition of define site effect and waveform attenuation.

This session will focus on several technical issues among which are organizational structure, strategic goals, technical standards, data archiving, data processing, and developing a common catalog.

**16:00 – 16:15 Coffee/tea break**



### Seventh Session

**16:15 – 18:30 MERC Dead Sea Rift Seismological Network Project II (cont.)**

**Chair: Rami Hofstetter**

**20:00 – 23:00 Workshop dinner hosted by Real Instituto y Observatorio de la Armada**

**Wednesday, 30 October 2013**

### Eighth Session

**09:00 – 09:30 Contributed papers**

**Chair: Hanan Al-Nimry**

**09:00 – 09:15 Sebastiano D'Amico, Pauline Galea and Daniela Farrugia**

*Dynamic Characteristics of an active Coastal Spreading Area using ambient noise Measurements: Examples from the Maltese Islands.*

**09:15 – 09:30 Zehra Cagnan**

*New Strong Motion Networks in the Northeastern Mediterranean Region*

**09:30 – 10:30 Middle East Regional Cooperation Program - Contributed papers**

Papers on all aspects of Middle Eastern seismology, tectonics, and data exchange are welcome but participants are urged to consider presentations on how their networks can formally or informally contribute to the MERC Program.

**10:30 – 10:45 Break – Preparation for Field Trip**

### Field trip

**10:45 – 20:00 Field trip to Granada (Including geology/archaeology/cultural heritage)**

**Thursday, 31 October 2013**

### Ninth Session

**09:00 – 11:15 MERC Round Table Discussion and General Discussion of MERC activities**

**11:15 – 11:30 Coffee/tea break**

### Tenth Session

**11:30 – 13:00 Contributed papers**

**Chair: Jalal Al Dabbeek**

11:30 – 11:45 **Nacer Jabour**

*Morocco National Seismic Network*

11:45 – 12:00 **Doğan Kalafat and Ali Pinar**

*Seismic Monitoring in Koeri (Turkey)*

12:00 – 12:15 **Iordanis Dimitriadis**

*The New Broadband National Seismological Network of Cyprus*

12:15 – 12:30 **Matthew R. Agius, Pauline Galea and Sebastiano D'Amico**

*In the process of a major upgrade at the Seismic Monitoring and Research Unit, University of Malta.*

12:30 – 12:45 **EI-Sayed Mohamed Salem**

*Seismicity of Nile River*

12:45 – 13:00 **M. Hamdache, J.A. Peláez, A. Kijko and A. Talbi**

*Characterization of a seismogenic source zone model in the Algeria-Morocco region*

**13:00 – 14:00 Lunch**

### Eleventh Session

**14:00 – 16:00 Contributed papers**

**Chair: Issa El-Hussain**

14:00 – 14:15 **M. Hamdache, J.A. Peláez and A. Talbi**

*Statistical analysis of some aftershock sequences in South and Southeastern Spain*

14:15 – 14:30 **Nasser Laouami**

*Derivation of spectral attenuation relation for Algeria based on local and regional strong motion database*

14:30 – 14:45 **Abuo El-Ela A. Mohamed and Adel M. E. Mohamed**

*Quarry Blasts Assessment and Their Environmental Impacts on the Nearby Oil Pipelines, Southeast of Helwan City, Egypt*

14:45 – 15:00 **Mourad Bezzeghoud and Assia Harbi**

*North African Group for Earthquake and Tsunami studies and the seismic hazard assessment in North Africa*

15:00 – 15:15 **Hanan S. Al-Nimry, Saddam H. Qeran and Musa R. Resheidat**

*Proposing an Indexing Method for Rapid Assessment of Seismic Vulnerability for Existing Residential Stone-Concrete Buildings*

15:15 – 15:30 **Jalal Al Dabbeek, Fabio Germagnoli, Barbara Borzi and Paola Ceresa**  
*Seismic Risk Mitigation in Palestine: SASPARM Project*

15:30 – 15:45 **Ali Pinar and Mustafa Erdik**  
*Earthquake Early Warning and Rapid Post-Earthquake Assessment Studies  
at Koeri, Turkey*

15:45 – 16:00           **Coffee/tea break**

### **Closing Session**

16:00 – 17:30           **Closing Session**  
                                  **Chair: Michael P. Foose and Alexandros Makarigakis**

**Friday, 1 November 2013**

Departure from Spain

## **Geosciences Activities of ROA Focusing on Seismic Studies at the Ibero-Maghrebian Region**

*J. Martin Davila and A. Pazos*

Sección de Geofísica, Real Instituto y Observatorio de la Armada (ROA)

ROA (“Real Instituto y Observatorio de la Armada”, San Fernando, Cádiz) is a Spanish Navy Institute about 250 years old, presently working on Astronomy, Celestial Mechanics, Time and Frequency and Earth Sciences (Geophysics-Geodesy). Since 1856 it has a post-graduate school in Mathematics, Astronomy and Earth Sciences.

ROA main activities related to Earth Sciences are: a) Seismological Service with a Short Period net deployed in the vicinities of Gibraltar Strait, and a Broad Band (BB) net (Western Mediterranean, WM net) with stations installed in South Spain-North Africa (Ibero-Maghrebian region) in collaboration with UCM, ISRABAT and GFZ. Two BB seismic stations deployed by the University of Evora (Portugal) are also associated to WM net. A temporary Ocean Bottom Seismometer (OBS) net is also deployed in the area; b) Geomagnetic Service with a remote Geomagnetic Observatory located 60 km away from ROA headquarters; c) Satellite Service with a permanent Satellite Laser Ranging station and a permanent GPS network which stations co-installed with WM BB stations.

Temporary seismic and GPS surveys are also carried out. ROA has been collaborating with Northern African countries for over 20 years, and presently ROA has installed different seismic and GPS stations at Northern Africa in collaboration with local partners, especially ISRABAT.

An underwater and on land observatory has been installed at Alboran island (mid Alboran sea) with geophysical and geodetic instrumentation (underwater three components BB sensor and accelerometer, Differential Pressure Gauge, etc) linked to the island with a two km fiber-optic cable where a geodetic GPS, a meteorological station and other instruments have been also installed, all them linked to ROA via VSAT.

Main research activities focus on Tectonics, Geodynamics, etc, by means of marine and on land surveys at different areas, among them Antarctica, Northern Caribbean zone (Hispaniola-Puerto Rico), Spanish Economic Exclusive Zone, etc.

In this presentation main ROA activities in geosciences will be introduced, with special emphasis in seismic studies carried out in the Ibero-Maghrebian region.

## **An Earthquake Early Warning System for the Ibero-Maghrebian región**

*E. Buforn*

Dpto. de Geofísica y Meteorología, Fac. CC.Físicas, Universidad Complutense, Madrid

The Ibero-Maghrebian region a tectonically complex region, located at the western part of the plate boundary between Eurasia and Africa. In this area potential large and damaging earthquakes may occur, such as the 1755 Lisbon ( $I_{max}=X$ ) or 1969 S. Vicente Cape ( $M_s=8,1$ ) events or the 1980, El Asnam or 2003 Boumerdes (Algeria) shocks. In order to study the feasibility of an Earthquake Early Warning System (EWS) for earthquakes on this region (ALERT-ES project), we have estimated the  $P_d$  and  $\tau_c$  parameters for a rapid estimation of the magnitude from the first seconds of the beginning of P-waves. A selection of earthquakes occurred on the period 2006-2011 with magnitude larger than 3.8 and recorded at regional distances at real time broadband seismic stations of Instituto Geográfico Nacional, Western Mediterranean and Portuguese National Networks have been done. Using these data, empirical scaling relationships have been derived between the early warning parameters and the earthquake size and/or its potential damaging effects for this region. An appropriate and suitable strategy is proposed for an EWS in the SW Iberian Peninsula, which takes into account the limitations of the existing seismological networks.



## Real Time Waveform Exchanges

*Rémy Bossu and Torild Van Eck*

EMSC and ORFEUS

A one day workshop on real time waveform exchanges is being organized following requests from several RELEMR participants who intend to implement such exchanges. The workshop will also be attended by several European counterparts, notably operators of tsunami warning systems.

In practice, this workshop aims at:

- Identifying the needs for (real time) waveform exchanges among partners
- Presenting technical solutions to implement (real time) waveform exchanges
- Identifying partners interested to implement such exchanges and promoting bilateral agreement to implement them
- Clarifying (with examples) the advantages and disadvantages of waveform data exchange: (near) real-time, off-line wave exchange and open/restricted data availability.

It is expected that at the end of the workshop participants would have identified several projects for real time exchanges and established implementation plan.

## **The Hellenic Seismic Network (HL): Recent Developments, Upgrades and Responsibilities**

*N.S. Melis, I.S. Kalogeras and C.P. Evangelidis*

National Observatory of Athens, Institute of Geodynamics, Athens, Greece

The National Observatory of Athens, Institute of Geodynamics (NOA-IG) monitors seismicity in Greece and offers an information–alert 24/7 service to the Greek State since its foundation in 1893. Upgrades towards a modernized digital seismic network started back in 2000 and they were continued, with national funds made available and more personnel employed. The most recent improvement started in 2007, with a national funded project aiming to establish a Unified National Seismic Network that links the Hellenic National Seismic Network of NOA-IG with the three University local/regional seismic networks: Athens, Thessaloniki and Patras. Although the four joined networks are operated independently, with each partner responsible for the operation of its own network, this project upgrade achieved the update – improvement of every individual network and made available the seismic waveform data in near real time amongst all four partners. In parallel, a new upgraded National Strong Motion Network at NOA-IG was also established through national funds. This gave the opportunity to join the continuous monitored accelerometric data in real time with the available broadband data and furthermore to upgrade existing seismic stations, by deploying an accelerometer next to the existing broadband sensor.

The 24/7 Operational Centre has been upgraded and refurbished. An auto location system based on SeisComP3 is operated, serving information alerts to the Greek State, the public and the scientific community. Alerts are also pushed to EMSC and they are fed to a Tsunami Alerting System that is operated at NOA-IG, since its establishment also as a National Tsunami Warning Centre for the Greek State and Candidate Tsunami Watch Provider for the frame of UNESCO NEAMTWS. Routine Moment Tensor estimation is also performed in an automatic operation as well as in interactive review approach. The available accelerometric data are in use, with the aim to establish a Shakemap providing service.

NOA-IG provides data openly for research purposes on a query basis and it is under preparation to act as an EIDA node. Exchange of real time data is performed on a Bilateral Agreement basis or through MoU that serve collaboration purposes.

The Unified National Seismic Network is expected by the end of 2015 to include a new 90 stations backbone seismic network and 20 tide gauge stations, which will serve towards the further improvement of earthquake and tsunami monitoring in Greece and the adjacent region.

## **The Hellenic Seismological Network of Crete. An Operational facility in South Aegean (Greece)**

*Ilias Papadopoulos and Filippos Vallianatos*

Technological Educational Institute of Crete,  
Laboratory of Geophysics & Seismology, Chania, Crete, Greece

Earthquakes, among other natural hazards, are the most probable cause for Natural Disaster in the proximity of Eastern Mediterranean Sea. The ability to monitor, study and understand the physics of the earth's interior in the front of the Hellenic Arc is crucial to prevent human loss and economic disasters due to strong earthquake activity. Hellenic Seismological Network of Crete (HSNC) is a regional local telemetric network of 13 modern state-of-art stations located in the South Aegean, in the vicinity of the island of Crete that monitor the seismic activity at the subduction zone and volcanic arc between the African and Aegean plate. By using modern facilities and employing private ADSL lines and satellite links, HSNC provides a reliable monitoring of the area. Specialized algorithms allow the detection of seismic events down to low magnitude scale and then a sophisticated system informs a closed list. Also, international seismic centers are informed of the activity in a very active and high seismic risk region.

### ***Acknowledgements***

This work was implemented through the project entitled "Interdisciplinary Multi-Scale Research of Earthquake Physics and Seismotectonics at the Front of the Hellenic Arc (IMPACT-ARC)" in the framework of action "ARCHIMEDES III – Support of Research Teams at TEI of Crete" (MIS380353) of the Operational Program

## Dynamic Characteristics of an Active Coastal Spreading Area Using Ambient Noise Measurements: Examples from the Maltese Islands

*Sebastiano D'Amico, Pauline Galea and Daniela Farrugia*

Physics Department, University of Malta, Msida, Malta

Landslides and rockfalls represent a significant geohazard, especially in areas of coastal instability. These are generally classified into a number of landslide mechanisms, such as rotational, translational and block sliding, rock toppling, debris flow, lateral spreading etc, however a common cause of many of these failure types is the superposition of rock strata with different geomechanical properties and erosional characteristics. An understanding of the mechanisms leading to slope failure is critical to assessing the hazard due to these formations, and to the eventual prevention of economic and human loss. Moreover, such rock failures are often triggered and aggravated by earthquake ground shaking, and often constitute a large proportion of the earthquake damage at an affected site. The study of such phenomena is therefore even more important in areas which are also subject to seismic hazard such as the Maltese archipelago. Studies related to the assessment and mapping of landslide hazard, as well as their vulnerability to earthquake shaking, have increased in recent years. Lately, slope and coastal instabilities have also been investigated by recording ambient noise, and the use of techniques such as H/V (horizontal-to-vertical spectral ratio) analysis, f-k analysis, site spectral ratios, polarization analysis etc (e. g. Burjánek et al, 2012, Panzera *et al*, 2012). In particular, single station methods prove to be a very cost effective and rapid way of surveying an area, bypassing the problem of bringing bulky instrumentation into mostly inaccessible areas. H/V measurements yield important insights into resonance behavior of particular lithomorphologies and geomorphological features, while polarization analysis provides information about particle motion and directivity properties, which in turn may be associated with mechanical vibrational behavior of large scale structures. In this study we investigate three different areas (Anchor Bay, Golden Bay and Xemxija Bay) in the Maltese islands affected by coastal instability and characterized by active lateral spreading, rock sliding and rockfalls. Here we make use of ambient noise recordings, using a single portable seismograph, and evaluate H/V ratios and polarization characteristics to investigate the dynamic characteristics of features at different stages of the destabilization process. In this study, we attempt to explore what information can be obtained from ambient noise about the dynamic behavior of different regions of the coastal cliff area and their state of instability or otherwise, and hence about the risk present. It is hoped that these results will enhance the knowledge gained from previous investigations using different methods.

### References

- Burjánek, J., Moore, J. R., Yugsí Molina, F. X., & Fäh, D. (2012). Instrumental evidence of normal mode rock slope vibration. *Geophysical Journal International*, 188(2), 559–569. doi:10.1111/j.1365-246X.2011.05272.x
- Panzera, F., D'Amico, S., Lotteri, a., Galea, P., & Lombardo, G. (2012). Seismic site response of unstable steep slope using noise measurements: the case study of Xemxija Bay area, Malta. *Natural Hazards and Earth System Science*, 12(11), 3421–3431. doi:10.5194/nhess-12-3421-2012

## **New Strong Motion Networks in the Northeastern Mediterranean Region**

*Zehra Cagnan*

Middle East Technical University, Turkey

Within the scope of the 'Seismic Hazard Assessment for Cyprus and Neighboring Regions' project, 13 free field strong motion stations were installed. The station locations were chosen in accordance with the density of earthquakes taking place in the Northeastern Mediterranean region; availability of required infrastructure and variability of soil conditions. The latter was fully characterized at these stations by detailed seismic and geotechnical tests. This new network was activated on 17.09.2012 and since then 120 strong motion records of 19 regional earthquakes were obtained.

Characteristics of these records will be discussed in this talk. The main aim behind deploying these stations is to enable development of local ground motion attenuation relations possible in the future. Within the scope of the 'Earthquake Vulnerability Assessment of Historical Monuments in Cyprus' project, 10 additional strong motions instruments were installed on the St. Nicholas Cathedral of Famagusta. One of these stations is a free field station and the remaining nine are distributed at two different levels throughout the structure. This network has been active since 01.04.2011. In this talk, details of this second newly developed network will be discussed as well.



## Morocco National Seismic Network

*Nacer Jabour*

Laboratoire de Géophysique, Centre National de Recherches  
Scientifiques et Techniques, (ING) Rabat, Morocco

The recent Moroccan seismic monitoring system started with the deployment of approximately 30 Very-Broad-Band and short period seismic stations. The new digital sensors will replace the old analog seismic ones.

In this way, the stations locations will be maintained for the major part of the previous network. New sites will also be investigated in order to improve the determinations in some seismogenic zones.

To ensure optimal signal to noise ratio, new stations shelters are constructed underground with necessary protections.

The stations are designed following the highest technical standards and the installation will be finalised in 2014 according to the plan. Other seismic stations from different institutions will be integrated in the new network.

The seismic data transmission to the national Data Centre in Rabat is done in real time using satellite technology.

## Seismic Monitoring in KOERI (Turkey)

*Doğan Kalafat<sup>(1)</sup> and Ali Pinar<sup>(2)</sup>*

<sup>(1)</sup>Boğaziçi University Kandilli Observatory & ERI, NEMC – İstanbul, Turkey

<sup>(2)</sup>Boğaziçi University Kandilli Observatory & ERI,  
Earthquake Engineering Department İstanbul/Turkey

Kandilli Observatory and Earthquake Research Institute (KOERI) is operating KOERI Seismic Network. Therefore National Earthquake Monitoring Center (NEMC) is responsible of seismic monitoring of Turkey. NEMC has established new earthquake stations in different regions all over the country, and NEMC has continuously developed its seismic network. KOERI currently is capable of acquisition of seismic data, analysis of this data and delivering the earthquake parameter results in a healthy, quick and real time manner in Turkey and surrounding area. The real time earthquake parameters are provided to all disaster related organizations.

Earthquakes occurring in any part of Turkey are located and their magnitude is calculated from the continuous real time data received from this network within a short time during 7 days 24 hours. The total numbers of stations are over 220 with satellite and/or 3G wireless mobile telecommunications technology connected. Especially two years ago we started deployment of strong motions stations in the whole coastal area surrounding Turkey. In addition, with the financial support of Turkish Telekom, in the Marmara Sea 5 Sea Bottom Observatories (3 component BB sensors (120 sec.), 3C accelerometer, pressure difference measurement, hydrophone, temperature measurement) installed. The seismic stations operated by other seismological data centers (115) are flowing to NEMC. Hundreds of them are international and the others are national. We use 2 main programs for Earthquake parameter solutions. Such as Zsacwin program developed by our center (Yılmaz, 2011). NEMC determines occurrence time, depth, location, fault plane solutions, size of earthquakes by using Zsacwin programme routine. Last definite information of earthquakes after resolved by Zsacwin programmed is automatically sent to the web page. The real time earthquake parameters are provided to all other disaster organizations automatically. The other program is Seiscomp3. This programme is developed by GFZ staff. Sc3 is currently used as primarily automatic solutions.

The Seismic Network record data continuously in realtime from NEMC stations in Turkey and neighbouring regions. The majority of this huge dataset, including broadband, strong motion, is made available in near realtime to the public and the scientific community via our data dissemination web base. At this site, data can be accessed from any time period from our continuous archives, or the SAC earthquake database can be queried and only data from selected earthquakes can be accessed.

The purpose of NEMC:

- To establish and operate seismic station network around the country,
- To determine the Earthquake parameters for Turkey in real time and share them related institutions,
- To collect Seismological Data in International Standards and make them available for all researchers,
- To upgrade the seismic stations network accordingly to current technology ,
- To build an Earthquake Data Bank for Earth Scientist,
- Aftershock monitoring activity after a destructive earthquake by installing new portable seismometer and data processing,
- To explain the Earthquake Parameters to social communities.
- After the earthquake NEMC provides shake map, loss map and damage maps automatically.

## **The New Broadband National Seismological Network of Cyprus**

*Iordanis Dimitriadis*

Geological Survey Department Nicosia, Cyprus

The New Broadband National Seismological Network of Cyprus is at the final stages of commissioning and will be fully operational by the end of 2013. It utilizes nine inland digital broadband seismological stations and 2 ocean bottom broadband sensors in the south west of the island. Eight of the inland stations are newly deployed by the Geological Survey Department (GSD) and are interconnected by a private, real-time VSAT satellite network, and a backup terrestrial internet network. Seismic data are continuously flowing in real-time through the VSAT and internet networks at a primary and a secondary (backup) seismological centre, where real-time automatic earthquake evaluation systems are in trial operation. The new computing equipment of GSD supports automatic and manual data processing including earthquake source parameters, network monitoring and preventive maintenance, as well as two-way real-time data sharing. The new network detects local events as small as 1.0 ML and is also providing regional and teleseismic earthquake arrivals to the seismological community. By the end of 2013 the network will be in full operation and GSD aspires to a real-time data-exchange collaboration scheme with regional networks of the eastern Mediterranean.

**In the process of a major upgrade at the Seismic  
Monitoring and Research Unit, University of Malta**

*Matthew R. Agius, Pauline Galea and Sebastiano D'Amico*

Seismic Monitoring & Research Unit, Dipartiment tal-Fizika,  
Fakulta tax-Xjenza, L-Universita ta' Malta.

The Seismic Monitoring and Research Unit (SMRU) of the University of Malta has, in the last year, seen substantial progress. The unit is a partner in a newly-launched €2.5 million project – SIMIT – funded by the Italia-Malta 2007-2013 Operational Programme, Strategic Projects. The project deals with the establishment of an integrated Civil Protection system for the Italo-Maltese cross-border area, focusing mainly on the handling of seismic risk. The role of the SMRU is to provide scientific input in the form of an improved real-time monitoring system for earthquakes in the Central Mediterranean, the evaluation of seismic hazard for the cross-border region and the numerical calculation of ground shaking scenarios in the event of a plausible earthquake.

In the last few months new personnel has been employed within the SMRU and real-time seismic monitoring has been stepped up with the installation of SeisComp3. At present the real-time data from stations across the Mediterranean is retrieved from the MedNet, Geofon and Tunisian networks. Automated e-mail and SMS earthquake alerts are sent within a few minutes from the origin time. A new site for a new permanent real-time broad-band seismic station is currently being identified on the island of Gozo, to be installed in the coming months. The new station together with possible data exchange of seismic stations from other locations such as Libya, Egypt, Greece and Sicily will help enhance the detectability and location accuracy of earthquakes in this part of the Mediterranean.

## Seismicity of Nile River

*El-Sayed Mohamed Salem*

Egyptian Geological Survey, Cairo, Egypt

Earthquakes do not occur at random sites but their epicenters follow certain trends according to the geological history of the region. Nile River is structurally controlled. To throw light on seismicity of the river seismological data were collected through the period 1906-2010 with addition to historical earthquakes, geological study has been carried out; Nile River was subdivided into 8 segments from Cairo to Aswan according to the bending of the river and damage areas.

The distribution of recorded and historical earthquakes revealed that the occurrences of damage regions associated with the bending of Nile River, these places are weak zones because they were subjected in the past to severe tectonic activity and reactivate in the recent.



## Characterization of a Seismogenic Source Zone Model in the Algeria-Morocco Region

*M. Hamdache<sup>(1)</sup>, J.A. Peláez<sup>(2)</sup>, A. Kijko<sup>(3)</sup> and A. Talbi<sup>(1)</sup>*

<sup>(1)</sup> Département Etudes et Surveillance Sismique, CRAAG, Algiers, Algeria.

<sup>(2)</sup> Department of Physics, University of Jaén, Jaén, Spain.

<sup>(3)</sup> Natural Hazard Center, University of Pretoria, Pretoria, SouthAfrica.

In this study, a seismogenic source zone model for the Algeria-Morocco region is proposed both for seismic forecasting and seismic hazard studies. The delineation includes five wide zones based on available seismic, seismotectonic and geophysical data.

Earthquake occurrence process is modeled and analyzed using recent earthquake catalogs compiled specifically for Northern Morocco and Northern Algeria in former studies. In these catalogs, dependent events were identified and removed by adapting Gardner & Knopoff declustering procedure to the study region. Magnitudes of completeness  $m_c$  were estimated using different methods, then the Poissonian character of the sub-catalogs obtained for the different  $m_c$  values were analyzed.

The parametric-historic procedure developed by Kijko & Graham (1998, 1999), including the recent improvement and extension of the maximum possible earthquake magnitude estimator, is used to compute seismic hazard parameters.

The  $b$ -value of the Gutenberg-Richter recurrence relationship, taken as an area-specific seismic hazard parameter, has been computed using an extension of the Aki-Utsu  $b$ -value estimator for incomplete earthquake catalogs. Then, we derive the activity rate  $\lambda(m)$  for events above the magnitude  $m$ , the maximum possible magnitude  $m_{max}$  and its probability distribution function (pdf), which have been analyzed in depth using parametric and non parametric procedures. These parameters were computed and analyzed for the five seismogenic source zones delineated in the Algeria-Morocco region.

The second part of this study is related to site-specific seismic hazard, which has been performed in terms of the maximum possible acceleration and seismic hazard curves in terms of PGA with a given probability of exceedence in  $T$  years, given a hypothetical engineering structure (HES) located at the most populated and industrial cities in the Algeria-Morocco region.

## Statistical analysis of some aftershock sequences in South and Southeastern Spain

*M. Hamdache<sup>(1)</sup>, J.A. Peláez<sup>(2)</sup> and A. Talbí<sup>(1)</sup>*

<sup>(1)</sup> Département Etudes et Surveillance Sismique, CRAAG.

<sup>(2)</sup> Department of Physics, University of Jaén, Jaén, Spain

A probabilistic modeling is used to analyze the spatio-temporal behavior of eleven aftershock sequences occurred in South and Southeastern Spain. This study focuses mainly on the analysis of two seismicity parameters: the  $b$ -value of the frequency-magnitude distribution, and the  $p$ -value, explaining the temporal decay rate of aftershocks. The computed  $b$ -values range between  $0.77 \pm 0.05$  and  $1.18 \pm 0.10$ . The computed  $p$ -values range between  $0.75 \pm 0.03$  and  $1.43 \pm 0.10$ , showing broad regimes of the temporal decay of aftershocks.

The modified Bath's law is used to analyze the energy partitioning. It suggests that a large fraction of the accumulated energy is released in the main shock, and only a relatively small fraction of energy is released during the aftershock sequence. For example, we obtained that an 80% of the total energy is released during the  $m_{bLg}$  4.8, Mula 1999, an 88% during the  $m_{bLg}$  4.8, Bullas 2002, and an 87% during the  $m_{bLg}$  4.8, La Paca 2005, earthquakes. The fractal dimension  $D_2$  is estimated using the correlation integral, and then used to derive the slip ratio, as the ratio of the slip occurred on primary fault segment to the total slip. For example, we have obtained a slip ratio equal to 71% for the Mula 1999, 61% for the Bullas 2002 event, 58% for the La Paca 2005, 50% for the Lorca 2011, and 63% for the Gador 2002 earthquakes.

Finally, the correlations between the fractal dimension, the  $b$ -value and the  $p$ -value are analyzed, and the Aki's relation  $D=3b/c$  is discussed as well.

## Derivation of spectral attenuation relation for Algeria based on local and regional strong motion database

*Nasser Laouami*

Centre National de Recherche Appliquée en Génie Parasismique  
Algiers, Algeria

Algeria is located on the northern edge of the African plate, which is converging with the European plate. Northern Algeria is a highly seismic area that experienced several destructive moderate-to-strong earthquakes in the past. Since the installation of the Algerian accelerographs network (335 stations), several earthquakes were recorded and constitute currently a very rich data bank. From this data bank, a strong motion catalog is established and contains information regarding the magnitude ( $M_s$ ), the hypocentral distance, the site type, earthquake and stations locations ...etc. Actually, the catalog contains around 1000 records ( $2 < M_s < 6.9$  and  $7 < D_{\text{hypo}} < 160$  Km). One of the most important applications was to derive an attenuation relationship for Algeria.

The considered spectral attenuation model accounts for geometrical spreading, anelastic attenuation, and geological site conditions. The regression method, introduced by Joyner and Boore (1981), is a two-step inversion [Fukushima and Tanaka, 1990; Fukushima and Tanaka, 1992]. The attenuation model describes the evolution of spectral acceleration according to magnitude, hypocentral distance, and category of the site.

Spectral attenuation laws were derived from 1155 horizontal components. The datasets are constituted of Algerian strong motion records (55%) and European records (45%) homogeneously processed. Two models are then studied, the first one considers Algerian data only, called local model, and the second one considers the whole data called regional model.

The obtained results show that the PGA standard deviation decreases from 0.33 (local data) to 0.32 (regional data), and the local model overestimates the predicted acceleration for larger magnitude and lower distance. The residual values between observed and predicted spectral accelerations are studied and do not exhibit any bias. The inferred regional law is in good agreement with classical published strong motion attenuation laws.

## Quarry Blasts Assessment and Their Environmental Impacts on the Nearby Oil Pipelines, Southeast of Helwan City, Egypt

*Abuo El-Ela A. Mohamed and Adel M. E. Mohamed*

Seismology Department, the National Research Institute  
of Astronomy and Geophysics, Egypt

Ground vibrations induced by blasting in the cement quarries are one of the fundamental problems in the quarrying industry and may cause severe damage to the nearby utilities and pipelines. Therefore, a vibration control study plays an important role in the minimization of environmental effects of blasting in quarries. This research paper presents the results of ground vibration measurements induced by blasting at the National Cement Company (NCC) southeast of Helwan city, Egypt. The aim of this study is to investigate the influence of the quarry blasts on the oil pipelines of SUMED Company. The seismic refraction for compressional waves and the shear wave velocity obtained from the Multi channel Analysis of Surface Waves (MASW) are used to evaluate the closest site of the two pipelines to the quarry blasts. The results demonstrate that, the closest site of the two pipelines is of class B, according to the International Building Code (IBC) and the safe distance to avoid any environmental effects is 650 m, following the deduced Peak Particle Velocity (PPV) and Scaled Distance (SD) relationship ( $PPV = 440.64 \times SD^{-1.225}$ ) in mm/s and the Air over Pressure (Air Blast) formula ( $Air\ Blast = 152.87 \times SD^{-0.071}$ ) in dB. In the light of the prediction analysis, the maximum allowable charge weight per delay was found to be  $591\text{ m/kg}^{0.5}$  with a damage criterion of 12.5 mm/sec at the closest site of the SUMED pipelines.

## North African Group for Earthquake and Tsunami studies and the seismic hazard assessment in North Africa

*Mourad Bezzeghoud<sup>(1)</sup> and Assia Harbi<sup>(2)</sup>*

<sup>(1)</sup>Dept. of Physics and Centro de Geofísica de Évora, ECT, University of Évora, Portugal

<sup>(2)</sup>Centre de Recherche en Astronomie, Astrophysique et Géophysique,  
CRAAG, Bouzaréah, Algiers, Algeria

North Africa is one of the most earthquake-prone areas of the Mediterranean. Many devastating earthquakes, some of them tsunami-triggering, inflicted heavy loss of life and considerable economic damage to the region. Thus it was important and necessary for the North-African Scientists to join their efforts in order to capitalize on any synergies aiming at the best seismic hazard assessment and risk mitigation of the region. The North African Group for Earthquake and Tsunami studies (NAGET, previously NASG) was founded in 2000 under the aegis of ICTP (Trieste, Italy). It is structured as a partnership among a diverse group of North African countries (Morocco, Algeria, Tunisia, Libya, Egypt and Sudan).

In this paper, we briefly present the nature, mission and objectives of NAGET and the first study, by the group, that aimed at producing Neo-deterministic seismic hazard assessment maps of North Africa including five countries: Morocco, Algeria, Tunisia, Libya, and Egypt. Then, we describe the seismotectonic context of North Africa and present the maps obtained in terms of the distribution of maximum displacement, maximum velocity, and design ground acceleration. These thematic maps about earthquake hazard constitute important basic information necessary for the sustainable social and economic development of North Africa.

### **Reference**

- Mourabit T., Abou Elenean K. M., Ayadi A., Benouar D., Ben Suleman A., Bezzeghoud M., Cheddadi A., Chourak M., ElGabry M. N., Harbi A., Hfaiedh M., Hussein H. M., Kacem J., Ksentini A., Jabour N., Magrin A., Maouche S., Meghraoui M., Ousadou F., Panza G.F., Peresan A., Romdhane N., Vaccari F. and Zuccolo E., 2013. Neo-Deterministic Seismic Hazard Assessment in North-Africa, *Journal of Seismology*, accepted. DOI 10.1007/s10950-013-9375-2

## Proposing an Indexing Method for Rapid Assessment of Seismic Vulnerability for Existing Residential Stone-Concrete Buildings

*Hanan S. Al-Nimry, Saddam H. Qeran, Musa R. Resheidat*

Department of Civil Engineering,  
Jordan University of Science and Technology, Irbid, Jordan

The residential building stock in Jordan is dominated by a local type of construction of weak RC infilled frames. The exterior frames are infilled with stiff stone-concrete walls whereas the interior frames bound masonry panels built of concrete blocks. Seismic vulnerability of this type of construction, which could only be found in Jordan and some of the neighboring countries, is not well-defined. Identification of seismically inadequate structures with detailed inspection and analysis requires enormous time and effort. This study is concerned with the development and application of an indexing method for rapid evaluation of the seismic vulnerability of existing residential stone-concrete buildings in Jordan. The proposed assessment method is a rapid and yet simple evaluation method that can be used to identify buildings as adequate, in terms of human life safety, or those that may be at risk during ground motions and therefore require further detailed evaluation. The proposed indexing method is only concerned with the local low and medium rise residential buildings constructed between 1990 and 2005. Buildings subject of the study are classified into two area groups wherein each area group is further classified into low rise (1-3 stories) or medium rise (4-6 stories) height categories. Under each area-height category, buildings are classified into regular and irregular subcategories. The effects of the locally dominant horizontal irregularities (setbacks and re-entrant corners), vertical irregularities (soft story) and overhangs on the seismic performance of local buildings are examined. A total of forty buildings were analyzed to arrive at the basic parameters of the evaluation method. Analytical computer models of the representative buildings were built. Contribution of the infill walls to the lateral resistance and stiffness of the representative buildings was modeled using nonlinear diagonal compressive struts. Using SAP2000N, static nonlinear (pushover) analysis was carried out to arrive at the capacity curves of the representative buildings. A Basic Capacity Index (BCI) was obtained for each building using its capacity curve and the design base shear value (code value). This was later modified using five performance modifiers to arrive at the Capacity Index (CI) of the building which is to be compared with a limit CI value. A Capacity Index value below the limit value indicates that the building under consideration could experience moderate damage during an earthquake and hence the building is classified as in need for further detailed evaluation whereas a higher CI value implies that the building under consideration could experience minor damage, if any. Assessment forms were designed and used to evaluate twenty two sample buildings in two main cities in Jordan.

### **Keywords**

Rapid assessment; reinforced concrete; infilled frames; stone-concrete infills; pushover analysis; capacity index.



## Seismic Risk Mitigation in Palestine SASPARM Project

*Jalal Al Dabbeek<sup>(1)</sup>, Paola Ceresa<sup>(2)</sup> <sup>(3)</sup>, Fabio Germagnoli<sup>(2)</sup> and Barbara Borzi<sup>(2)</sup>*

<sup>(1)</sup>UPDRRC TEAM, Palestine

<sup>(2)</sup>EUCENTRE, Italy.

<sup>(3)</sup>IUSS University, Italy.

This project aims to reinforce the cooperation with Europe's neighbours in the context of the European Research Area. Urban Planning and Disaster Risk Reduction Center (UPDRRC) at An-Najah National University (NNU) in Palestine is coordinating the project, supported by the European Centre for Training and Research in Earthquake Engineering (EUCENTRE) and the Institute for Advanced Study of Pavia (IUSS) in Italy. The supporting action of EUCENTRE will lead UPDRRC to become a globally competitive and experienced research centre in the field of seismic risk mitigation and disaster management. EUCENTRE will collaborate with UPDRRC to devise a research strategy capable of increasing the scope and visibility of UPDRRC at the national and international levels. The supporting action of IUSS will be fundamental for the training activities for students and young researchers. The long experience of IUSS in the field of earthquake engineering and engineering seismology post-graduate courses will represent a distinguishing feature of the international vocation of the SASPARM activities.

By developing a comprehensive research strategy, the significant strengthening of UPDRRC role will be fundamental in meeting the national socio-economic challenges and regional and international research activities. The project activities are identified with the goal of creating a research infrastructure and developing and enhancing international cooperation with PS in the field of scientific technology and capacity building, i.e. human resources, research policy, networks of researchers and research institutes. In an international framework the proposed activities will lead UPDRRC to a fruitful cooperation with EU.

At the national level, an enhancement of capability will ensure PS to establish a centre prepared to respond to earthquake engineering needs of the local community. The mentioned target will be pursued by enhancing the capability of UPDRRC for training activity in the field of earthquake engineering. Furthermore, a higher visibility of UPDRRC will encourage researchers to compete internationally in terms of scientific excellence (e.g., acquiring and participating in EU Framework projects related to seismic risk reductions) and increase their incentives to continue their research activities in PS.

Improved competitiveness of NNU, creation of networks of research centres, promote initiatives of general public awareness are some of the expected results of SASPARM.

Note: Project acronym: SASPARM  
Project full title: "Support Action for Strengthening Palestinian-administrated Areas capabilities for Seismic Risk Mitigation.  
Project funded by European Commission through the SEVENTH FRAME WORK PROGRAMME.

## **Earthquake Early Warning and Rapid Post-Earthquake Assessment Studies at KOERI, Turkey**

*Ali Pinar and Mustafa Erdik*

Bogazici University, Kaindilli Observatory and Earthquake Research Institute (KOERI),  
Istanbul, Turkey

The implementation of the earthquake early warning system (EEWS) in Istanbul commenced in 2001. Satellite based and fiber optic data transmission systems are used for communication between the remote stations and the base station at KOERI. The continuous on-line data from these stations is used to provide real time warning for emerging potentially disastrous earthquakes. A simple and robust Early Warning algorithm, based on specific threshold time domain amplitude levels named as CAV is implemented. Regional early warning algorithms such as PRESTo and Virtual Seismologist running under Seiscomp3 are to be implemented as well. The early warning signal is to be communicated to the appropriate servo shut-down systems of the recipient facilities, which will automatically decide proper action based on the alarm level. Among the prospective end users of the EEW signal are the facilities such as Fast Train and Tube Tunnel, Istanbul Gas Distribution Corporation (IGDAS). Recently constructed tall buildings, electric power plants.

In addition, work done over the last decades regarding the development of new approaches and setting up of new applications for earthquake rapid response systems that function to estimate earthquake losses in quasi-real time after an earthquake are elaborated.

## List of Participants

### Algeria

#### **Nasser Laouami**

Directeur de Recherche  
Chef de Division de Recherche Aléa  
Sismique  
Centre National de Recherche Appliquée  
en Génie Parasismique, CGS  
Rue Kaddour Rahim, BP. 252, Hussein  
Dey, Alger, Algérie.  
Tel: +213 21 49 55 41  
Fax: +213 21 49 55 36  
E-mail: [nlaouami@cgs-dz.org](mailto:nlaouami@cgs-dz.org)  
[n\\_laouami@hotmail.com](mailto:n_laouami@hotmail.com)

#### **Mohamed Hamdache**

Chercheur  
CRAAG  
BP63 Bouzaréah 16348  
Algiers, Algeria  
Tel: +21 90 44 54/55  
Fax: +21 90 44 58  
E-mail: [mhamdache@hotmail.com](mailto:mhamdache@hotmail.com)  
[m.hamdache@craag.dz](mailto:m.hamdache@craag.dz)

### Cyprus

#### **Eleni Georgiou Morisseau**

Director  
Geological Survey Department  
1415 Nicosia, Cyprus  
Tel: +357 224 09213  
Fax: +357 223 16873  
E-mail: [director@gsd.moa.gov.cy](mailto:director@gsd.moa.gov.cy)

#### **Stelios Nicolaidis**

Senior Geological Officer  
Geological Survey Department  
1415 Nicosia, Cyprus  
Tel: +357-22409260  
Fax: +357 223 16873  
E-mail: [snicolaidis@gsd.moa.gov.cy](mailto:snicolaidis@gsd.moa.gov.cy)

#### **Iordanis Dimitriadis**

Seismologist  
Geological Survey Department  
1415 Nicosia  
Cyprus  
E-mail: [jdimitriadis@gsd.moa.gov.cy](mailto:jdimitriadis@gsd.moa.gov.cy)

### Egypt

#### **Hatem Odah**

President  
National Research Institute of Astronomy  
and Geophysics - NRIAG  
Helwan  
Cairo, Egypt  
E-mail: [hatemodah@nriag.sci.eg](mailto:hatemodah@nriag.sci.eg)  
[hatemodah@yahoo.com](mailto:hatemodah@yahoo.com)

#### **Abuo El-Ela Amin Mohamed**

Professor,  
Head of Seismology Department,  
National Research Institute of Astronomy  
and Geophysics  
E-mail: [amin@nriag.sci.eg](mailto:amin@nriag.sci.eg)  
[abuoelela99@hotmail.com](mailto:abuoelela99@hotmail.com)

#### **El-Sayed Mohamed Salem**

Egyptian Geological Survey and Mining  
Authority  
3 Salah Salem Road  
Abbasiya, Cairo 11517, Egypte  
Tel: +202 682 8013  
E-mail: [sayedsalem2000@hotmail.com](mailto:sayedsalem2000@hotmail.com)

### France

#### **Remy Bussu**

Secretary General  
European-Mediterranean Seismological  
Centre  
c/o CEA, Bt. Sâbles  
Centre DAM- Ile de France  
Bruyères le Châtel  
91297 Arpajon Cedex  
France  
Tel: +33 169267814  
E-mail: [Remy.BOSSU@CEA.FR](mailto:Remy.BOSSU@CEA.FR)

**Gilles Mazet-Roux**

Seismologist of the European-  
Mediterranean Seismological Centre  
c/o CEA, Bt. Bard Centre DAM –  
Ile de France Bruyères le Châtel  
91297 Arpajon Cedex  
France  
E-mail : [mazet@emsc-csem.org](mailto:mazet@emsc-csem.org)

**Pascal Roudil**

Head of CENALT  
Commissariat à l'Energie Atomique et aux  
Energies Alternatives DASE/LDG Bruyères-  
le-Châtel  
91297 Arpajon Cedex  
France  
E-mail : [pascal.roudil@cea.fr](mailto:pascal.roudil@cea.fr)

**Germany****Angelo Strollo**

Seismologist (GEOFON)  
GFZ German Research Centre for  
Geosciences  
14473 Potsdam Brandenburg  
Germany  
E-mail: [strollo@gfz-potsdam.de](mailto:strollo@gfz-potsdam.de)

**Greece****Filippos Vallianatos**

Head of the Laboratory of Geophysics &  
Seismology  
Technological Educational Institute of  
Crete  
School of Natural Resources &  
Environment  
3 Romanou Str., Chalepa, Chania 73133  
Crete,  
Greece  
E-mail: [fvallian@chania.teicrete.gr](mailto:fvallian@chania.teicrete.gr)

**Ilias Papadopoulos**

Laboratory of Geophysics and Seismology,  
Department of Environment and  
Natural Resources  
Technological Educational Institute of  
Crete  
GR-73100  
Chania, GREECE  
Tel: +30-2310-23028  
Email: [ilias@chania.teicrete.gr](mailto:ilias@chania.teicrete.gr)

**Nikolaos S. Melis**

Director of Research  
Institute of Geodynamics,  
National Observatory of Athens,  
Lofos Nimfon,  
GR-118 10, Thissio,  
Athens,  
Greece  
E-mail: [nmelis@noa.gr](mailto:nmelis@noa.gr)

**Israel****Rami Hofstetter**

Head Seismology Division  
Geophysical Institute of Israel (GII)  
P.O.B 182, LOD 71100,  
Israel  
E-mail: [ramih@gii.co.il](mailto:ramih@gii.co.il)  
[ramihof@yahoo.com](mailto:ramihof@yahoo.com)

**Vladimir Pinsky**

Senior Researcher  
Seismology Division  
Geophysical Institute of Israel (GII)  
P.O.B 182, LOD 71100,  
Israel  
E-mail: [vlad@seis.mni.gov.il](mailto:vlad@seis.mni.gov.il)

**Andrei Polozov**

Geophysical Institute of Israel (GII)  
P.O.B 182, LOD 71100,  
Israel  
E-mail: [andre.user12@gmail.com](mailto:andre.user12@gmail.com)



**NERA**

**Lea Feldman**

Analyst,  
Seismology Division  
Geophysical Institute of Israel (GII)  
P.O.B 182, LOD 71100,  
Israel  
E-mail: [leaf@gii.co.il](mailto:leaf@gii.co.il)

**Yochai Ben Horin**

Head of SNRC,  
Soreq Nuclear Research Center,  
National Data Center of Israel,  
Yavne 81800,  
Israel  
E-mail: [yochai.benhorin@gmail.com](mailto:yochai.benhorin@gmail.com)

**Italy**

**Beatrice M.Sole Giambastiani**

Earth Sciences Department  
University of Ferrara  
Ferrara,  
Italy  
Tel: +39 0532 974695  
E-mail: [gmbbrc@unife.it](mailto:gmbbrc@unife.it)

**Jordan**

**Mahmoud Al-Qarryouti**

Head of Jordan Seismological  
Observatory (JSO)  
Natural Resources Authority  
Amman 1118,  
Jordan  
E-mail: [Mahmoud.Qaryouti@NRA.GOV.JO](mailto:Mahmoud.Qaryouti@NRA.GOV.JO)

**Ali Sawarieh**

Director of Geology  
Natural Resources Authority  
P.O. Box 7  
Amman 11118  
Jordan  
E-mail: [sawarieh@nra.gov.jo](mailto:sawarieh@nra.gov.jo)

**Waseem Allan**

Computer Engineer  
Jordan Seismological Observatory (JSO)  
Natural Resources Authority (NRA)  
Ministry of Energy and Mineral resources  
Tel: +962 795092092  
E-mail: [waseemallan@hotmail.com](mailto:waseemallan@hotmail.com)

**Hanan Al-Nimry**

Assistant Professor of Structural  
Engineering  
Department of Civil Engineering,  
Faculty of Engineering  
Jordan University of Science and  
Technology  
P.O Box 3030 Irbid 22110,  
Jordan  
Tel: +962 2 720 1000 Ext. 22110  
Fax: +962 2 720 1074  
E-mail: [hsnimry@just.edu.jo](mailto:hsnimry@just.edu.jo)

**Lebanon**

**Rachid Jomaa**

Head of the Seismological Network  
Centre for Geophysical research  
National Council for Scientific Research  
Lebanon  
Tel: +9614-981885  
Fax +9614-981886  
E-mail: [rjomaa@cnrs.edu.lb](mailto:rjomaa@cnrs.edu.lb)

**Libya**

**Abdala Elmelade**

Head of Department of Research and Field  
Studies  
Libyan Centre for Remote Sensing and  
Space Science (LCRSSS)  
Abuslim, Tripoli,  
Libya  
Tel: 218913361701  
E-mail: [abmiladi@yahoo.com](mailto:abmiladi@yahoo.com)

**Mohamed Imhmed Saleh**

Libyan Centre for Remote Sensing and  
Space Science (LCRSSS)  
Abuslim, Tripoli,  
Libya

**Nofel Nouredin Shanta**

Libyan Centre for Remote Sensing and  
Space Science (LCRSSS)  
Abuslim, Tripoli,  
Libya

**Malta****Matthew R. Agius**

Research Support Officer  
Department of Physics  
Faculty of Science  
University of Malta  
Msida MSD2080,  
Malta  
E-mail: [matthew.agius@um.edu.mt](mailto:matthew.agius@um.edu.mt)

**Sebastiano D'Amico**

Department of Physics  
University of Malta,  
Msida MSD 2080,  
Malta  
Tel: (+356) 2340 2101  
Fax: (+356) 21312110  
E-mail: [sebdamico@gmail.com](mailto:sebdamico@gmail.com)

**Morocco****Mimoun Harnafi**

Université Mohammed V- Agdal  
Institut Scientifique  
Avenue Ibn Batota  
Rabat,  
Morocco  
E-mail: [harnafi@israbat.ac.ma](mailto:harnafi@israbat.ac.ma)  
[harnafimimoun@yahoo.com](mailto:harnafimimoun@yahoo.com)

**Nacer Jabour**

Laboratoire de Géophysique  
Centre National de Recherches  
Scientifiques et Techniques  
Rabat,  
Morocco  
E-mail: [jabour@cnrst.ma](mailto:jabour@cnrst.ma)

**The Netherlands****Torild Van Eck**

ORFEUS secretary general  
NERA project manager  
PO Box 201  
NL-3730 AE De Bilt  
Netherlands  
Tel: +31 30 2206780  
E-mail: [vaneck@knmi.nl](mailto:vaneck@knmi.nl)

**Sultanate of Oman****Issa El-Hussain**

Director, Earthquake Monitoring Center  
Sultan Qaboos University  
P.O. Box 50, Al-Khoudh PC123  
Muscat, Oman  
Direct Tel. +968 24142642  
Fax/tel. +968 24413137  
E-mail: [elhussain@squ.edu.om](mailto:elhussain@squ.edu.om)

**Khalifa S. Al-Jabri**

Associate Professor  
Department of Civil and  
Architectural Engineering  
College of Engineering,  
Sultan Qaboos University  
P.O. Box 33, Al-Khod 123, Muscat,  
Sultanate of Oman  
E-mail: [aljabri@squ.edu.om](mailto:aljabri@squ.edu.om)



### **Palestine**

#### **Jalal Al Dabbeek**

ESSEC Director  
Earth Sciences and Seismic Engineering  
Center  
Nablus, West Bank  
Palestine  
Tel: +970 92344121  
Fax: +970 92345982  
Mobile: + 970 599336061  
E-mail: [seiscen@najah.edu](mailto:seiscen@najah.edu)

#### **Radwan El Kelani**

ESSEC  
Earth Sciences and Seismic Engineering  
Center  
Nablus, West Bank  
Palestine  
E-mail: [radwan.kelani@gmail.com](mailto:radwan.kelani@gmail.com)

#### **Ayman A. T. Mohsen**

ESSEC Seismologist  
Earth Sciences and Seismic Engineering  
Center  
Nablus, West Bank  
Palestine  
E-mail: [ayman\\_mohsen@najah.edu](mailto:ayman_mohsen@najah.edu)

#### **Hatim F. Al Wahsh**

ESSEC Engineer  
Earth Sciences and Seismic Engineering  
Center  
Nablus, West Bank  
Palestine  
E-mail: [Hatem\\_wahsh@najah.edu](mailto:Hatem_wahsh@najah.edu)

#### **Moamar F.S. Ishtayyeh**

ESSEC Software Engineer  
Earth Sciences and Seismic Engineering  
Center  
Nablus, West Bank  
Palestine  
E-mail: [moamar@najah.edu](mailto:moamar@najah.edu)

#### **Anas Tayseer Atatri**

ESSEC Seismologist  
Earth Sciences and Seismic Engineering  
Center  
Nablus, West Bank  
Palestine

#### **Wala' N. Ajaj**

ESSEC  
Earth Sciences and Seismic Engineering  
Center  
Nablus, West Bank  
Palestine

#### **Mutaz A. Al-Qutob**

Head of the Department of Environment  
and Earth Studies  
Faculty of Science and Technology  
Al-Quds University  
PO Box 19164  
Jerusalem,  
Israel  
E-mail: [mkutob@science.alquds.edu](mailto:mkutob@science.alquds.edu)

### **Portugal**

#### **Mourad Bezzegoud**

Departamento de Física  
Centro de Geofísica de Évora  
Escola de Ciências e Tecnologia  
Universidade de Évora  
Rua Romão Ramalho, 59  
7002-554 Évora,  
Portugal  
E-mail: [mourad@uevora.pt](mailto:mourad@uevora.pt)

#### **Fernando Carrilho**

Instituto Português do Mar e da Atmosfera,  
Rua C ao Aeroporto, 1749-077  
Lisboa,  
Portugal  
E-mail: [fernando.carrilho@ipma.pt](mailto:fernando.carrilho@ipma.pt)

### **Saudi Arabia**

#### **Mashel N. Alkadam**

Seismologist  
King Saud University,  
Department of Geology  
P.O. Box 2455,  
Riyadh 11451,  
Saudi Arabia  
E-mail: [m.alkadam@hotmail.com](mailto:m.alkadam@hotmail.com)

### **Spain**

#### **José Martín Davila**

Real I. Observatorio de la Armada  
Head Geophysical Department  
Cecilio Pujazon  
E- 11100 San Fernando (Cadiz) Spain  
E-mail: [mdavila@roa.es](mailto:mdavila@roa.es)

#### **Antonio Pazos Garcia**

Real I. Observatorio de la Armada  
Head Seismological Service  
Geophysical Department  
Cecilio Pujazon s/n  
E-11100 San Fernando (Cadiz) Spain  
E-mail: [pazos@roa.es](mailto:pazos@roa.es)

#### **María José Jiménez**

CSIC  
Institute of Geosciences ( CSIC, UCM)  
Jose Gutiérrez Abascal, 2  
E- 28006 Madrid, Spain  
Tel: +34 914 111 328 ext. 1160  
Fax: +34 915 644 740  
E-mail: [mj.jimenez@csic.es](mailto:mj.jimenez@csic.es)

#### **Mariano Garcia-Fernandez**

Secretary General of the European  
Seismological Commission  
Editor-in-chief of Journal of Seismology  
Institute of Geoscience (CSIC, UCM)  
MCN location  
Jose Gutierrez Abascal, 2  
E-28006 Madrid, Spain  
Phone: +34 914 111 328 ext 1160  
Fax: +34 915 644 740 / +34 915 645 078  
E-mail: [mariano.garcia@csic.es](mailto:mariano.garcia@csic.es)

### **Elisa Buforn**

Universidad Complutense de Madrid  
Facultad de Ciencias Físicas  
Departamento de Geofísica  
28040 Madrid, Spain  
E-mail: [ebuforn@fis.ucm.es](mailto:ebuforn@fis.ucm.es)

### **Sudan**

#### **Indira Abdel Rahman Mohamed**

Geological Research Authority of Sudan  
PO Box 410,  
Khartoum,  
Sudan  
E-mail: [mohamedindira@hotmail.com](mailto:mohamedindira@hotmail.com)

### **Tunisia**

#### **Najla Bouden Romdhane**

Professor,  
Scientific Senior Councilor  
Minister of Higher Education, Scientific  
Research and Technology of Tunisia  
Tunis  
Tunisia  
E-mail: [najlaromdhane@hotmail.fr](mailto:najlaromdhane@hotmail.fr)

#### **Semir Ben Abdallah**

Director  
Geophysics and Astronomy Dept.  
National Meteorological Institute  
P.O. Box 156, 2035  
Tunis – Carthage  
E-mail: [ben\\_abdallah@meteo.tn](mailto:ben_abdallah@meteo.tn)

#### **Atef Bouallegue**

Chief of service  
Seismology Department  
National Meteorological Institute  
P.O.Box 156, 2035  
Tunis - Carthage  
Tunisia  
E-mail: [atef.bouallegue@gmail.com](mailto:atef.bouallegue@gmail.com)



### Turkey

#### **Ali Pinar**

Kandilli Observatory and Earthquake  
Research Institute - KOERI  
Department of Earthquake Engineering  
Bogazici University  
81220, Cengelkoy  
Istanbul  
Turkey  
E-mail: [4alipinar@gmail.com](mailto:4alipinar@gmail.com)

#### **Dogan Kalafat**

Boğaziçi University, Kandilli Observatory &  
Earthquake Research Institute, National  
Earthquake Monitoring Centre (NEMC),  
Çengelköy 34680, İstanbul,  
TURKEY  
E-mail: [kalafato@boun.edu.tr](mailto:kalafato@boun.edu.tr)

#### **Niyazi Türkelli**

Professor  
Department of Geophysics  
Kandilli Observatory  
Earthquake Research Institute  
Bogazici University  
34684 Cengelkoy  
Istanbul  
Turkey  
E-mail: [turkelli@boun.edu.tr](mailto:turkelli@boun.edu.tr)

#### **Zehra Çağnan**

Associate Professor  
Middle East Technical University  
Turkey  
E-mail: [cagnan@metu.edu.tr](mailto:cagnan@metu.edu.tr)

### United Arab Emirates

#### **Hussain Mahdi Al Hajeri**

National Center of Meteorology &  
Seismology  
Ministry of Presidential Affairs  
P.O. Box 4815, Abu Dhabi,  
United Arab Emirates  
Tel: +971 2 2227479  
Fax: +971 2 6661575  
Email: [Halhajeri@ncms.ae](mailto:Halhajeri@ncms.ae)

#### **Talal Alwahedi**

Seismologist  
National Center of Meteorology and  
Seismology  
Ministry of Presidential Affairs  
P.O. Box 4815  
Abu Dhabi  
United Arab Emirates  
E-mail: [TAIWahedi@ncms.ae](mailto:TAIWahedi@ncms.ae)

### United States of America

#### **Michael P. Foose**

Regional Specialist for Africa and the  
Middle East  
International Programs  
U.S. Geological Survey National Center,  
MS 917  
12201 Sunrise Valley Drive  
Reston, VA 20192-0002, USA  
Tel: + 1- 703-648-6055  
Fax: + 1 -703-648-6075  
E-mail: [mfoose@usgs.gov](mailto:mfoose@usgs.gov)

#### **David H. Oppenheimer**

U.S. Geological Survey 345 Middlefield  
Road MS 977 Menlo Park, CA 94025-3591  
United States of America  
E-mail: [oppen@usgs.gov](mailto:oppen@usgs.gov)

#### **Rob Mellors**

Seismologist  
Lawrence Livermore National Laboratory  
7000 East Avenue  
Livermore  
CA 94550  
USA  
Tel: 925-423-0578  
E-mail: [mellors1@llnl.gov](mailto:mellors1@llnl.gov)

#### **Stephen Herzog**

Manager, Seismic Cooperation Program  
U.S. Department of Energy  
1000 Independence Ave. SW  
Washington, DC 20585  
USA  
E-mail: [stephen.herzog@nnsa.doe.gov](mailto:stephen.herzog@nnsa.doe.gov)



**NERA**

**Ogie Kuraica**

Kinematics Systems  
222 Vista Avenue  
Pasadena  
California 91107  
USA  
E-mail: [ogie@kmi.com](mailto:ogie@kmi.com)

**UNESCO**

**Frederick O. Simon**

Consultant  
Cross-Cutting Thematic Unit on Disaster  
Risk Reduction  
Natural Science Sector  
UNESCO  
11813 Stuart Mill Road  
Oakton, Virginia 22124  
United States of America  
Tel: +1 703 620 2772  
Fax: +1 703 620 3043  
E-mail: [fredericksimon@msn.com](mailto:fredericksimon@msn.com)

**Alexandros Makarigakis**

Chief of Unit  
Cross-Cutting Thematic Unit on Disaster  
Risk Reduction  
Rm B3.19, 1 Rue Miollis,  
75015, Paris,  
France  
Tel: + 33 (0) 1 456 84 178  
Mob: + 33 (0) 695905937  
E-mail: [a.makarigakis@unesco.org](mailto:a.makarigakis@unesco.org)  
Website: <http://www.unesco.org/disaster>

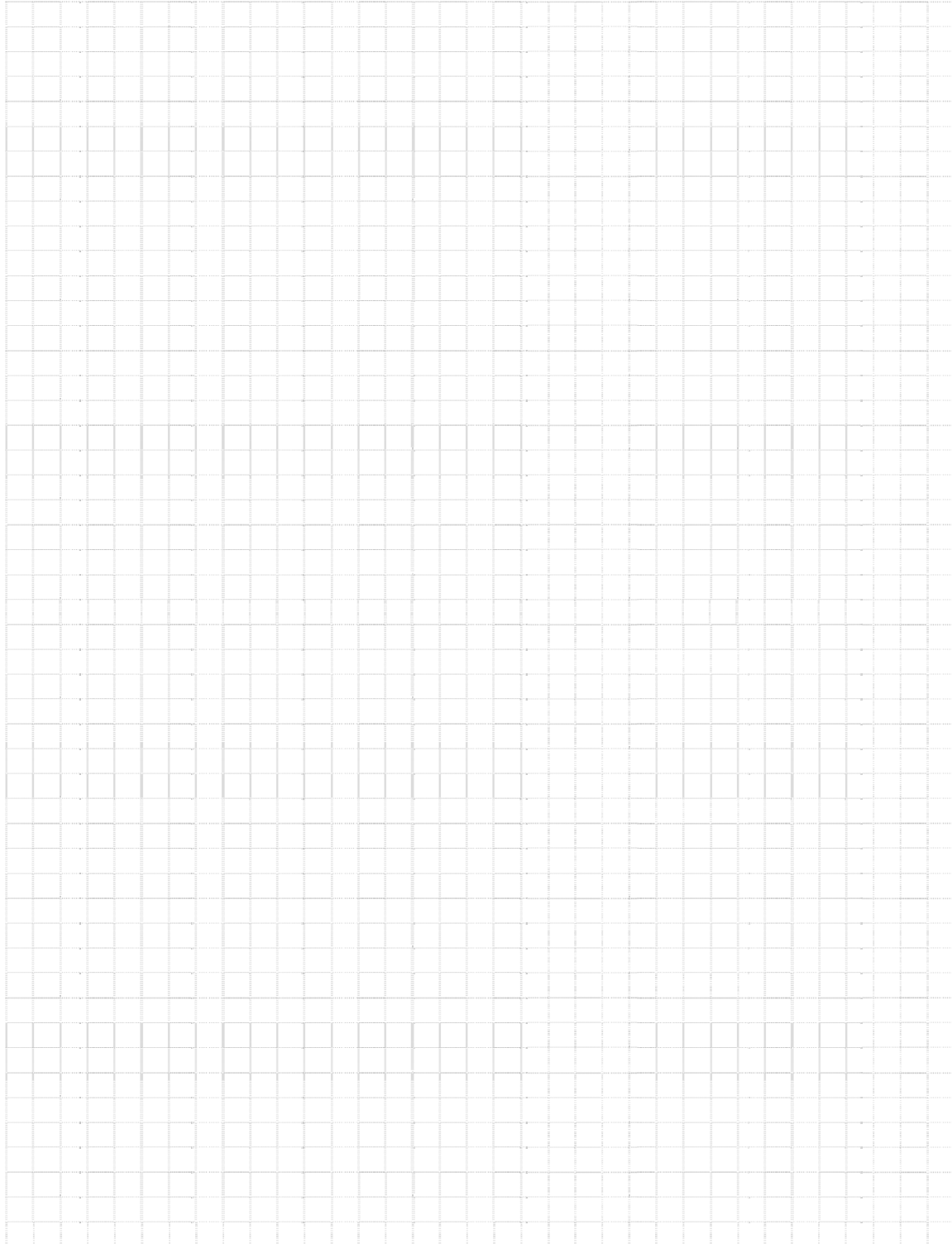
**Jair Torres**

Cross-Cutting Thematic Unit on Disaster  
Risk Reduction  
Natural Science Sector  
UNESCO  
1, rue Miollis, B3.23  
75732 Paris Cedex 15, France  
Tel: +33 (0)1 45 68 41 22  
Fax: +33 (0)1 45 68 58 21  
E-mail: [j.torres@unesco.org](mailto:j.torres@unesco.org)  
Website: <http://www.unesco.org/disaster>

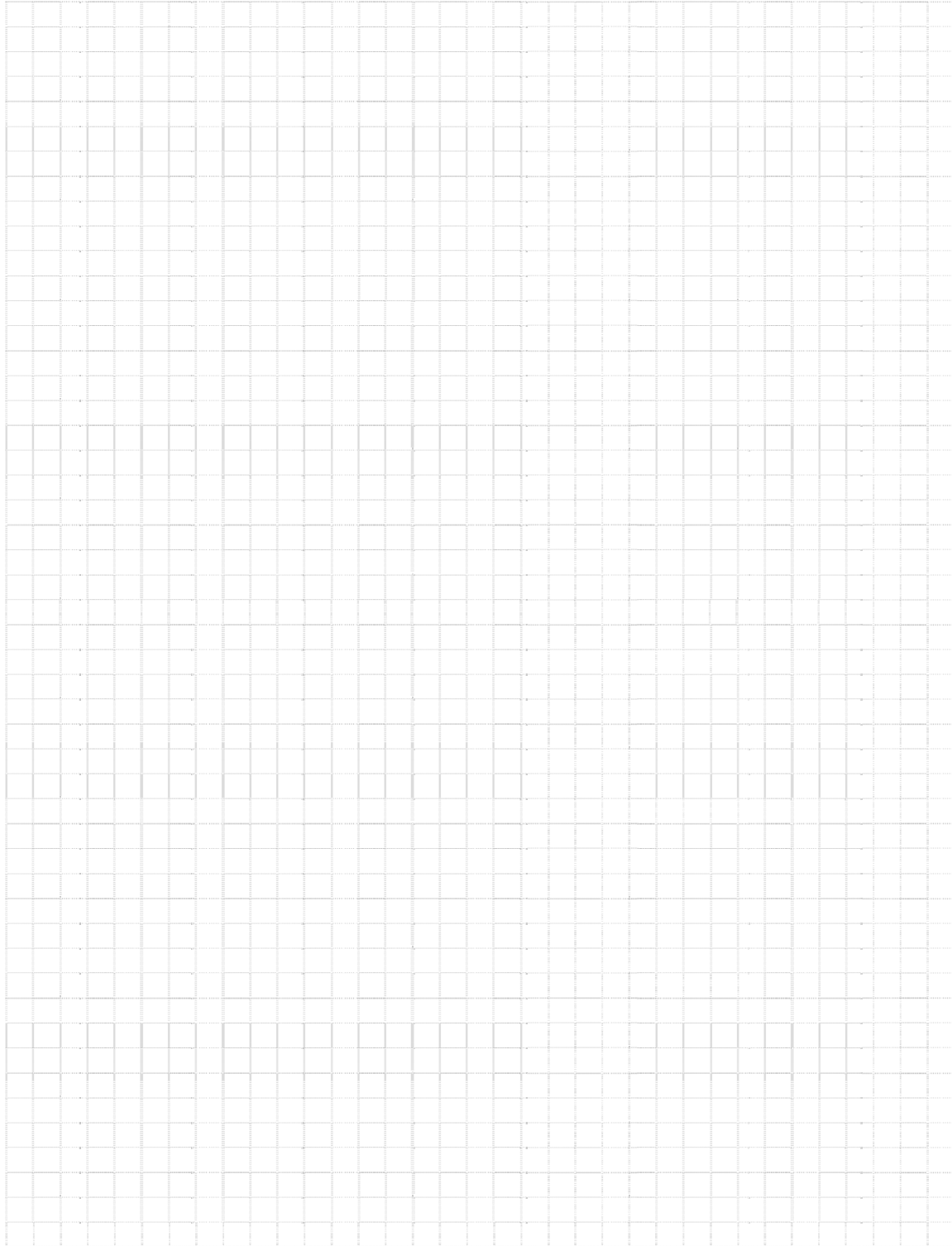


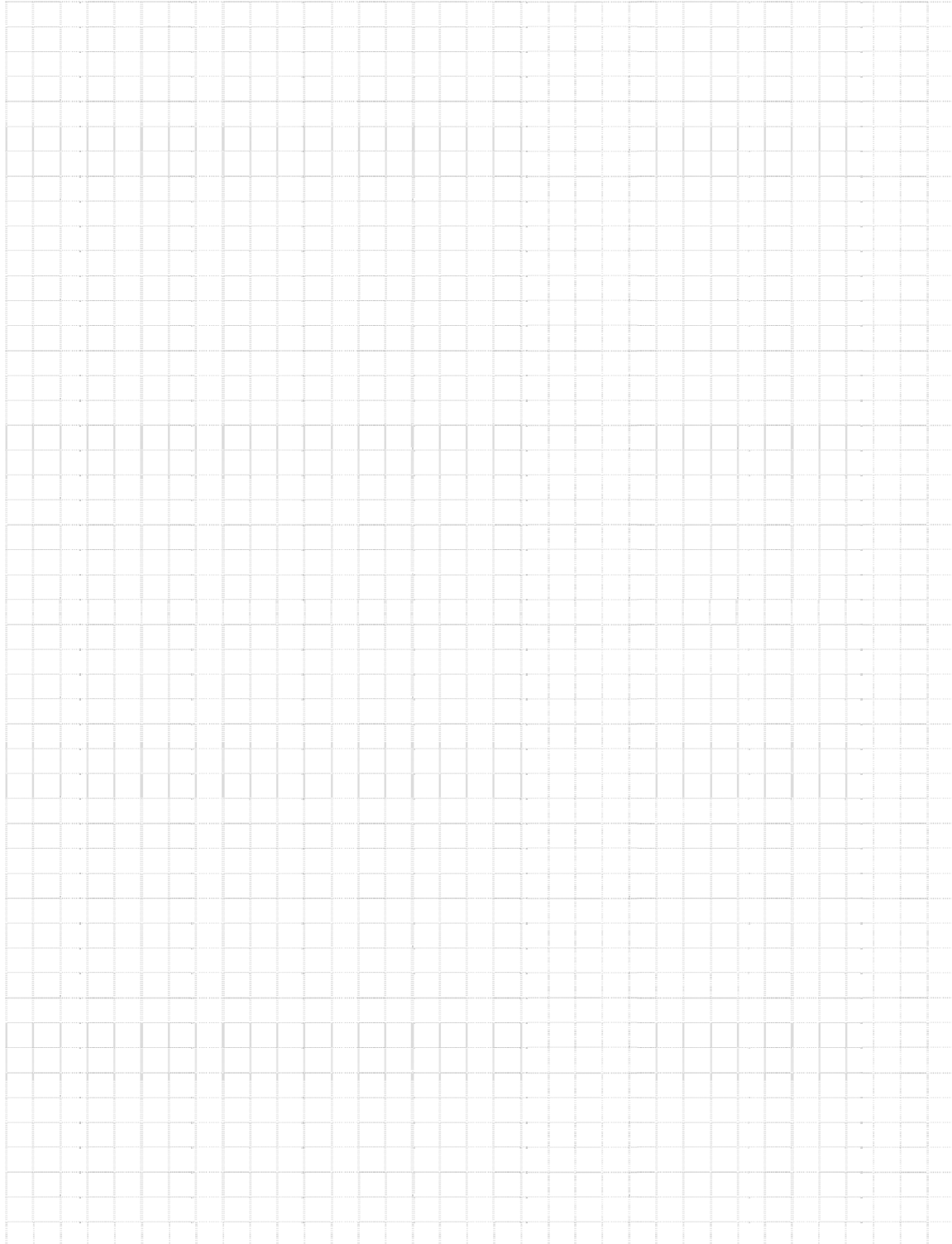
**Notes**

A large grid of graph paper for taking notes.







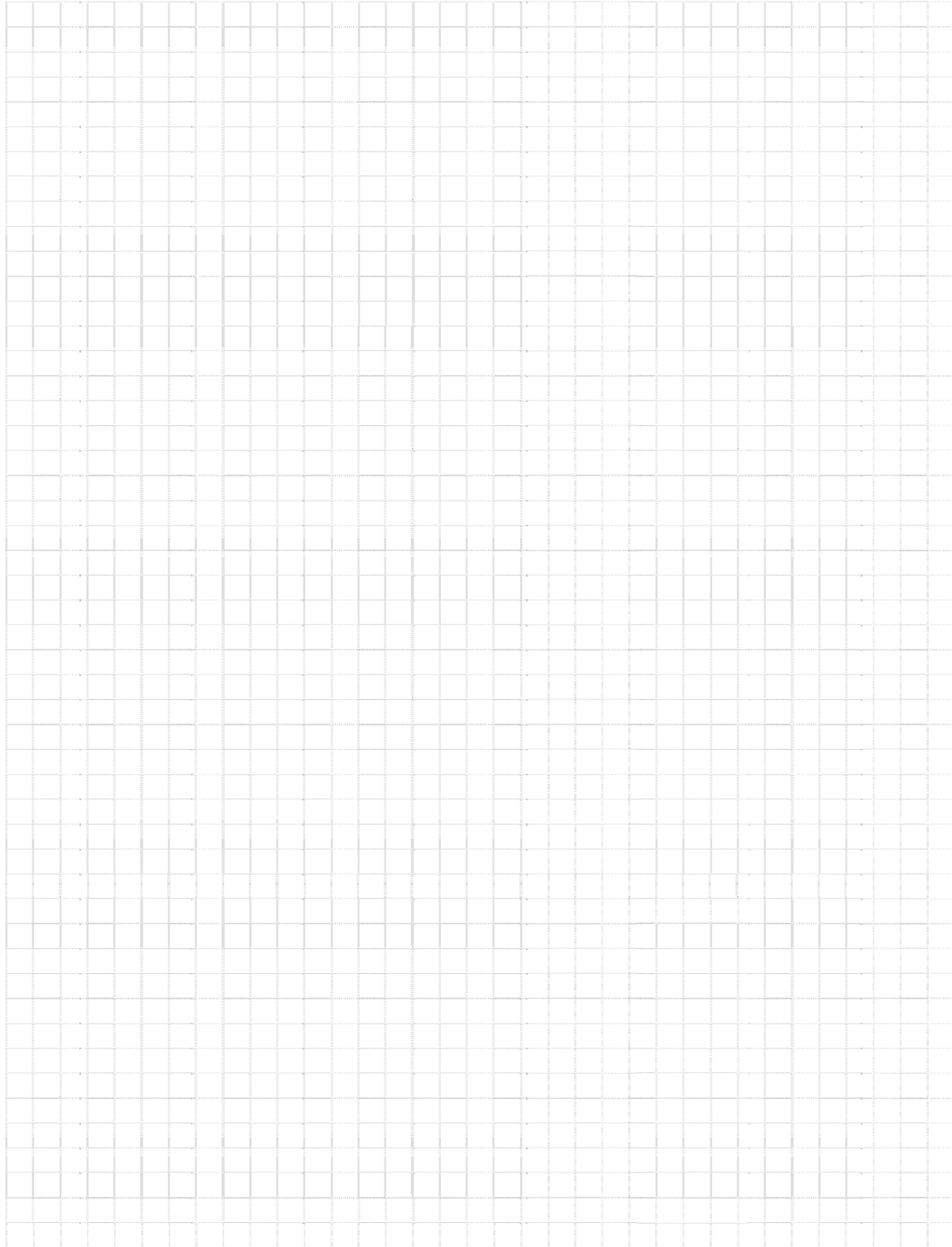




United Nations  
Educational, Scientific and  
Cultural Organization



**NERA**





United Nations  
Educational, Scientific and  
Cultural Organization



**NERA**