SEISMICITY OF SINAI PENINSULA, EGYPT

Kamal Abdel-Rahman[1], Abdullah M. S. Al-Amri[2] and Abdel-Moneim[1], E.

[1]Seismology Dept., National Research Institute of Astronomy and Geophysics (NRIAG), Helwan, Cairo, Egypt. E-mail: ka_rahmaneg@yahoo.com
[2] Geology Dept., Faculty of Science, King Saud University, Riyadh, Saudi Arabia.
E-mail: amsamri@ksu.edu.sa

Sinai Peninsula has a triangular shape between the African and Arabian Plates and bounded from the western and eastern borders by the Gulf of Suez and Gulf of Aqaba-Dead Sea rift systems respectively. It is affected by strong and destructive earthquakes (e.g. 31 rd March 1969 and 22nd November, 1995), and moderate earthquakes (m_b >5) through its history. After the installation of the Egyptian National Seismic Network (ENSN), there are great number of earthquakes have been recorded within and around Sinai. Consequently, the seismognic source zones and seismotectonic behavior can be clearly identified. The available data including both of historical and instrumental (1900 – 1997) that have been collected from national and international data centers. While the data from 1998 till Dec. 2007 is gathered from ENSN bulletins. The seismogenic source zones that might affect Sinai Peninsula are defined more precisely in this work depending on the distribution of earthquakes, seismicity rate (a-value), b-value and fault plane solution of the major earthquakes. In addition to, the type of faults prevailed and characterized these zones. It is concluded that, Gulf of Aqaba zone - Dead Sea transform zone, Gulf of Suez rift zone, Cairo-Suez District zone and Eastern Mediterranean dislocation zone represent the major effective zones for Sinai. Furthermore, there are two local seismic zones passing through Sinai contributing the earthquake activities of Sinai and these are; Negev shear zone (NSZ) and Central Sinai fault (Themed fault) zone(TFZ). The source parameters, a & b-values and the maximum expected moment magnitude has been determined for each one of zones. These results will contribute to great extent in the seismic hazard assessment and risk mitigation studies for Sinai Peninsula to protect the developmental projects.

Damage survey of the old nuclei of the Casbah of Dellys (Algeria) and performance of preventive traditional measures in the wake of the Boumerdes 2003 earthquake

A. Amina Abdessemed-Foufa[1], D. Benouar [2]

1. Dr Architect.University of Blida, Architecture Department, Blida, Algeria.
E-mail: foufa_a_dz@yahoo.fr
2. Professor Civil Engineer. University o Bab Ezzouar, Algiers, Algeria
E-mail: dbenouar@yahoo.com

ABSTRACT

This research work presents the damage recorded in the Casbah of Dellys and stresses the performance of traditional structures with an emphasis on earthquake-resistant techniques that were tested during the Boumerdes earthquake of May 21st, 2003. Dellys is a city located, within the stricken area by the Boumerdes 2003 earthquake, at about 170 Km east of the capital Algiers. It is one of the most ancient Casbah in Algeria. Previous to the Ottoman period, it was based in 1068 by the moors that fled Andalousia. The houses of the Casbah of Dellys have their roofs made with assembled half-bricks, and although they look like, by certain structural elements (corbelling construction) and architectural style, the houses of the Casbah of Algiers which is ottoman. Dellys lives today following the May 21st, 2003 earthquake, its third major earthquake. The first destructive earthquake was recorded during the year 42 BC and the second one was in the 17th century (1631). Also, it experienced on May 21st, 2003, the Boumerdes earthquake where many houses were damaged or destroyed. The structural damage assessment indicates the following kinds of failures: (1) total collapse and partial destruction of load bearing walls, (2) deep fissuring in the load bearing walls, (3) disconnection of the structural walls, (4) destruction of floors and roofs and (5) destruction of stairs and partition walls. Nevertheless, certain parts of houses that resisted the shaking were built according to Ottoman earthquake-resistant procedures as the corbelling construction.

Keywords: Performance, pathologies, Traditional preventive measures, Boumerdes earthquake, Casbah of Dellys, Algeria.

PRESENTER'S BIOGRAPHY

Dr Architect, lecturer at the department of Architecture, Faculty of civil engineers, University of Blida, Algeria.
International lecturer: 10-2003- Invited lecturer at the 13th Intensive European Courses on Local Seismic Culture, European University Center for Cultural Heritage, Ravello, Italy
Qualified Architect in historical construction. Has conducted many research from 2000 until today in the field of Historical seismicity of the Maghreb, preventive constructive techniques used after the great earthquake in the Maghreb, reducing risk to cultural heritage in Algeria. Is a membership of the NASG, GADR and DRH,
Has publications in International Journals **02/2005**-" Contribution for a catalogue of earthquake-resistant traditional techniques in Northern Africa: the cases of the Casbah of Algiers. European Earthquake Engineering Journal. Pp 23-39. **05/2007**-"Damage survey of the old nuclei of the Casbah of Dellys (Algeria) and performance of preventive traditional measures in the wake of the Boumerdes 2003 earthquake". European Earthquake Engineering Journal. Pp 10-20. Has publication in International Conferences

Earthquake-Resistant Traditional Techniques in Northern Africa: The Case of the Casbahs of Algiers, Tunis and Fez (Algeria, Tunisia and Morocco)

A. Amina Abdessemed-Foufa[1], D. Benouar [2]

1. Dr Architect.University of Blida, Architecture Department, Blida, Algeria.
E-mail: foufa_a_dz@yahoo.fr
2. Professor Civil Engineer. University o Bab Ezzouar, Algiers, Algeria
E-mail: dbenouar@yahoo.com

ABSTRACT

This work presents a contribution for a catalogue of the earthquake-resistant traditional techniques representing the urban, architectural and the structural aspects used in the Casbah of Algiers,Fez and Tunis. These techniques were highlighted by a detailed historical research in documentary sources (written and graphic sources, files, etc.) together with an archaeological investigation on the site and a comparison to the modern seismic design codes. The Casbah of Algiers suffered the effects of several earthquakes from its establishment to today. The first reported earthquake goes back to 1365 and the last one is that of May 21 2003. It is of interest to mention no research in historical seismicity in Algeria has been conducted, expect for some well known destructive events. The data have been reviewed only for the 20th century. In 1716, an earthquake whose intensity was estimated at IX damaged seriously the Casbah of Algiers. Following that earthquake disaster, it is deferred that the authority of that time, in fact the Dey (Governor) Ali Chaouch imposed to the Algiers population a preventive construction measures.
Fez also suffered different effects of great earthquakes. The most important events are the 1624 earthquake and Lisbon 1755. Tunis was damaged by the 1758 earthquake. In these different areas preventive techniques were used after the reconstruction. This work puts forward the techniques of these measures.

Key word: Historical seismicity, preventive measures, earthquake-resistant techniques, Casbah of Algiers, Algeria, Fez, Morocco; Tunis, Tunisia.

PRESENTER'S BIOGRAPHY

Dr Architect, lecturer at the department of Architecture, Faculty of civil engineers, University of Blida, Algeria.
International lecturer: 10-2003- Invited lecturer at the 13th Intensive European Courses on Local Seismic Culture, European University Center for Cultural Heritage, Ravello, Italy
Qualified Architect in historical construction. Has conducted many research from 2000 until today in the field of Historical seismicity of the Maghreb, preventive constructive techniques used after the great earthquake in the Maghreb, reducing risk to cultural heritage in Algeria. Is a membership of the NASG, GADR and DRH,
Has publications in International Journals **02/2005**-" Contribution for a catalogue of earthquake-resistant traditional techniques in Northern Africa: the cases of the Casbah of Algiers. European Earthquake Engineering Journal. Pp 23-39. **05/2007**-"Damage survey of the old nuclei of the Casbah of Dellys (Algeria) and performance of preventive traditional measures in the wake of the Boumerdes 2003 earthquake". European Earthquake Engineering Journal. Pp 10-20. Has publication in International Conferences

Urban Seismic Scenario of the old nuclei of Algiers At the XVIIIth century (Algeria) Assessment of the damages after the 1716 earthquake of Algiers

A. Amina Abdessemed-Foufa[1], D. Benouar [2]

1. Dr Architect.University of Blida, Architecture Department, Blida, Algeria.
E-mail: foufa_a_dz@yahoo.fr
2. Professor Civil Engineer. University o Bab Ezzouar, Algiers, Algeria
E-mail: dbenouar@yahoo.com

ABSTRACT

This work presents the urban seismic scenario of one of the great historic earthquakes which have stricken the city of Algiers. To establish the urban seismic scenario at the ancient time means the localization of the effects of the earthquake at the time where they shake the city. This supposes a research of the urban aspect of Algiers over the great time when the most significant earthquake happened. This aspect must appear with the localization of the center or the core of the city, its habitat, its streets and its major buildings.
It is enough to examine the various sources available recalling the urban aspect of the city to each studied period when that is possible and to superimpose them on the assessments of the damage which happened at that time. The result will be translated by a map locating as much as possible the damages induced by the earthquakes on the Medina of Algiers. These maps will represent as much as possible a topographic restitution of the effects of the most significant earthquakes.
The aim of this work is not to rewrite the history of Algiers but to locate the damaged areas in the past in order to establish the future scenarios for a better protection of our built cultural heritage. The Casbah of Algiers as named today belonged to our identity. It is still present until now in spite of the state of decay in which prevail the majority of its houses.
Algiers was stricken by three great earthquakes or major tremors by the past. The first one at the medieval time in 1359, the second one at the end of the 16th century in1673, and the last big one at the beginning of the 18th century in 1716.
However the data relating to the urban aspect and the seismic damage are very few and brief. The data collected are unfortunately very few for each earthquake, and it was difficult to give a total aspect of wide earthquake. We will try to recall the urban seismic scenario only for the 1716 earthquake of which we collected sufficient information. Nevertheless the illustration obtained informs us some on this natural disaster which stricken Algiers at the modern time (XVIIIth century).
Some information which we could collect find confined in heterogeneous sources:

- Of the files of *the wakf*, ottoman archives, Algerian archives
- Arab manuscripts or their French translation,
- Until descriptions of the Arab travellers and Maghrebins geographers(historic books)
- And attempts made by recent studies.

Keys word:
1716 earthquake of Algiers, old nuclei, seismic scenario, Casbah of Algiers, cultural heritage, Algeria.

PRESENTER'S BIOGRAPHY

Dr Architect, lecturer at the department of Architecture, Faculty of civil engineers, University of Blida, Algeria.
International lecturer: 10-2003- Invited lecturer at the 13th Intensive European Courses on Local Seismic Culture, European University Center for Cultural Heritage, Ravello, Italy
Qualified Architect in historical construction. Has conducted many research from 2000 until today in the field of Historical seismicity of the Maghreb, preventive constructive techniques used after the great earthquake in the Maghreb, reducing risk to cultural heritage in Algeria. Is a membership of the NASG, GADR and DRH,
Has publications in International Journals **02/2005**-" Contribution for a catalogue of earthquake-resistant traditional techniques in Northern Africa: the cases of the Casbah of Algiers. European Earthquake Engineering Journal. Pp 23-39. **05/2007**-"Damage survey of the old nuclei of the Casbah of Dellys (Algeria) and performance

of preventive traditional measures in the wake of the Boumerdes 2003 earthquake". European Earthquake Engineering Journal. Pp 10-20. Has publication in International Conferences

The seismic vulnerability and risk evaluation for the 19th century's urban nuclei in Algeria.

Amina Abdessemed-Foufa

1. Dr Architect.University of Blida, Architecture Department, Blida, Algeria.
E-mail: foufa_a_dz@yahoo.fr

ABSTRACT:

Nowadays, the old urban nuclei dating from the 19th century in Algeria, presents a state of degradation due to the negligence, the poorest quality of materials, and to some natural disasters as earthquake, landslides, floods, etc. The constructions are built of not chained masonry with steels floors and are located in the seismic area in the northern part of the country. The old urban nuclei in Algeria lead to high density of population and increase the vulnerability of the buildings. More comprehensive vulnerability analysis has to base on the information about the quality of the residential buildings. Indeed, the estimation of damaged residential buildings is important in order to elaborate the map of seismic intensity for scenario earthquake.
Mitigation of seismic risk has to involve pre disaster and post disaster measures. The mitigation policy is based on what follows:

- Identification or registration: creating a data base on inhabited and public buildings dating from the 19th century.
- Investigation on the existing buildings stocks using the rapid visual screening.
- Classification of those among different groups of vulnerability.
- Surveys are carried on in the case of the vulnerability value of the building.
- Preparation of several scenarios for potential damage at weak, moderate and strong earthquake.

The map for analysis and assessment of seismic damages for these types of buildings (masonry) and probable looses among population can provide the decision about priorities of the repairing and or the destruction of the old buildings. We can mitigate by structural measures as a rehabilitation design and the seismic reinforcement of the inhabitant and public buildings.

Key-words: earthquake, vulnerability, masonry buildings, old urban nuclei, 19th century, Algeria.

PRESENTER'S BIOGRAPHY

Dr Architect, lecturer at the department of Architecture, Faculty of civil engineers, University of Blida, Algeria.
International lecturer: 10-2003- Invited lecturer at the 13th Intensive European Courses on Local Seismic Culture, European University Center for Cultural Heritage, Ravello, Italy
Qualified Architect in historical construction. Has conducted many research from 2000 until today in the field of Historical seismicity of the Maghreb, preventive constructive techniques used after the great earthquake in the Maghreb, reducing risk to cultural heritage in Algeria. Is a membership of the NASG, GADR and DRH,
Has publications in International Journals **02/2005-**" Contribution for a catalogue of earthquake-resistant traditional techniques in Northern Africa: the cases of the Casbah of Algiers. European Earthquake Engineering Journal. Pp 23-39. **05/2007**-"Damage survey of the old nuclei of the Casbah of Dellys (Algeria) and performance of preventive traditional measures in the wake of the Boumerdes 2003 earthquake". European Earthquake Engineering Journal. Pp 10-20. Has publication in International Conferences

Source Parameters and Ground Motion of the Suez-Cairo Shear Zone Earthquakes, Eastern Desert, Egypt

Abou Elenean, K. M.[1, 2], Adel M. E. Mohamed[1] and H. M. Hussein[1, 2]

[1] Seismology Department, National Research Institute of Astronomy and Geophysics, Helwan, Egypt.
[2] North Africa Seismological Group NASG Net40/OEA/ICTP

ABSTRACT

Three felt earthquakes with local magnitudes 4.0 (June 29th, 2000), 4.2 (July 07th, 2005) and 3.7 (October 30th, 2007) occurred to the south-east of Cairo along the Suez-Cairo shear zone. Being well recorded by the Egyptian National Seismic Network (ENSN), they provide us an excellent opportunity to study the tectonic process, stress field, source parameters and the expected ground motion at Cairo. The focal mechanisms of the three events based on the first motion P-wave polarities indicate mainly normal faults with slight strike slip components along nodal planes trending nearly EW and NW-SE. These solutions imply a rejuvenation of the pre-exiting E-W and NW-SE faults due to a partly transfer of rifting deformation from the Red Sea-Gulf of Suez along these trends. Dynamic source parameters of these events are estimated from P-wave spectra of their closer ENSN stations. The average values of the seismic moment, stress drop, rupture radius and fault dislocation from six stations are estimated and interpreted in the context of the tectonic setting. These parameters in addition to the effects of site and path are used to synthesize the ground motion seismograms using stochastic modeling technique at the recorded stations and some strategic sites.

Key words: Focal Mechanism, source parameters, ground motion, Suez-Cairo

PRESENTER'S BIOGRAPHY

Kamal M. Abou Elenean,
Associate Prof., Seismology Deparment, National Research Institute of Astronomy and Geophysics (NRIAG),
Helwan, Egypt
Employment
* Mar. 1990 - May 1993: Assistant Researcher, Seismology Dept., NRIAG.
* Jun. 1993 - Sep. 1997: Research Assistant, Seismology Dept., NRIAG.
* April. 1998-Dec. 2004: Lecturer and Researcher, Seismology Dept., NRIAG.
* Dec., 2004 –Assoc. Prof., Seismology Dept., NRIAG.

NEW SEISMOTECTONIC ZONING OF NORTHERN MOROCCO

Tadili Benaissa

Earth's Physics Laboratory
Scientific institute, Av Ibn Batouta
BP.703 Agdal Rabat, Morocco

In this work, a new seismotectonic zoning of the North of Morocco is proposed. It is based on a new database which includes recent work in the fields:

- Geology (active faults, geometrical characteristics, chronology of the various recent tectonic phases).
- Geophysics (instrumental and historical seismicity, focal mechanisms, nature crust).
- As well as the geodynamic context of the convergence of the plates Africa-Europe in the area going from the Atlantic Ocean to the Mediterranean sea passing by the Straits of Gibraltar.

New zoning seismotectonic suggested is not limited to the borders of the north of Morocco. It takes into account all the seismic sources (from 100 to 400 km) able to generate strong earthquakes destroying purposes on Morocco, such that of Lisbon in 1755 on the level of the transforming fault Azores-Gibraltar.

New catalogues of the historical seismicity from 1045 to 2005 (Peláez and Al 2006), and instrumental from 1900 to 2005 (Tadili and Ait Brahim 2006) as well as active faults data base were elaborated. The most influential parameters having effects on the definition of the characteristics of the source areas were predetermined with an acceptable precision.

New elaborate zoning that includes 10 seismotectonic zones, each one corresponding to a volume of the earth's crust, were analyzed and interpreted. The data were used to determine its static and dynamic states. Each seismotectonic zone presents homogeneity of the seismogene potential and its mode of deformation obtained with using seismicity, strain and the stresses data. For the zones made up of faults, we specified each time, the geometrical characteristics, and the chronology of the various motions corresponding to the successive tectonic episodes.

This new zoning will be of a great contribution for the future probabilistic studies for the definition of the seismic hazard and the determination of accelerations of the ground in the north of Morocco.

The methodology used in revising the earthquake catalogue in North African countries –Algeria, Morocco, Tunisia –

Djillali Benouar

USTHB, FGC, Built Environment Res. Lab. BP 32 EL-ALIA, Bab Ezzouar, Alger, Algeria
E-mail: dbenouar@yahoo.com

ABSTRACT:

The main purpose of this work is to present the methodology used in revising the earthquake catalogue in the North African countries (Algeria, Morocco, and Tunisia) in view to establish a uniform catalogue of all earthquakes reported in the region. This catalogue should satisfies the conditions of homogeneity, and to derive from this basic data set the general laws governing the space and time distribution of earthquake occurrences in the seismic source zones, and to evaluate the seismic hazard. This paper shows how it is so important to revise the data from original sources when available, and not taking all the sources for granted. It also illustrates also the difficulties that may arise in reconstructing macroseismic field of past earthquakes in order to re-assess the damage recorded and thus the size of the earthquake. This methodology includes, not only, the damage but also takes into account, among others, the economic, political, cultural and religious conditions prevailing at the time of the earthquake. All these parameters have been carefully used to reconstruct intensity distribution maps when data available is large enough. For the North African region, earthquake hazard constitutes a constant threat to human life and property, sometimes causing major economic losses and disruption. The rapid urbanisation, development of critical engineering works such as dams, nuclear power plants, and industrialisation of cities with modern types of buildings and the concentration of populations living or settling in hazardous areas are matters of growing concern, as they contribute to heavier loss of life and increase considerably the cost of disaster damage. The environment concerns and an increased official and public awareness of earthquake hazards have, in the last two decades, led to a rapid rise of interest in seismicity and, seismic hazard and risk evaluations in the North African countries. In order to assess the seismic hazard with a certain degree of reliability, an earthquake data of the region under investigation which are as complete, homogeneous and accurate as possible are needed. The research work presents also calibration of earthquakes in the region which is fundamental to attribute intensities and thus magnitudes to historical seismic events and even early twentieth century events. For this purpose, and from the point of view of long term prediction and seismic hazard assessment, it is imperative that input data in the catalogues in the other North African countries be revised and homogenised. This remains a fundamental mean for an effective and reliable disaster risk reduction process.

Key words: North Africa, Seismicity, catalogue, earthquake Hazard

PRESENTER'S BIOGRAPHY

Dr. BENOUAR Djillali, Eng., M.Sc., Ph.D., DIC

Professor in Earthquake Engineering (University of Science & Technology Houari Boumediene (USTHB)
Director, Built Environment Res. Lab. LBE (USTHB)
Associate Member of the Third World Academy of Science (TWAS)
Senior Associate to the International Centre for Theoretical Physics (ICTP)
Consultant: World Bank, UNESCO, IIED, ALECSO, UN/ISDR

Degrees:
Post-Doc. Institute of Industrial Science (University of Tokyo, Japan)
Ph.D. degree in Engineering Seismology (Imperial College, UK)
M. Sc. In Earthquake Engineering (Stanford University, USA)
Engineer in Civil Engineering (University of Algiers, Algeria)

Award: UNESCO-GADR-AWARD-2005 for Disaster Risk Reduction

Main publication: "Materials for the investigation of the seismicity of Algeria and adjacent regions during the twentieth century", Special Issue of the Annali Di Geofisica (Istituto Nazionale di Geofisica, Italy), Vol. XXXVII, No. 4, July 1994, and several others in earthquake hazard assessment and vulnerability evaluation.

Uncertainties in seismic hazard evaluation in the site of Algiers using different attenuation models

Djillali Benouar* and Mounir Naili**

*USTHB, FGC, Built Environment Res. Lab. BP 32 EL-ALIA, Bab Ezzouar, Alger, Algeria
E-mail: dbenouar@yahoo.com
** CGS, 1 Rue kaddour Rahim, Alger, Algeria
E-mail: m_naili@caramail.com

ABSTRACT:

This research presents the evaluation of seismic hazard at the site of Algiers (Capital of Algeria) using four different attenuation models. Seismic hazard analysis was carried out using a simple earthquake occurrence model and the new seismic catalogue compiled recently by Benouar[5] for the Maghreb region. The site is defined by longitude 3.00°E and latitude 36.45°N. Because earthquake process around the site is poorly understood, it is assumed that future earthquakes will occur in an area in which they have already occurred in the past. The hazard, expressed in terms of the probability of exceedance of the PGA, is calculated for an economic life of the structure of 10, 50, and 100 years. The absolute acceleration for a given return period is also determined. Due to the shortage of ground motion records, no attenuation law has been derived for Algeria. The main objective of this study is to analyse the influence of the attenuation models on the seismic hazard evaluation, since the results of seismic hazard are sensitive to these models. Thus, a selection of an appropriate attenuation law is very crucial. For this purpose, four attenuation laws which seem to fit the Algerian data were selected from the literature, these are Joyner and Boore[1], Ambraseys and Bommer[2], Ambraseys[3] (controlled depth) and Ambraseys[3] (uncontrolled depth). A comparison of the expected seismic hazard allows a first critical estimate showing that seismic hazard is very sensitive to the attenuation models selected and the PGA could be either conservative or not, depending on the attenuation model and the level of acceptable risk.

Key words: Algeria, Algiers, seismic hazard, PGA attenuation models, return period.

PRESENTER'S BIOGRAPHY

Dr. BENOUAR Djillali, Eng., M.Sc., Ph.D., DIC

Professor in Earthquake Engineering (University of Science & Technology Houari Boumediene (USTHB)
Director, Built Environment Res. Lab. LBE (USTHB)
Associate Member of the Third World Academy of Science (TWAS)
Senior Associate to the International Centre for Theoretical Physics (ICTP)
Consultant: World Bank, UNESCO, IIED, ALECSO, UN/ISDR

Degrees:
Post-Doc. Institute of Industrial Science (University of Tokyo, Japan)
Ph.D. degree in Engineering Seismology (Imperial College, UK)
M. Sc. In Earthquake Engineering (Stanford University, USA)
Engineer in Civil Engineering (University of Algiers, Algeria)

Award: UNESCO-GADR-AWARD-2005 for Disaster Risk Reduction

Main publication: "Materials for the investigation of the seismicity of Algeria and adjacent regions during the twentieth century", Special Issue of the Annali Di Geofisica (Istituto Nazionale di Geofisica, Italy), Vol. XXXVII, No. 4, July 1994, and several others in earthquake hazard assessment and vulnerability evaluation.

On the coordination role of the EMSC in Northern Africa and the Middle East

Rémy Bossu,1 and the EMSC members

1. Euro-Mediterranean Seismological Centre (EMSC), Bruyères le Châtel, France, bossu@emsc-csem.org

ABSTRACT

One of the primary goals of the European- Mediterranean Seismological Centre (EMSC) has consistently been to improve collaboration and cooperation among seismological observatories and institutes in the Euro-Med region. A special and growing focus has been put on the Northern Africa and the Middle East regions over the last 15 years, a move advocated and supported by our General Assembly.

After an overview on the past efforts, this talk will focus on a recent EC-project called EERWEM (Earthquake monitoring and Earthquake Risk in WEstern Mediterranean) as an example of the type of actions carried out. This small project aimed at discussing data exchange among the 21 participating networks operators involved in the monitoring of the Western Mediterranean region, identifying together appropriate topics and objectives for more ambitious projects and ensuring that Northern African seismological community can benefit from developments of European projects. Interestingly, this project was submitted to the European Commission early 2004, i.e. before the Indian Ocean tsunami which made data exchange a timely issue. The European developments have geared up since this submission through the NERIES project, the largest EC-project ever funded in our field, making cooperation and coordination even more essential.

Two pragmatic, result-oriented meetings, were held in San Fernando (Spain), June 2006 and Rabat (Morocco), November 2007. A MoU for *the establishment of a Cooperation framework on earthquake surveillance in the Western Mediterranean Region* was drafted and signed by 18 institutes from 10 different countries. Its main objectives are to: improve the cooperation in earthquake monitoring, provide input for improved assessment of seismic hazards, build a regional network for earthquake surveillance, reinforce and ally the local institutions and personnel, facilitate access to advanced technologies, increase the regional participation in international activities. It was completed by a revised MoU where signatories establish the pragmatic actions they plan to contribute to the stated objectives. A special issue of the EMSC newsletter (1 500 paper copies more than 30 000 downloads) was published in May 2007 to present existing earthquake monitoring infrastructures in Western Mediterranean as well as special papers on the M6.1 earthquake which shook Portugal, Spain and Morocco on Feb. 12 2007, an event which was a good illustration of an event having an impact (hopefully not damaging) at a regional scale and a further demonstration of the necessity to coordinate surveillance. About 10 so-called technical visits were also funded to contribute to the achievement of the MoU's objectives, such as training or software implementation.

This approach, fully coordinated with ORFEUS, created a momentum and, although EERWEM is over, a new regional meeting is likely to be organized next spring. It also significantly contributed to the establishment of several bilateral agreements in the field in seismology in the region and was decisive in at least one case. A similar, result-oriented initiative is currently being discussed with stakeholders of the Eastern Mediterranean region.

Key words: Cooperation, Northern Africa, Middle East

PRESENTER'S BIOGRAPHY

Rémy Bossu has been the Secretary General of the European-Mediterranean Seismological Centre since 2001. EMSC is a non-profit international NGO. Its members are seismological observatories and institutes and there are currently 83 members from 55 countries. It acts as a service provider for rapid earthquake information and it plays a key role in the integration of the Euro-Med seismological community (in close collaboration with ORFEUS (the second European organization in seismology) with the NERIES EC-project being currently the flagship project. Finally, EMSC also aims at improving collaboration and coordination with Northern Africa and the Middle East, EERWEM being its last EC-project on this topic.

SEISMIC HAZARD AND ACTIVE FAULTS IN NORTHERN ALGERIA

Youcef BOUHADAD*

*Dr. ,National Centre of applied research in earthquake engineering.
C.G.S. ,1 rue Kadour Rahim H.Dey BP 252, Alger -Algeria.
E-mail: Bouhadad_y@yahoo.com

Fault interaction and stress transfer is a key point in seismotectonics and seismic hazard. The mechanical behaviour of a given fault or it's probable segmentation means the presence of discontinuities along the fault, capable to stop the propagation of rupture processes during an earthquake. These discontinuities may be geometric, structural or geomorphologic such us the presence of asperities, faults in echelon, presence of curvatures (changes in the direction) and segments relayed by secondary faults. This fact is particularly observed along the El-Asnam Fault which produced three moderate to strong earthquakes in fifty years namely The El Abadia, 1934 (M_s=5.1), The Orléanville, 1954 (M_s=6.5) and the El Asnam, 1980 (M_s=7.3) earthquakes. In order to take in consideration this we used a probabilistic approach to assess seismic hazard for Oran region based on the constrain of seismic potential of active faults. Source parameters such as b-values, slip rate and maximum magnitude are assessed for each seismic source. The attenuation of ground shaking motion with distance is estimated by using attenuation relationships developed world-wide which fit the locally recorded data. Different choices of source parameters values as well as attenuation relationships are assigned an appropriate weight in the framework of a logic tree model. Results are presented as relationships between values of peak ground acceleration and annual frequency of exceedance, and maps of hazard for different return periods.

Key words: Active faults, segmentation, earthquakes, probabilistic analysis, seismic hazard, Algeria.

Seismicity and seismotectonics of Sudan

Nada Bushra El Tahir

Sudan Seismic Network, Sudan, E-mail: nada_ahmed99@hotmail.com

ABSTRACT

Sudan is regarded as relatively stable seismically, though several devastating earthquakes have occurred. The largest of these, was probably the largest earthquake in Africa in the 20th century. It occurred on 20 May 1990 (Ms = 7.1 – 7.4,) near Juba in southern Sudan. The main event was followed by several aftershocks, the largest of which had a magnitude of, Ms = 7.0. Other earthquakes whose effects caused major damage and even deaths, include the Suakin graben earthquake (Ms=5.8) of 12 May 1938, located on the western margin of the Red Sea, the Jebel Dumbier event located in Central Kordofan (Ms=5.6), which occurred on 9 October 1966, and the Khartoum event (Ms=5.5) of 1 August 1993. The sources of these earthquakes could be related to the main tectonic features associated with the East African Rift System (EARS). The western part of the EARS ends in the southern part of Sudan whilst the Central African Rift System (CARS) crosses the central part of the country. Many of the earthquakes are found to be located along these structures. Geophysical studies of the crust and lithosphere structures of the west and central African rifted basins indicate that the rift basins provided weak zones in an otherwise stable craton. One can conclude that most parts of the Sudan are subjected to compression stress in the eastern part and extensional stress in the central and southern part due to rifts zones. More detailed studies are necessary to investigate the active zones.

Key words: Sudan, seismicity, tectonic, rift zones

NADA BUSHRA EL TAHIR'S BIOGRAPHY

I am a researcher at the Geological Researcher Authority of Sudan. I hold B. Sc. (Hons) degrees in Geology from Khartoum University. Then I pursued an M. Sc. in Geophysics at the Department of Earth Science, Bergen University, Norway, with a specialization in seismology. My master's thesis topics included noise measurements, sites response investigations for our new seismic station, probabilistic seismic hazard assessment for Sudan and crustal structure studies using surface wave group velocities. My research in the future will focus on understanding the crustal structure of Sudan in greater detail. I will use earthquake data recorded by the Sudanese Seismic Network (SSN). Receiver function analysis will be used to determine a P and S-wave velocity structure specific for Sudan.

From El-Asnam 1980 to Boumerdes 2003 earthquakes: Seismic risk reduction efforts in Algeria

Mohamed Farsi* and Djillali Benouar**

* CGS, 1 rue Kadour Rahim, Hussein Dey, Alger, Algeria
E-mail: mnfarsi@cgs-dz.org
** USTHB, FGC, Built Environment Res. Lab. BP 32 EL-ALIA, Bab Ezzouar, Alger, Algeria
E-mail: dbenouar@yahoo.com

ABSTRACT:

To reduce earthquake effects due principally to the seismotectonic setting of the Maghreb region, the Algerian authorities have devoted particular efforts for seismic risk prevention by creating, following El-Asnam earthquake (October 10th 1980), special institutes dealing with seismology and earthquake engineering, installing seismic observation systems and elaborating a code of earthquake resistant design of structure in order to reduce the consequences of this natural phenomenon. Hence, many organizations have been created and many professionals have been trained. In this paper all the seismic risk actions leaded by these institutes since 1980 are reviewed. As a consequence of the 2003 Boumerdes Earthquake, the government has updated and strengthened the National policy and the programmes of actions and also the legal and regulatory framework. In this last field, it may mention the following items as examples:

- Enacting on 25 Dec. 2004 of the "Law related to major risks reduction and management in the framework of sustainable development". This law, in addition to the requirements dealing with all the aspects of disaster risk reduction and management of major risks that have to be considered by the institutional bodies, the communities and all the stakeholders, requires in its item 68 the creation of the "National Delegation for Major Risks" . The missions of this National Delegation are of "advising, assessment, and coordination of actions aiming at reducing the impacts of major disasters on the economy of the country and the security of people and property". The decree of creation of this very important institutional body is presently under examination at the concerned level of governmental administration.
- Enacting of "Law 04-05 of 14 Aug., 2004, modifying and supplementing the law 90-29 of 1 Dec., 1990, related to land management and urban planning."
- Enacting by "Ordinance (law) of 26 Aug. 2003 related to the obligation of "natural" disasters insurance and the payment of the victims".
- Enacting by "Ministerial Decision of 4 January 2004 of Ministry of Habitat and Urban Planning approved the new Earthquake resistant building Regulations RPA 99 / Reviewed 2003". The reviewing of the Algerian seismic regulations that exist since 1981 deals mainly with a new zoning map and more restrictions for reinforced concrete beam-columns building systems considered as very vulnerable in common.

Key words: Algeria, earthquake, seismic risk, seismic hazard, disaster.

Ten years of seismicity in the Euro-Mediterranean region: panorama of the EMSC bulletin 1998-2007

Stéphanie Godey,1 Rémy Bossu,1 Gilles Mazet-Roux,1 and the Euro-Med seismological network operators

1. Euro-Mediterranean Seismological Centre (EMSC), Bruyères le Châtel, France, bossu@emsc-csem.org

ABSTRACT

The Euro-Mediterranean Seismological Center (EMSC) collects seismological parametric data recorded in the Euro-Mediterranean region (from Iceland to Oman and from Russia to Azores Islands) in order to improve data availability for the scientific community and rapidly produce an homogenous instrumental earthquake catalogue for the region. The aims are to reproduce the seismicity as imaged by the local agencies when events occur within their network and to improve event location in borders regions and off-shore.

In this presentation, we show the last ten years of seismicity that occurred in the Euro-Mediterranean region. Event locations have been obtained in the Euro-Med Bulletin for the period January 1998 to December 2007 by merging parametric data collected from 77 seismological agencies. Thanks to the many contributions, the Euro-Med Bulletin displays a high coverage of the region with the collection of data recorded by 2,465 stations and only two known missing networks. In total, almost 100,000 events greater than M3 are included for the period 1998-2007. This should be noted that data collection is now close to be comprehensive in the region. The Euro-Med bulletin was the first project to collect data and make them available to the community with the recent examples from countries such as Azerbaijan, Iran, Libya or Saudi Arabia.

The priority so far had been to optimize data collection, and ensure a prompt publication (currently 9 month delay) and define the procedures for its integration in the ISC catalogue. The coming year will be devoted to improve procedures on issues such as the type of events (rockbursts, explosions etc) which prove really difficult to track-down as being handled in various ways by local networks and to suppress the suppress magnitude threshold to include all the detected earthquakes. This project is an open-ended task.

Key words: Euro-Med seismicity, earthquake information, earthquake catalogue

PRESENTER'S BIOGRAPHY

Rémy Bossu has been the Secretary General of the European-Mediterranean Seismological Centre since 2001. EMSC is a non-profit international NGO. Its members are seismological observatories and institutes and there are currently 83 members from 55 countries. It acts as a service provider for rapid earthquake information and it plays a key role in the integration of the Euro-Med seismological community (in close collaboration with ORFEUS (the second European organization in seismology) with the NERIES EC-project being currently the flagship project. Finally, EMSC also aims at improving collaboration and coordination with Northern Africa and the Middle East, EERWEM being its last EC-project on this topic.

Updated probabilistic seismic hazard values in northern Algeria. A contribution to the Algerian building code.

M. Hamdache[1], J.A. Peláez[2]

1. CRAAG, B.P. 63-Bouzaréah, 16340-Algiers, Algeria, mhamdache@hotmail.com
2. Department of Physics, University of Jaén, Jaén, Spain, japelaez@ujaen.es

ABSTRACT

The recent seismic activity in northern Algeria evidences the need for updating the current Algerian building code, and consequently, the need to update the probabilistic seismic hazard values in force in northern Algeria assessed in previous works.

This study is a large highlight on the used updated procedure. The compiled earthquake catalog, considering homogenization, completeness and declustering approach, is described in detail. The spatially-smoothed seismicity approach was used for the computation of the seismic hazard values. The adopted method combines both parametric and non-parametric approaches (*i.e.*, zonified and non-zonified methods). Besides, it is well adapted to model disperse or background seismicity, *i.e.*, the seismicity that cannot be assigned to specific geological structures. Seismic hazard map in terms of peak ground acceleration (PGA) with 10% probability of exceedance in 50 years was initially obtained for rock. Also, we have computed spectral acceleration (SA) values for rock (V_S > 750 m/s), corresponding to soils type A in Eurocode-8, and soils type S1 in the Algerian building code, damped at 5% for different periods. The compilation of seismic hazard in term of SA at different periods, damped at 5%, for three different types of soils (rock, and soft and stiff soils), and for return periods of 100 and 475 years, allow us to derive interesting relationships between SA (0.2-sec) *vs.* PGA and SA (1.0-sec) *vs.* PGA independent of the considered return period. In addition, uniform hazard spectra (UHS) have been obtained for different return periods at different locations. The computed UHS for different types of soils and for a 475 years return period have been proposed as design spectra. We have used the well known Newman-Hall approach with certain modifications. The SA (0.2-sec) is used to establish the spectral region for lower periods (region controlled by acceleration), while the SA (1.0-sec) is used to establish the spectral region for intermediate periods (region controlled by the velocity), just as it is proposed in the most recent International Building Code.

The flexibility of the procedure allowed us to derive the contribution in the seismic hazard values of the region for a new event, the 21 May 2003 Zemmouri (M_W 6.8) earthquake. For a return period of 475 years, and after the occurrence of the Zemmouri earthquake, we have obtained an increase in the PGA values of about 40% in the central part of the Tellian Atlas, comprising the Zemmouri-Boumerdes and Algiers region.

This event has been studied in detail. Initially, the recorded accelerograms have been processed, showing that horizontal hodograms agree with the rupture propagation, as suggested by some authors. Besides, soil amplification effects at some stations, as well as the influence of the directivity in other ones, are compared to similar effects observed in the 1994 Northridge earthquake. Afterwards, the aftershock sequence is modelized by means of a point process to derive spatio-temporal parameters. The obtained *b*-value of the Gutenberg-Richter relationship is equal to 1.30 ± 0.06, and the *p*-value of the Omori relationship is equal to 0.93 ± 0.04, with a characteristic time equal to 0.24 ± 0.08 hr. From the correlation integral, the fractal dimension of aftershock epicenters is estimated to be 1.79 ± 0.02, which allows us to deduce a cluster around the main rupture zone. Finally, from the Aki's fractal dimension, we deduce that the slip of the primary rupture segment over the total slip in the Zemmouri system is in the range 52-60%. These results are compared to those obtained in other aftershock sequences occurred in the Ibero-Maghrebian region, especially with those occurred in Morocco (2004 Alhoceima earthquake, M_S 6.1) and Spain (2004 Navarra earthquake, M_S 4.6, and 2005 Bullas earthquake, M_S 4.7).

Key words: Peak ground acceleration, spectral acceleration, uniform hazard spectra, design spectra, aftershock sequence.

PRESENTER'S BIOGRAPHY

Dr. Mohamed Hamdache is a senior researcher at CRAAG (Algerian Center for Scientific Research in Astronomy, Astrophysics and Geophysics) where he is responsible of the Seismic Hazard Laboratory. He received his Doctort's third degree in Mathematics from university of Rouen (France) and his Doctorat es Sciences in Mathematics from the faculty of Mathematics of the USTHB University, in Algiers. He is currently collaborating with Spanish researchers conducting seismic hazard studies in northern Algeria. His current research interests include seismic hazard assessment and statistical seismology. His work has led to numerous technical publications in journals and international conferences.

ON THE SOURCE OF THE NORTH ATLNATIC 1975 EARTHQUAKE AND TSUNAMI

F KAABOUBEN[1,2], M A BAPTISTA[3,4], JM MIRANDA[4], A I BRAHIM[1], E TOTO[2]

(1) Centre National pour la Recherche Scientifique et Technique (CNRST), Morocco
(2) University of Kenitra, Morocco
(3) Instituto Superior de Engenharia de Lisboa, CGUL, IDL

(4) University of Lisbon, CGUL, IDL

The 1975 May 26 earthquake was located by the global seismic network approximately 200 km south of the presumed Nubia-Eurasia plate boundary, the Gloria Fault.The focal mechanism was a dextral strike slip event with no significant dip-slip component, compatible with the relative motion between Eurasia and Nubia plates, but away from the presumed plate boundary.

The companion tsunami was recorded from the Azores islands to Portugal and Spain. In the Azores at the main harbor of São Miguel a strong withdraw of the sea was observed and the boats touched the bottom.

In this paper we present the results of tsunami hydrodynamic modeling to evaluate the set of the focal mechanism solutions proposed by seismologists. Tsunami modeling includes backward ray tracing (BRT) as well as forward non linear shallow water (NLSW) simulations using tide record data f Iberia, Azores, and northern Africa. We show that a good fit between observed data and synthetic waveforms can be obtained with a focal mechanism with no significant dip slip component. These results support the earthquake event interpretation as almost pure dextral strike slip event located in an old fracture zone south of Gloria Fault.

Expanding the on-going real-time test of earthquake prediction algorithm over the entire Mediterranean

Vladimir G. Kossobokov[1,2], Leontina L. Romashkova[1]

[1] International Institute of Earthquake Prediction Theory and Mathematical Geophysics, Russian Academy of Sciences, 84/32 Profsoyuznaya Street, Moscow 117997, Russian Federation
[2] Institut de Physique du Globe de Paris, 4 Place Jussieu, 75252 Paris, Cedex 05, France

ABSTRACT

Over the years Italy represents an area of Mediterranean where a modified version of the intermediate-term middle-range earthquake prediction algorithm M8 is used for routine monitoring of seismic hazard (defined to the state of a "black-box" application since 2002). Based on general concepts of pattern recognition that permit to deal with multiple seismic precursors the methodology of the algorithm allows for a systematic diagnosis of prospective seismic activity to-date, as well as for a strict testing of the prediction performance. The achieved performance results of the real-time experiments in Italy and on global scale ("black-box" application since 1992) along with a number of retrospective studies for Aegean Sea, Israel, and Algeria regions appear to create the necessary preconditions for expansion of the routine monitoring aimed at prediction of seismic hazard over the entire Mediterranean and adjacent regions.

Key words: earthquake prediction, hypothesis testing, Mediterranean

PRESENTER'S BIOGRAPHY

Vladimir G. Kossobokov. Chief scientist at the International Institute of Earthquake Prediction Theory and Mathematical Geophysics – Russian Academy of Sciences, Moscow. MS in Mathematics, Department of Mechanics and Mathematics, Moscow State University (1975); PhD in Geophysics at the Institute of Physics of the Earth – USSR Academy of Sciences, Moscow (1984); Doctor of Science in Geophysics at the International Institute of Earthquake Prediction Theory and Mathematical Geophysics – Russian Academy of Sciences, Moscow (2004). Since 1999 an expert of European Advisory Evaluation Committee for Earthquake Prediction, Council of Europe; since 2007 a vice president of the IUGG GeoRisk Commission (Commission of Geophysical Risk and Sustainability). An author of reproducible earthquake prediction algorithms and their on-going global real-time testing aimed at the largest earthquakes worldwide (set up in 1992). He suggested a generalization of the Gutenberg-Richter scaling law, which takes into account the fractal properties of earthquake distribution. Author of 133 scientific publications.

North Africa Seismological Group (NASG): A successful South-South Co-operation

North Africa Seismological Group (NASG)

Coordinator and corresponding author: T. Mourabit[1*]

National Team leaders: T. Mourabit[1], D. Benouar[2], H. Hussein[3], A. Ben Suleiman[4].

NASG Members & Collaborators: K. Abu Elenean[3], A. Ayadi[6], M. Chourak[8], M. El-Gabry[3], A. Foufa[6], H. Ghazala[10], M. Guidarelli[7-10], A. Harbi[6], I. Korrat[10], N. Jabour[5], S. Maouche[6], G. Panza[7-10], A. Peresan[7-10], F. Vaccari[7-10], E. Zuccolo[7-10]. K. Aoudia[10]

1) Abdelmalek Essadi, Faculty of Science & Techniques,Tangiers, Morocco,* tmourabit@gmail.com
2) University of Bab Ezzouar (USTHB), Fac. of Civil Engineering, Univ. of Bab Ezzouar, Alger, Algeria
3) National Research Institute of Astronomy and Geophysics, NRIAG, Helwan, Cairo, Egypt
4) Al-Fatih University, Tripoli, Libya
5) Centre National de Recherche Scientifique et Technique, Rabat, Morocco
6) Centre de Recherche en Astronomie, Astrophysique et Géophysique CRAAG, Algiers, Algeria
7) Department of Earth Sciences, University of Trieste, Italy
8) Moulay Ismail University, Meknes, Morocco.
9) Department of Geology, University of El Mansoura, Egypt
10) International Centre for Theoretical Physics, ICTP, Trieste, Italy

Abstract

The North Africa Seismological Group (NASG) is a collaboration of researchers from leading universities and research institutes in North Africa. It was founded in 1999 at the Abdus Salam International Centre for Theoretical Physics (ICTP, Trieste, Italy) with the scientific support of the Structure and Non-linear Dynamics of the Earth's group, Earth System Physics Section (SAND/ESP), and the financial support of the Office of External Activities NET40-OEA/ICTP.

The NASG main objective is to coordinate advanced seismological research in North Africa, and to gather scientists from North African countries to work on joint research project aiming at seismic hazard. The coordination of the research activities is promoted both at national and regional scales through frequent visits and exchanges of the partnership that evolved, during the years, from the regional scientific meetings of the working group, to international manifestations and workshops. Main NASG activities and results are summarily presented

The scientific field of cooperation is seismology, seismotectonics, engineering seismology, geodynamics with GPS monitoring, regional seismic hazard assessment, seismic zoning modelling structure and microzoning for megacities and urban areas.

The NASG involves the countries of Algeria, Egypt, Libya, Morocco and Tunisia. In this work, we present one of our most recent outputs represented in the compilation of the earthquake catalogue in North Africa. In addition to this earthquake catalogue, a more specialized catalogue was created for the purpose of neo-deterministic approach for seismic hazard mapping in North Africa.

Toward the compilation of a unified earthquake catalogue for North Africa

A. Peresan[1,2], A. Harbi[2,3], H.M. Hussein[4], O. P. Ogwari[2], G.F. Panza[1,2]

[1] Department of Earth Sciences, University of Trieste, Via Weiss 4, 34127 Trieste, Italy. aperesan@units.it
[2] The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy
[3] Centre de Recherche en Astronomie, Astrophysique et Géophysique, Algiers, Algeria
[4] National Research Institute of Astronomy and Geophysics, NRIAG, Elmarsad St., Helwan, Cairo, Egypt

ABSTRACT

Earthquake catalogues, as accurate, homogeneous and complete as possible, are essential for any space-time analysis of earthquakes occurrence, as well as for a sound assessment of seismic hazard. Although several collections of information about the occurrence of seismic events in North Africa countries are available, they cover different time periods, are incomplete at some regions or inaccurate in several parameters. Great caution must be taken in using available earthquake catalogues uncritically, especially in the areas of moderate and low seismicity (e.g. Libya), where the lack of systematically collected and prolonged observations appears particularly severe.

A preliminary unified catalogue for the whole North Africa region has been therefore complied by merging five national catalogues, available to us in the framework of the North Africa Seismological Group (NASG). The considered data sets, namely catalogues of Morocco, Algeria, Tunisia, Libya and Egypt, span different time periods and spatially overlap, moreover they provide heterogeneous estimations of earthquakes size (either magnitudes or intensities); this eventually complicates data merging and increases the possibility of duplicated events.

The procedure for the compilation of the unified catalogue is composed of two main phases: a) national catalogues revision and internal homogeneization; b) assessment, comparison and merging of the different national catalogues into a unified data set. In this framework, a revision of the earthquake catalogue of Algeria has been carried out, mainly focused on the reappraisal of historical seismicity; the improvements attained so far in the description of seismic activity of North Eastern Algeria are illustrated. The effort to define a homogeneous measure of earthquakes size, out of the several different magnitude estimates provided in each catalogue, is described considering the specific case of the instrumental catalogue of Egypt. To allow for an appropriate merging of national data sets, a preliminary analysis is performed for each individual catalogue, by evaluating earthquakes distribution versus magnitude and time as well as by considering the Gutenberg-Richter distribution. Spatial coverage is evaluated as well, using the NEIC and ISC catalogues as reference data sets, so as to define the spatial completeness level of each national catalogue. The method of compilation of the preliminary unified earthquake catalogue of North Africa, as a result of the national catalogues merging and updating, is described. Data analysis and merging is performed considering different areas and time intervals, which are found characterized by diverse data properties. In view of the heterogeneity of the magnitude scales used to quantify earthquakes size in the different catalogues and time spans, as well as of the various magnitude estimates eventually provided in the same catalogue, in this analysis the operating magnitude is selected as the maximum magnitude reported for each event. The unified catalogue of North Africa assembled in this way covers an area which extends between latitudes 20°N-39°N and longitudes 15°W-36°E. A brief description of the catalogue format is provided, along with a preliminary analysis of its homogeneity in time and magnitude.

Key words: earthquake catalogue, North Africa, magnitude, historical seismicity

PRESENTER'S BIOGRAPHY

Antonella Peresan, Researcher at the Department of Earth Sciences –University of Trieste, Italy. Lecturer at the ESP Diploma course at the Abdus Salam International Centre for Theoretical Physics, ICTP. She received her PhD in geophysics, in 2001, and her B.Sc. in physics in 1996, from the University of Trieste. She is an active member of the ICTP-SAND Group since 1998. Her researches mainly focussed on the following topics: a) Application and evaluation of intermediate-term earthquake prediction algorithms, using real and synthetic catalogues; b) Studies of seismicity and its evolution at different space and time scales; c) Analysis, integration and updating of earthquake catalogues for earthquake prediction and seismic hazard assessment, in several regions of the world; d) Studies of temporal variations of volcano seismicity; e) Numerical simulation of seismicity in the block structure model of lithosphere dynamics. She proposed a procedure for neo-deterministic seismic hazard assessment, integrating the space-time information about impending strong earthquakes provided by different pattern-recognition methodologies.

SEISMIC HAZARD ASSESSMENT FOR HURGHADA CITY, RED SEA, EGYPT

S. Riad [1], A. A. Tealeb [2], Abuo El-Ela A. Mohamed [3], kamal Abdel Rahman[4], Mostafa Sarhan[5]

1. Professor of Seismology, Egypt, nriad@link.net
2. Professor of Seismology, amin@nriag.sci.eg
3. Professor of Seismology, amin@nriag.sci.eg
4. Researcher of Seismology, amin@nriag.sci.eg
5. Research Assistance of Seismology, amin@nriag.sci.eg

ABSTRACT

Hurghada City is located on the northern part of Red Sea at the southern entrance of the Gulf of Suez. It has been affected by a relatively strong earthquake occurred on March 31st, 1969 with magnitude 6.9 M_s. Due to the damage distributions observed during this earthquake, it becomes necessary to carry out the seismic microzoning for Hurghada based on the integration between geological, seismological, geotechnical and structural information. The microtremor (ambient noise) measurements and analysis proved to be an efficient and low cost method for seismic microzoning. Through the application of horizontal/vertical (H/V) spectral ratio technique was possible to obtain both resonance frequency and the amplification factors of ground vibration at-71 sites within Hurghada city. It is noticed that these two parameters varies considerably from one site to another reflecting the changes in the thickness of sediments. The values for resonance frequency range between 0.4 and 6.5 Hz. It decreases when the basement depth increases (e.g. in areas having younger alluvial deposits). While, the amplification factors range from 1 to 6 and vary from the northern zone of Hurghada towards the southeastern and eastern zones. The ground model and dynamic characteristics for the soil and foundation layer are estimated at 10-selected sites within Hurghada city. The stochastic simulation technique was used to calculate Peak Ground Acceleration (PGA) at 81-sites distributed within Hurghada. The Maximum PGA produced by the Southern Gulf of Suez seismic source is calculated. Ground motion amplification factors controls the site of high values of PGA. The response spectrum which reflects the characteristics of earthquake was calculated also at various damping values.

Key words: Seismic Hazard, Red Sea, Egypt, Microzonation

PRESENTER'S BIOGRAPHY

Name: Abuo El-Ela Amin Mohamed

Date and Place of Birth: 29-03-1957, Sharkia, Egypt.

Nationality: Egyptian

Present Job: Professor, Head of Seismology Department

Address of Work: National Research Institute of Astronomy and Geophysics, Helwan, Cairo, Egypt.

General Field of Work: Seismology.

Special Field of Work: Engineering Seismology.

Member in the Egyptian Geophysical Society (EGS).

Member in the Egyptian National Seismic Network (ENSN).

Member in the Reduction of Earthquake Losses in the Eastern Mediterranean Region (RELEMR) Group.

Member in the Egyptian Engineering Society (EES).

Seismicity and seismotectonics of the northeastern part of Egypt

Samir Riad* and Ali Tealeb**
*Prof. of Geophysics, Geology Department, Assiut University, Egypt, nriad@link.net
** Prof. of Geophysics,
National Research Institute of Astronomy and Geophysics, tealebaa@yahoo.com

Abstract:
Earthquakes are the expression of continuing evolution of the Earth planet and reshaping of its surface. They are the most deadly of all natural disasters affecting the human environment. Their direct catastrophic effects last for few seconds, therefore no protective action could be taken during the disaster.
Social and human losses, and vulnerability to earthquakes, are increasing steadily as urbanization and development occupy more areas prone to significant earthquakes. The uncontrolled growth of cities is often associated with the construction of seismically unsafe buildings and infrastructures, mostly due to the insufficient knowledge of earthquake activity and seismic hazard in the area. Moderate, and even small, earthquakes may turn catastrophic in areas with poor building construction practice, poor mitigation and preparedness policies, and finally with disaster/crises mismanagement
Although earthquake activity in Egypt is relatively low, seismic risk is considerably high. This is due to the fact that many of the earthquakes occur near overpopulated cities and villages, coupled with the methods of construction that vary between old (as those still being used in the villages, found all over the country's agriculture areas) or new buildings with poor construction practice. Soil characteristics in different localities in Egypt and their impact on seismic wave attenuation and modification are important parameters that control earthquake risk.
The huge investments in different areas in the eastern and western parts of Sinai require vulnerability and preparedness studies based on proper understanding of the tectonic setup, historical and instrumental seismicity in these areas.
The study of the seismicity of Sinai clearly reflects activities along different structural trends. Gulf of Aqaba in the last 50 years acquired the highest concentrations of epicenters in Sinai area. On the 22nd of November 1995, an Mw 7.2 earthquake occurred in the central Gulf of Aqaba region (East of Nuwaybe City) causing damage in nearby communities in Jordan, Egypt, Israel, and Saudi Arabia and was felt for more than 700 km away. An aftershock sequence lasted for more than one year with numerous shocks exceeding Ms 5.
In the Gulf of Suez area other trends perpendicular or oblique to the Gulf can be easily detected. The Central areas of Sinai can be classified as seismically inactive.

Biography

Dr. Samir Riad received B.Sc. degree in 1961 from Cairo University, Ph.D. in 1969 from Moscow State University. Chairman, Geology Department, Helwan University, from July, 1996 to May, 1997, and Chairman, Geology Dept., Assiut University, from January 1993 to June 30, 1996. Consultant, UNESCO Cairo Office, In Charge of Earth Sciences Programs from March 1998 to June 2005.

Director of the New Valley Regional Research Center, Kharga, The Academy of Scientific Research and Technology, from May 1993 to June 2000. Founder of the Center for Studies and Research for South Valley Development. Assiut University and its Director From May 1997 to July 1999. He contributed to a number of local and regional research prpjects, published more than 60 research papers and supervised more than 30 M.Sc. and Ph.D. degrees. Presently, he is Prof. Emaretus, Geology Dept., Faculty of Science, Assiut University Since, September 1997.

Seismic risk assessment for the basin of Tunis: a HAZUS exporting case study

N.B.ROMDHANE[1], A.KSENTINI[2]

1. National School of Engineer of Tunis, TUNISIA, najla.romdhane@enit.rnu.tn
2. National School of Engineer of Tunis, TUNISIA, ahmed.ksentini@issatgb.rnu.tn

ABSTRACT

Seismicity in Tunisia is often considered as moderate. In fact, The National Institute of Meteorology earthquake catalog covers the period [1724-2007] and presents a maximal local magnitude of 6.0. The aim of this survey is to assess the seismic risk for the capital and to define zones with potential risk. In order to estimate the seismic risk in the basin of Tunis, we used "Federal emergency management agency" FEMA Loss estimation tool: "HAZUS-MH" (Hazard-US) which uses Geographic Information System (GIS) and algorithms to calculate, map, and display earthquake loss data. For this Task, we proceed by the analysis of ground motion for the area and the vulnerability of the exposure such as buildings and essential facilities.

A preliminary survey permits to compute probabilistic seismic hazard for all the territory using recent earthquake catalogs and different source models. Peak ground acceleration is calculated for a return period of 50 years with a probability of being exceeded of 10%. Then, elastic response spectra (5% damping) are defined for each census tract of the study region combining ground motion and soil amplification parameters (site effect) depending on local site conditions. Resonance frequencies are measured using back ground noises. That led to define demand spectrum with peak ground acceleration, spectral acceleration at 0.3 second and 1.0 second periods, and peak ground velocity for each census tract.

In the other hand, another study focuses on general building stock damages due to ground shaking. We use damage functions such as fragility curves that give the probability of reaching or exceeding different states of damage (Slight, moderate, Extensive and Complete damage) and building capacity curves (push-over) to determine peak building response. FEMA-proposed capacity curves and building schemes are modified in order to best fit local building types and occupation classes. For this task, an inventory of more than 1000 buildings (number of stories, building type, occupation classes...) including some recorded ambient vibrations and measured resonance frequencies for different model building classes is used to adjust capacity curves in the linear domain.

In order to combine estimated hazard and gathered exposure under HAZUS, we use GIS to create study region and populate building databases. Aggregated region grid permits to gather under census tracts (150x150m) buildings and ground motion parameters got from user supplied shake-maps and applied at the centroid of the census tract. Peak building responses (spectral displacement) are calculated by superposing capacity curves and demand spectrum. After that, we estimate damage state probabilities exploiting fragility curves. Finally, estimated potential earthquake losses are plotted under GIS in order to help state officials to mitigate risk and to prepare for emergency response.

Key words: Risk, Hazard, Capacity curves, HAZUS, GIS.

PRESENTER'S BIOGRAPHY

An assessment of site effects and liquefaction potential in Tunis City, Tunisia

Najla Bouden Romdhane[1], Christian Camerlynck[2], Sihem Louati[3], Sameh Anibi[4]

1. Ecole Nationale d'Ingénieurs de Tunis, Tunisia, najla.romdhane@enit.rnu.tn
2. Université Pierre et Marie Curie, France, christian.camerlynck@upmc.fr
3. Université Pierre et Marie Curie, France, sihem_loua@yahoo.fr
4. Ecole Nationale d'Ingénieurs de Tunis, Tunisia, sameh_anibi2002@yahoo.com

ABSTRACT

Tunis and its suburbs are developing around the fringes of the Lake of Tunis (El Bhira) over a coastal sedimentary basin which is characterized by saturated loose silty deposits over a more compact bedrock; the superficial lithology includes plastic clays and loose sandy interbeds. Damage patterns in previous earthquakes (Mexico City 1985; Loma Prieta, 1989; Kobe, 1995; etc..) have shown that similar soil conditions may significantly amplify the level of ground shaking and induce soil liquefaction.

Tunis and its area are nowadays well disposed for growing economic activity, large investments and modern urban infrastructures (suspension bridges, viaducts, marinas, etc.). Taking into account the socioeconomic importance of Tunis and the particular geotechnical context associated with the vicinity of areas with high level of seismicity (Sicily and Algeria), the Civil Engineering Department of the National School of Engineers of Tunis (ENIT) has, in the last decade, conducted a series of comprehensive seismic hazard and vulnerability studies with a special emphasis on lithological and topographic site effects, liquefaction potential and vulnerability assessment.

A recent study was dedicated to the edges of "El Bhira" where ambitious investment projects were initiated in the early 2008 and cover more than 25 million square meters of buildings, towers, tourist complexes, bridges and yacht embankments. The main topics of this study are covered in this paper and involve principally (1) the seismic microzonation of the area by means of Nakamura's Technique and (2) an assessment of liquefaction potential of the subsoil.

The seismic noise measurements were performed using a new generation of high resolution digital instrument (TROMINO®) which permits a fast and reliable data acquisition and processing. The HVNR was calculated and the results (pick frequencies and corresponding amplification factors) showed a good spatial stability, compatible with the geotechnical zoning. They also showed that:

- very low fundamental frequencies (0.2 to 1.2 hertz) of the subsoil dominate in the area and corroborate the geophysical investigations which situate the bedrock at a depth between 300 and 600m;
- Significant site amplification factors, between 4.5 and 10, are expected.

All theses informations are compiled in a GIS and can be retrieved, for instance, when designing the building towers and planning the area; in that case, buildings eigenmodes should be far from the range of the subsoil frequencies so that to avoid any induced coupled resonance during an earthquake.

The evaluation of the liquefaction potential of the saturated loose features embedded within the first 20 meters was conducted for the first time in Tunisia. We collected and compiled borehole informations from both private and public projects. For this study, we evaluated data from 1,000 boreholes, Pressuremeters, Standard Penetration Tests, Cone Penetration Tests and undisturbed soil samples. We conducted (1) a detailed study of the geological and hydrogeological data available on the site as well as a study of geotechnical properties of the soils (grain size distribution, Atterberg limits, water content, fine content…) and (2) a comparison between the cyclic resistance ratio (CRR) and the cyclic intensity of loading (CSReq) using the "Simplified" method established by Seed and Idriss (1971).

Both studies confirmed the existence of layers presenting a moderate to high liquefaction potential. These layers are located at depths varying between 0.2 and 20m. Liquefaction hazard maps and cross sections showing the variation of the liquefaction potential with depth and for increasing shaking levels are proposed in this paper and discussed.

Key words: Site effects, ambient noise, liquefaction, Liquefaction Potential Index, Tunis City.

PRESENTER'S BIOGRAPHY

Najla Bouden Romdhane is Professor of Civil Engineering at the National School of Engineers of Tunis (ENIT) and the Ecole Polytechnique of Tunisie (EPT). She earned a Doctorat ès-Sciences in Earthquake Engineering, a PhD in Mining Engineering from the Ecole des Mines de Paris and a Bachelors of Science in Civil Engineering from the Ecole Supérieure des Travaux Publics in Paris.

Najla is the General Secretary of the Scientific Association of ENIT, co-Director of the Research Group "Geotechnical Engineering", active member in international research groups working mainly in the field of seismic risk assessment and visiting professor at the department of Applied Geophysics of the University Paris 6. She is the Councilor of the Minister of Higher Education, Scientific Research and Technology (Tunisia). She holds the National Merit Medal of Education and Sciences and was a member and a lecturer at the National Defense Institute (IDN, 23th cohorte).

Mapping of the topographic site effect in the site of Tunis

Najla Bouden ROMDHANE, Essaieb HAMDI, Saida BEN AMEUR

Geotechnical Engineering Research Team, Ecole Nationale d'Ingénieurs de Tunis, Tunisia

"Topographic site effect" is an important phenomenon which should be studied when foundations are to be built in a non-plane area. This paper presents a methodology which was set up to analyse the contribution of the topography to the amplification of the seismic signal in the site of Tunis using the Dynamics version of a 2D Finite Element calculations' software (PLAXIS).

In order to highlight the part of the topography alone in the amplification of the signal, and to cancel any geologic contribution, a comparative approach is used: accelerations in each model are compared to those of a plane model having similar characteristics.

The methodology is based on two steps: the first is the analysis of canonical cases response (hill, valley, and slope) to a Ricker input signal. The influence of some geometrical parameters (height, slope dip angle…) and seismic input signal parameters (amplitude, frequency…) was thoroughly analysed. At this stage, it was found that in the case of a LF seismic signal, the amplification to the summit of the slope is larger when the slope increases. On the other hand, in the case of a HF seismic signal, the zone characterized by strong amplifications of horizontal acceleration is, on the contrary, localised on the summit of the slope which the angle of the slope is high.

Moreover, this first step was followed by a more detailed study was focused on the selection of six sites of Tunis city : Belvédère -Djbel Lahmar, Borj Ali Erraïes (67,5m), Campus- El Manar (120m), El gorjani- Essaïda El Mannoubia (57,5m), Errabta(52m) and Rastabia-cité Erromana (82m). For each site, 4 real 2D topography sections (N-S, E-W, NW-SE, NE-SW) were derived and Finite Elements simulations of the topographic site effect were conducted. The influence of low (f=1Hz) and high (f=6Hz) signal frequency as well as signal amplitude (0.2g or 0.5g) was investigated. The outputs of this analysis are a site per site amplification maps for each of the 4 considered cases.

KEY WORDS: Topographic site effect, amplification, Ricker, Tunis

Seismic Hazard Microzoning in Urban Areas.

Shapira A[1)] ,Zaslavsky Y[2)], Gorshtein, M[2)], Ataev G[2)], Gorstein M. [2)], Aksinenko T. [2)], Kalmanovich M. [2)], Perelman N. [2)], Hofstetter A. [2)]

1) Earthquakes Preparedness Committee, Ministry of National Infrastructure, Jerusalem, Israel
2) Seismology Division, Geophysical Institute of Israel, P.O. Box 182, Lod 71100, Israel, e-mail: avis@mni.gov.il

The necessity for detailed mapping of the earthquake hazard in urban areas, stems from the fact that the combination of geological inhomogeneity and structures of different characteristics dominates the special distribution of the magnitude of damage and amount of casualties. Most of the cities around the world, including the major cities of North Africa, the great variability in the subsurface conditions across a town/city and the relatively high costs associated with obtaining the appropriate information about the subsurface, strongly limit proper hazard assessments and direct information from strong motion recordings is usually unavailable.

To overcome those practical difficulties we adhere to the use of simplified modelling of the earthquake processes. More precisely, we generate synthetic spectra of the expected ground notions by implementing the so called Stochastic Approach (e.g. Boore, 2000), in which we integrate analytical models to determine the nonlinear response of the site under investigation. The later requires modelling of the subsurface. Then, Monte-Carlo simulations are used to obtain the uniform hazard, site-specific acceleration spectrum which serves as basic information for the engineer to either design a new structure or assess its capability to withstand the ground shaking from future earthquakes.

Over the years, we have conducted site investigations in several thousands of sites. These investigations demonstrate the usefulness of using horizontal-to-vertical (H/V) spectra of ambient noise measurements to identify sites with high potential for being vulnerable to amplification effects and characterize the sites with respect to their expected resonance frequencies and the corresponding H/V levels. This information, together with any available geological, geotechnical and geophysical information, helps building a reliable model of the subsurface, which is then integrated in the processes of the seismic hazard assessment.

An important element in the process of modeling the subsurface and assessing the earthquake hazards in urban areas is the performance of systematic ambient noise measurements on a grid with spacing of 100-500 m. In doing so, we are able to develop a regional subsurface model, which is systematic with all additional information we compile, i.e., geological maps, borehole information, seismic refraction surveys etc.

We have conducted many tests to verify the stability in H/V, to develop the required skills to choose appropriate sections of the recorded noise.

Based on the hazard assessments for individual sites, the city/town could be divided into zones of similar hazard characteristics, which are used for earthquake scenarios and better represent the design acceleration spectra for safer buildings.

Earthquake Preparedness in the RELEMR context.

Avi Shapira

Earthquake Preparedness Committee, Jerusalem, Israel e-mail: avis@mni.gov.il

Many of the RELEMR activities where associated with evaluating the earthquake hazards in North Africa and the east Mediterranean regions. Occasionally, following the occurrence of strong and destructive earthquakes, RELEMR participants were faced with the consequences of not being prepared.

In this presentation I shall present some personal thoughts and concepts that touch earthquake preparedness which we may like to discuss and implement within the RELEMR activities. As an interesting case, I shall mention the unusual seismic activity in south Lebanon and its implications in the context of earthquake preparedness.

Reappraisal of the seismicity and seismic hazard of Libya as a result of the newly established Libyan national seismograph network

Abdunnur Ben Suleman[1], Hadi Gashut[2]

1. Libyan Center for Remote Sensing and Space Science, Libya, abdunnurs@yahoo.com
2. Libyan Center for Remote Sensing and Space Science, Libya, ha_nass2003@yahoo.com

ABSTRACT

The tectonic evolution of Libya, located at the northern extreme of the African continent, has yielded a complex crustal structure that is composed of a series of basins and uplifts. The present day deformation of Libya is the result of the Eurasia-Africa continental collision. The recorded number of earthquakes in Libya was not representative of the actual total number before the establishment of the Libyan National Seismograph network. A number of reasons contribute to this fact among which are be the small number of seismological stations in the area and the limitations on instrumental sensitivity before 1950. This scientific fact was fully proven after the establishment of the Libyan National Seismograph Network (LNSN) operated since November of the year 2005. The LNSN consists of an up-to-date 15 broadband digital national network, utilizing state of the art VSAT communication technology, and a Central Processing Center, located in the City of Ghariyan, Libya. This study aims to explain in detail the LNSN and its main objectives both on the local and regional scales. We also aim to discuss the first catalogue of Libyan earthquakes and to explain the new picture of the seismicity and seismic hazard of Libya. The newly compiled Libyan catalogue represents the main source of data through which we analytically reanalyze earthquake activity of Libya with the aim of improving the earthquake hazard assessment of the Country. Different sources were used in the compilation process within a geographical window limited by the 19^0 N and 35^0 N parallels and the 9^0 E and 26^0 E meridians.

The LNSN network was designed to monitor local, regional and teleseismic activities, as well as to provide high quality data for research projects both locally and on the regional and global scale. At first glance the seismic activity map, based on the present seismic catalogue, shows dominant trends of seismicity with most seismic activity concentrated along the northern coastal areas. Four major seismic trends were quite noticeable. A first trend is a NW-SE direction coinciding with the eastern boarder of the Hun Graben. A second trend is also a NW-SE direction in the offshore area and might be a continuation of this trend. The other two trends were located in the western Gulf of Sirt and Cyrenaica platform. The rest of seismicity is diffuse either offshore or in land, with no good correlation with well-mapped faults.

Key words: Libyan seismograph network**,** seismicity; seismic hazard.

PRESENTER'S BIOGRAPHY

Dr. Abdunnur Ben Suleman is a professor of geophysics and head of the Department of Geophysics at Al-Fateh University in Tripoli, Libya. He is also a member of the scientific committee at the Libyan Centre for Remote Sensing and Space Science (LCRSSS) and the scientific advisor of the seismological office at the LCRSSS. After Graduating from Al Fateh University in 1976 he joined Oasis Oil Company of Libya. In 1984 he graduated from the University of Texas at El Paso (USA) with MSc degree in Geophysics. In 1993 he graduated from the same university with a PhD degree in geophysics. Dr. Ben Suleman's research interests include studies of historical and recent earthquakes in Libya and the surrounding areas. He currently serves as the National advisor for the North African Seismological group (NASG) and as the president of the Libyan Chapter of the European Geophysical Union (EGU). Dr. Ben Suleman teaches a range of geophysical and environmental related course both on the graduate and undergraduate level.

.

The two seismic events of January 9th, 2008 (M:5.2) and June 6th, 2008 (M:5.5) in the Oran region (western Algeria).

A.K. Yelles-Chaouche[1], A.Kherroubi[1], A.Haned[1], H. Beldjoudi[1], A.Allili[1]

1. C.R.A.A.G. Route de l'Observatoire B.P.63 Bouzaréah Algiers, Algeria, a.yelles@craag.dz

ABSTRACT

During the year 2008, the Oran region located about 400 Km west of Algiers (the capital of Algeria) experienced two moderate earthquakes of magnitude 5.2 for the first in January 9th and 5.5 for the second in June, 6 th, 2008 The first shock occurred at 22h 24 mn (GMT) and was located at 35.57°N, -0.32°E near the village of Boufatis (20 Kw SE Oran) where it was felt strongly. There, some people were injured and effects were observed as cracks on the walls of the buildings and falling of the chimneys. Some fissures were also observed on the soil.The earthquake was felt also in a large radius of about 100 km, mainly at Mostaghanem, Sidi Bel Abbes and Mascara. Based on these observations, an intensity of VI was attributed.

The second event occurred at 20h 02mn and was located at 36.06°N, -0.64 E, about 25 km north of Oran. It was strongly felt in the Oran city and caused a great panic among the population. Some buildings at Oran were affected by cracks on their walls The event of Intensity VII was felt in the main wilayas of the west of Algeria as Tlemcen, Mostaghanem and Ain Temouchent.

For the two events, temporary seismic networks in addition of the national network were deployed in the region. For the first event, only few aftershocks were recorded. For the second event, the aftershocks crisis lasted several weeks and hundreds of shocks were recorded

These two moderate events at Oran are the strongest recorded since a long period. Indeed, if some moderate events occurred not so far in the Mostaghanem region (August, 8th, 2007, M:5.1), the Ain Temouchent region (December, 22thm 1999, M:5.7) or the Mascara region (August, 18th, 1999, M:5.7), the Oran was characterized by a low seismic activity. We just remind that in the past, Oran city was in 1790 almost destroyed by a violent earthquake which led to the leaving of the Spanish.

The study of these two events allowed for the first time to know better the seismic sources of the region. Two new faults, one near the village of Boufatis and the second offshore north of the city of Oran, were evidenced. The first structure is linked to a small topographic high related to a small anticline located inside the Mleta basin, the second fault is a part of the major fault linking the Yussuf ridge, the Chleff basin and the Dahra escarpment.

The knowledge of these two faults allowed to a better assessment of the seismic hazard of the Oran region.

Key words : Oran, earthquake,magnitude, Intensity, faults.

PRESENTER'S BIOGRAPHY

A.K Yelles-Chaouche
Director of the CRAAG (Centre de Recherche en Astronomie Astrophysics Géophysics
PHD in 1987 at the IPGP Paris (France)
Director of Research since 2000
Head of the Seismology Laboratory in CRAAG.

Recent seismic activity in the Algiers region (2005-2008)

A.K.Yelles-Chaouche [1], H.Beldjoudi[1],A.Haned[1], A.Kherroubi[1], H.Djellit[1], F.Semmane[1].

1. C.R.A.A.G. Route de l'Observatoire B.P. 63 Bouzaréah Algiers, Algeria, a.yelles@craag.dz

ABSTRACT

The deployment of five portable stations in addition of the ones of the Algerian network allowed to record the microseismic activity of the Mitidja basin where Algiers, the capital of Algeria is located. We present here the results of three years and half recording from July 2005 to December 2007.
During this period, an intense activity occurred as about a thousand of events were recorded with a maximum magnitude of 4.0. About 400 events have been located with a magnitude ranging from 2.5 to 4.0. The most significant events are the one which happened on August 22 th, 2007 in the Médea region with a magnitude 5.2.
From data analysis, we can point out that the most important activity occurred in the eastern part of the basin, the area where the last Boumerdes of May 21 st, 2003 occurred.
The second important group of events is located between Hammam Melouane and Meftah villages, i.e along the southern border of the Mitidja basin. This active boundary is known to be the site where the destructive event of Blida in 1825 (20 000 persons death) happened. In this region, we can observe that the seismicity is concentrated on the several segments of this boundary.
The activity concentrated also near the Algiers massif and mainly off this massif (bay of Algiers, along the Ain Benian fault).
Some of the epicenters happened in the middle of the basin indicating the presence of blind structures.
No epicentres were recorded in the western part of the basin (Chenoua faults)
Some epicentres were evidenced on the Khayr Eddine fault.
Many seismic events occurred in the Médea region located in the Tellian Atlas.
Focal mechanisms determined indicate that the Algiers area is under compression with a NNW-SSE main stress direction.
For the first time, several active faults in the basin are evidenced by the record of the seismic activity of the basin. These represents a major threat for Algiers and the Blida, two main cities of Algeria.

Keys words: Algiers, seismicity, Mitidja basin, seismic stations, epicenters

PRESENTER'S BIOGRAPHY

A.K Yelles-Chaouche
Director of the CRAAG (Centre de Recherche en Astronomie Astrophysics Géophysics
PHD in 1987 at the IPGP Paris (France)
Director of Research since 2000
Head of the Seiimology Laboratory in CRAAG.

Seismicity of northern Algeria: from 419 AD to present

A.K. Yelles-Chaouche[1], H.Djellit[1], H.Beldjoudi[1], A.Kherroubi[1], F.Semmane[1], A.Haned[1], T.Allili[1], C.Aidi[1].

1. CRAAG Route de l'Observatoire B.P 63 Bouzareah Algiers Algeria, a.yelles@craag.dz

ABSTRACT

Recent investigations (archives in museums) indicate that the first Algerian seismic event known is one which occurred at Sitifis(now Setif) in 419. They also indicate other events in the romain period (Ain Temouchent, 699). In the medieval period, only few events were reported. The most important is the one of 1365 which hit Algiers. During the XVIII century, (Sebai and Bernard, 2008) reported several events. During the French epoch, several catalogues were edited allowing a first knowledge of the Algerian seismicity.
For the recent period, installation of seismic stations (from 1910) and networks (analog in1991, 1998 and digital in 2006) was an opportunity to record the Algerian seismic activity and to know its characteristics. From 1998 to present, the increase of the number of earthquakes recorded allows to have a more precise seismic map of Algeria. The seismic monitoring highlights the different seismic zones of northern Algeria, outlining new seismic areas as the Djelfa area or the El Oued area
The studies of the most important seismic events as the one of El Asnam(1980) or the recent Boumerdes earthquake (May, 2003) allow to precise the deformation pattern in northern Algeria. Finally recent investigations along the margin (Maradja surveys) gave to opportunity to identify the offshore seismic sources and to better understand the deformation pattern of the African-Eurasiatic plate boundary in northern Algeria.

Key words: Seismicity, northern Algeria, seismic monitoring, network.

PRESENTER'S BIOGRAPHY

A.K Yelles-Chaouche
Director of the CRAAG (Centre de Recherche en Astronomie Astrophysics Géophysics)
PHD in 1987 at the IPGP Paris (France)
Director of Research since 2000.
Head of the Seismology Laboratory in CRAAG.

Site effects assessment from six local earthquakes triggered strong motion stations during 2004-2008 using H/V technique

Y. Zaslavsky, **A. Hofstetter**, N. Perelman, and U. Peled

Seismology Division, Geophysical Institute of Israel, P.O. Box 182, Lod, Israel, rami@seis.mni.gov.il

Many population centers of Israel are situated close to the seismically active Dead Sea fault system, which is capable of generating strong earthquakes (M~7.5). In addition, the majority of cities and village as are build on soft sediments or on hilly terrain where geological and topographical effects will probably amplify seismic ground motion and significantly increase the hazard. In Israel, as in areas of low to moderate seismicity, felt earthquakes present long return period. Nevertheless, during 2004-2008 six earthquakes triggered strong motion station operates as part of the Israel Seismic Network. This data set includes 50 three component accelerograms of earthquakes with magnitudes from 5.2 to 4.3 occurring at epicentral distances of 10 to 170 km from the rupture fault and PGA ranging from 0.08 to 0.01 g. In this study we use the horizontal-to-vertical (H/V) spectral ratio of earthquake shear wave to examine the possibility of estimating site effects on the major geological units and effect of topography on seismic ground motion in different areas of Israel. Amplification effects by near-surface geological conditions of factor 4-6 are observed at various frequencies in the 0.8-4.0 Hz band. The seismic station located on the high plateau near top escarpment and on small mountains and hills amplified the motion in the frequency range 0.6-3.0 Hz with a factor of up to 5. At these sites we observe essential change in the value H/V spectral ratios of two horizontal components while virtually turning axis of horizontal accellerometers. For same strong motion stations we compared results obtained by H/V technique applied for accelerograms and ambient noise recorded at same site. We have got a good agreement between the frequencies and amplitudes on the first resonance modes obtained using different data sets. Attempts to use geological, geotechnical information and 1-D modeling for the explanation of our results were failed. Reliable estimations of site response are obtained by combining different empirical approaches supplemented with analytical computation where the empirical observation, geophysical data and geological information constrain the model parameters.