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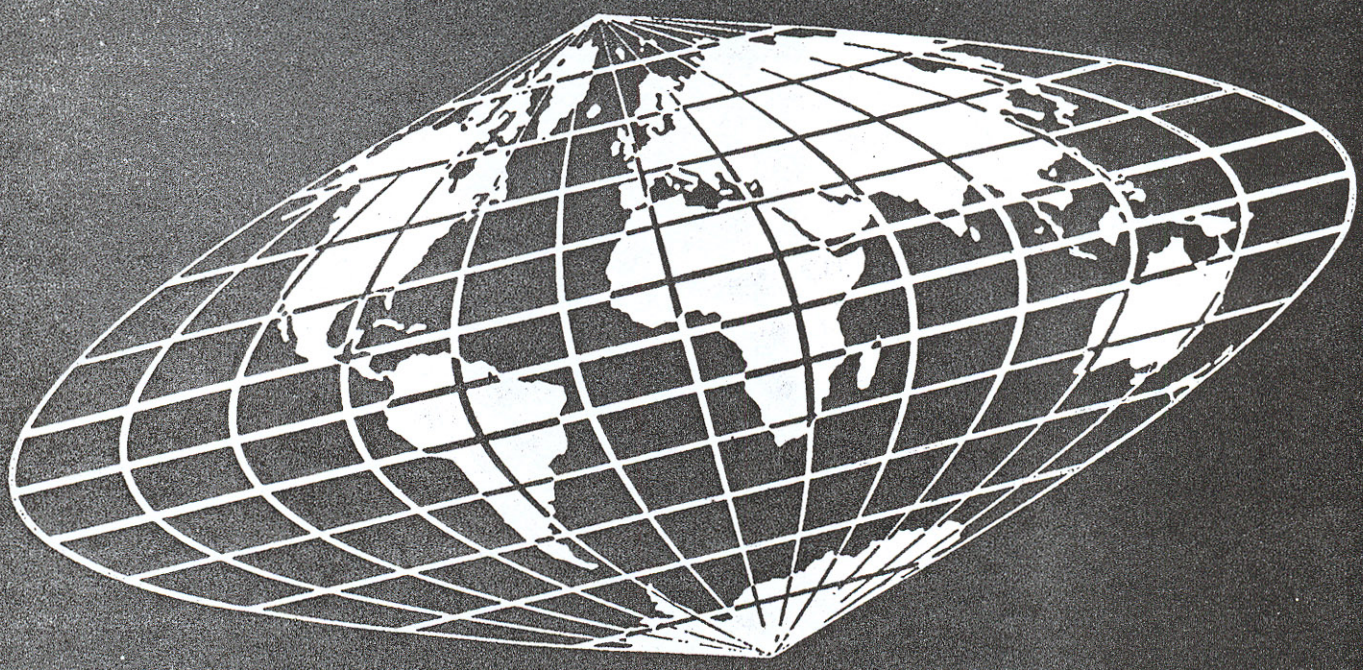

ABSTRACT VOLUME

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ABSTRACTS

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Session J06:5P

J06 : 5P/01 : PO
Volcanic and Seismic-Volcanic Hazards in Greece

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The volcanic hazards in Greece are generally very few apart from the areas along the volcanic arc and especially the areas of active volcanic centers, such as Methana, Milos, Santorini, and Nisyros. The impending hazards of these areas could be characterised as low relative to other volcanic zones of the planet, however they exists, which automatically implies to put on some measures for reducing the risks. Despite the fact that volcanic action along the volcanic arc seems limited, however there is increased risk for seismic-volcanic activity, that is a "volcanic activity-excitation" with or without any apparent indication on the surface, but with simultaneous occurrence of seismic activity, due to ongoing activity in the volcanic center. The occurrence of such seismic activity even if it does not include high magnitude earthquakes- usually not over than 5.5R- however ought to the possible small depth of the focus- 1 to 5 km- it can be proved especially hazardous for the neighboring towns which are also characterised by high seismic vulnerability. The seismic-volcanic hazards are controlled mainly by two significant factors and especially by the big fault zones and some particular geological formations with problematic seismic response. Especially in Greece, along the volcanic arc the volcanic activity was controlled or accompanied, in almost all the cases, by large fault zones which were active prior, during or after the volcanic activity such as the outstanding examples in the volcanic region of Milos and Nisyros. These fault zones consist the vulnerable, or the high risk areas. Similar case is the 1992 earthquakes in Milos island, which caused reactivation of large faults with a surface occurrence. Similar phenomena were also observed in the island of Nisyros during the period 1996-1997. Another factor which increase the seismic-volcanic hazards is the presence of volcanic formations which show problematic response. Especially the occurrence of volcanic products, such as tuffs, ash and other pyroclastics which consist the non-cohesive rocks and also with small thickness overlying solid rocky lavas, represent a negative soil-dynamic frame, unsuitable for founding any constructions, except if special construction measures are taken. Additionally, the morphological dips compose the favorable conditions for landsliding phenomena particularly in cases of earthquakes. The historical documents which referred to the occurrence of earthquakes during the periods of volcanic activity or in the intervals, the recent examples of catastrophical earthquakes in volcanic centers in the domain of Greece (i.e., Milos 1992, Nisyros 1996), as well as the above mentioned documents, imply the necessity of input and evaluate the data regarding the seismic-volcanic hazards which together with the rest of the data will help in the better, long term land-use planning of the volcanic areas.

J06 : 5P/02 : PO
Active Fault Deformation-Antiseismic Planning in the Island of Zakynthos (W. Greece)

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It is well known that the island of Zakynthos is situated in the outer part of the Hellenic Arc and very close to the convergence limit of the two plates, the European and the African one. This geotectonic setting of the island and the intense neotectonic deformation which is represented mainly with faults which are also the cause for the occurrence of the seismic shocks. Despite the severe problems created by the earthquakes, so far there has not been attempted any systematic mapping and study of the faults. Therefore there is not a complete view of the seismotectonic frame. As a result it is not plausible to make any effort to organise an antiseismic plan and survey for the reduce of the seismic hazards. Within the framework of a neotectonic research it was distinguished and plotted in a small scale, all the faults and fault zones. Based on this elaborate tectonic analysis it was shown that the most active faults and fault zones are: 1); The Zakynthos fault with a general orientation NE-SW which intersects and displace Pleistocene formations, limits alluvial formations. This fault basically cut across the town of Zakynthos. 2); The faults in the area of Mpohalis-Gerakari with a general orientation NW-SE which intersect and displace the Pliocene and Pleistocene formations. 3); The fault zone in Bolimnes consists of 3-4 faults which cut even younger to recent formations of scree and fans. The fault zone of Bolimnes is directly associated with the seismic activity. 4); The fault zones on either side of the Keri bay with a general orientation E-W, which create the topographical lowering of the bay and intersects even the recent formations. The classification and the precise mapping of the active faults is one of the first and essential elements for the antiseismic planning and the survey of the island, considering that: 5); Areas with the highest risk are precisely surveyed. These areas correspond to the traces of the faults and the fault zones. 6); The correlation of the faults and the earthquake focus gives a clearer view of the recent deformation. 7); It is possible to form appropriate aid plans in case of an earthquake, so as to considerably reduce the effects of the shock or generally any geodynamic episode. 8); Large scale development plans or public utility works can be designed in such a way so as to be unaffected by fault reactivation and the effects of the consequent seismic activity, especially regarding that their normal utility is considered necessary.

J06 : 5P/03 : PO
Seismotectonics in the North Aegean Area (N. Greece)

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The North Aegean area is characterized by high seismic activity. Epicenter distribution of earthquakes with magnitudes greater than 4.0, during the period 1963-1992 reveals that the main seismically active fault zones, correlate well with the dominant morphological features of the area. In order to gain an initial insight to the seismotectonics of the area the fault plane solutions of major earthquakes in the area were examined. The solutions proposed by previous authors were grouped per event and the best solution for each event was selected taking into consideration the epicenter distribution and the morphological and tectonic features of the area.

Next, the data recorded by a 10-station temporary seismic network installed in the North Aegean were analyzed. Epicenter distribution of small magnitude earthquakes, recorded during the period September 1993 - December 1995, delineates the major fault zones and tectonic structures in the area (North Aegean and Sarros troughs, Sporades basin). Focal mechanisms of selected microearthquakes in association with the epicenter distribution and depth cross-sections indicate NNW-SSE extension in the area. The main tectonic features of the North Aegean and Sarros troughs are delineated by NE-SW fault zones and connected or divided by secondary fault zones trending NW-SE. The calculated fault plane solutions indicate predominantly normal faulting but strike slip or reverse faulting is also locally observed.

The high seismic activity the corresponding seismic hazard implications in the area were emphasized by two major earthquakes which caused minor damage. The first one with magnitude 5.9 occurred in May 1994 in the southeastern part of area between Lesvos and Chios and the second with 5.4 magnitude in May 1995 near the town of Arnea in the Chalkidiki peninsula. The detailed study of these events and their aftershock sequences recorded by the local network provided additional valuable information about the tectonics of the area.

J06 : 5P/04 : PO
Geotechnical and Seismic Characterisation of the Martim Moniz Area (Lisbon)

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Lisbon is placed in a relatively high seismic risk area. This risk is associated to several seismogenetic origins both intraplate and interplate which gave rise to some important historical earthquakes such as the one on the November 1st 1755, and many registered earthquakes. The big earthquake of 1755 was the first one to have a very complete description of the effects produced. The effects caused by the 1755 earthquake show, in Lisbon, a narrow relationship between the damage distribution and local geology. The most damaged areas, located on the East side of Lisbon, were the ones that have alluvial subsoil followed by the areas that have Miocene subsoil. The Miocene formations are composed of over-consolidated hard soils and soft rocks, such as sands, clays and sandstones that are decompressed near the surface. The West side, where the damage was less significant, is mainly composed of Cretaceous limestones and Neo-Cretaceous basalts. The Downtown Lisbon was one of the most affected areas.

In order to minimise the risks it is very important to evaluate the role of the different parameters involved. The knowledge of the geotechnical behaviour of the materials that compose the subsoil is one of the important aspects of this multidisciplinary work, essential to the knowledge of the site effects.

The seismic modelling must be based on the detailed geology knowledge. In urban areas, such as Lisbon, where it is very difficult to find an outcrop, the geological engineering boreholes take on a great importance. They allow a detailed knowledge of the local geology as well as a geotechnical characterisation of the materials.

Following the work done in Almeida et al (1997) in the area of the Castelo de São Jorge hill, the detailed geological-geotechnical mapping for the Martim Moniz area and the 1-D seismic modelling was preformed. This area is part of one old branch of the Tagus River, the Arroios tributary. The valley deeply carved in Miocene formations has a thick cover of alluvial and coverage materials. The 1-D seismic modelling was calculated at different points of the valley allowing a better visualisation of the seismic behaviour of this area and an understanding of the effect of the different behaviours of the materials (lithology, thickness and compaction, among others).

Almeida I, Lopes I, Almeida F & Teves-Costa P, *Caracterização Geotécnica da Colina do Castelo. Abordagem preliminar para a estimativa do risco sísmico. 3º Encon. sobre Sismologia e Eng. Sísmica. IST, Lisboa*, 129-136, (1997).

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Nonparametric Statistical Analysis of the Risk of Ocurrence of Earthquakes

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If T is a random variable defined as the time of failure of a system(that is, the time of occurrence of a particular event), with probability distribution function F and probability density function f, the hazard function or failure rate is defined as $r(x)=f(x)/(1-F(x)).r(x)dx$ might be thought of as the instantaneous probability of failure at x, given survival to x, (see, e.g. Prakasa Rao, 1983). The study of this function has a great interest, particularly when the particular event measures the occurrence of an earthquake in a certain area of study (Rice and Rosenblatt, 1976), because the hazard function performs the risk of occurrence of a new earthquake at time x. The estimation of the hazard function by means of nonparametric estimates has been quite important in the statistical literature in the recent years (see, e.g.