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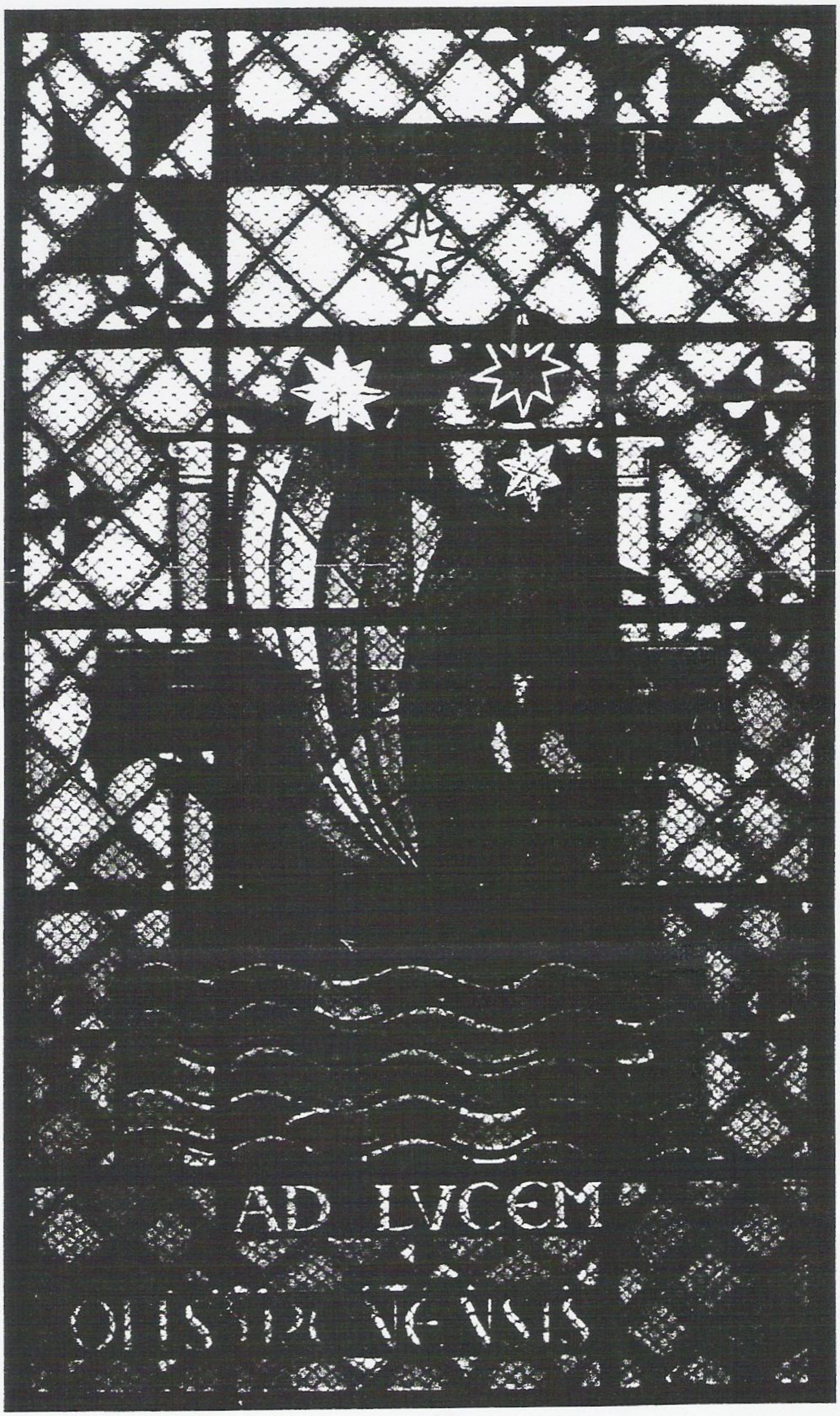

BOOK OF ABSTRACTS AND PAPERS

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ABSTRACT
In the paper, on example of one of the highly sensitive energy-active sites in the South Armenia, located at a distance of 1300km from the focus of the Izmit earthquake, along with pre-, co-, post-seismic anomalous daily dynamics of local geophysical and geochemical fields (ADF effect), three unique co-seismic ADF impulses shifted from each other in 1 hour 010 minutes (10 minutes measuring regulations) are shown in multiparameter data. Beside that, the first and the third co- seismic impulses are reversible, and the second one is irreversible. The data analysis shows, that the first reversible ADF impulse is related with reversible compression of energy-active point under the impact of the dynamic seismic wave propagation from the Izmit earthquake's source to the observation site. The second irreversible ADF impulse is related with irreversible compression of energy-active point under the impact of the Arabian plate's impulsive crush movement towards the Eurasian plate, probably after the earth's crust rupture in the Izmit area and the right lateral displacement offset of North-Anatolian fault. The third, relatively weak reversible ADF impulse is connected with comparably weak reversible extension of the energy-active point, under the impact of the weak reverse rebound of the Arabian plate, or under the influence of the weak reverse reconstruction of the energy-active point.
It is shown, that the energy-active point situated on a distance of 1300km from the focus of the Izmit earthquake reacted to all the main seismic and seismotectonic events, take place in the zone of the Arabian and Eurasian plates collision in the period of the Izmit earthquake.
The obtained results, on the base of which are the highly-precise multiparameter observations, acqure more evidence mostly thanks to the international program READINESS initiated and financed by GFZ, Germany under the leadership of Prof. Zschau.

SS-5 – 14 - O 12:45

THE ATHENS SEPTEMBER 1999 EARTHQUAKE

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On September 7, 1999 at 14:56 local time (11:56:51 GMT) a strong earthquake with magnitude Mw=5.9 occurred close to the city of Athens in Greece. The calculated epicentral coordinates of the earthquake were 38.059°N, 23.571°E and its focal depth, h~5 km. The fault plane solution proposed by Harvard University (φ = 114°, δ = 45°, λ = -73°) indicate WNW-ESE trending, almost a south-dipping normal fault.
More than 40 buildings collapsed, 143 deaths were reported while hundreds of injuries were attributed to the earthquake. The area affected by the mainshock belongs to zone II of the New Greek seismic code with an effective acceleration, ag=0.16g. The most serious damage caused by the earthquake was observed at the northern suburbs of Athens (Ano Liosia, Menidi, Metamorphosi, Thracomakedones etc.) that fall close to the epicentral area. The mean macroseismic intensity for the suburbs of Ano Liosia, Menidi, Thrakomacedones and at the industrial area of Chelidonou, was estimated to VIII degrees (in the Modified Mercalli scale). However, isolated areas with higher intensities up to IX+ were also observed. Significant attenuation of macroseismic intensity towards south was observed in the area of Halandri -Kipseli where the Modified Mercalli intensity reduces to about VI degrees. A few collapses of buildings were also observed at the suburbs of Nea Philadelpheia, Nea Erythrea and Metamorfosi, while in some cases damage was also observed on buildings, which suffered minor damage due to the February 1981, Corinthos earthquake.
The dominant construction systems in these suburbs are reinforced concrete frames and one or two-storey buildings with masonry walls. Most of the buildings were built according to the old code with seismic coefficient equal to 0.04, 0.06 and 0.08 for firm, medium and soft soils, respectively (Seismic zone I).
The Institute of Engineering Seismology and Earthquake Engineering (ITSAK) had installed long before the earthquake three analog accelerographs in the city of Athens, which recorded the mainshock. Moreover, within a few hours an additional network consisted of digital accelerographs as well as a mobile multi-channel recording unit on a public building were installed. A preliminary damage investigation was also carried out in the strongly affected area. The largest peak horizontal ground acceleration (PHGA) recorded at the ATH03 station, was 0.30g and appeared at a period of 0.25sec. The bracketed duration, for acceleration level ≥0.05g, was 5.5sec. The PHGA at the other two stations, ATH02 and ATH04, was 0.16g and 0.12g, respectively. The highest PHGA of the strongest aftershock was recorded at station ATH03 and was 0.05g. Considering that at a distance of about 15km the observed peak ground acceleration was around 0.30g and using attenuation relation of PHGA proposed for Greece, a normalized epicentral (R≈5km) peak ground acceleration of the order of 0.60g may be predicted.

SS-5 – 15 - O 14:30

THE SEPTEMBER 7, 1999, PARNITHA EARTHQUAKE: MACROSEISMIC OBSERVATIONS

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The September 7, 1999 MS=5.9 Parnitha earthquake caused considerable and extended damage to a large number of suburbs, lying mainly NW of Athens. The affected structures were mainly residences of low-to-medium quality and some industrial buildings, which partly collapsed and resulted in death toll. Immediately after the earthquake, our team organised special field trips concentrating in the evaluation of the building stock of the meizoseismal area, as well as of the damage, taking into account the guidelines and requirements of the European Macroseismic Scale 1998. Thus, representative photographic documentation of buildings and damage, video filming and questionnaire forms were collected from the several suburbs affected. Questionnaire forms were also collected from outside the meizoseismal area. The available information aims at the creation of a database of building types and damage grades due to the earthquake, for future use. This also allows for identifying the most common structural characteristics in the area and for a realistic assessment of macroseismic intensity according to EMS98. Maximum intensity reached 9 at sites, but the macroseismic field was not extensive. In this paper, the results of the survey at all the buildings in Ano Liossia, as well as selected cases from 5 nearby municipalities are presented, in order to demonstrate the earthquake resistant design and vulnerability classes of the buildings in the meizoseismal area, as well as the damage due to the earthquake, in comparison to the post-earthquake inspections carried out by the relevant authorities.

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THE CATASTROPHIC EARTHQUAKE OF 7 SEPTEMBER 1999 IN ATHENS, GREECE

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The earthquake that hit the area of Athens, Greece, on 7 September, 1999 has been the first moderate-to-strong shock (Ms = 5.9) ever reported to have occurred at such a small epicentral distance (D≈18 km) from the historical center of the city and the first shock in the long history of Athens to cause casualties within its urban area. Its meizoseismal area with intensities of up to IX degree (MM) was located very close to the Fili neotectonic fault in the hanging-wall domain, where peak ground accelerations of at least 0.31g were recorded. The geometry of the aftershock zone along with the focal mechanism of the mainshock indicate that the earthquake was associated with a WNW-ESE trending and SSW dipping seismogenic structure, the topographic expression of which, possibly, is the neotectonic fault of Fili, striking N110o-130o and dipping 60o-85o SW. The mainshock was relocated at a depth of 16.8 km at a distance of about 15 km to the SW from the surface trace of the Fili fault. The foreshock locations imply that the earthquake sequence started in the western part of the activated zone. The mainshock rupture occurred in the deep central part of the aftershock zone and the activity continued at shallower levels mainly at the eastern part of the zone. This implies directivity of the mainshock rupture from SW to NE and upwards, which explains in part the heavy damage observed on the central and eastern sides of the activated zone. However, local ground conditions certainly contributed to the high ground accelerations and damage observed. The b-value of 1.13 found for the aftershock sequence and the magnitude difference of M0 - M1 = 1.0 between the mainshock and its largest aftershock are typical for Greek shallow earthquakes. The Athens earthquake was rather unexpected in the sense that the particular seismogenic structure on which the earthquake apparently occurred was not considered at all to have a seismic potential beforehand.

SS-5 – 17 - O 15:00

SOURCE PARAMETERS DETERMINATION OF THE SEPTEMBER 7, 1999 ATHENS

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ABSTRACT

On 7 September 1999, an earthquake of magnitude Ms = 5.9 occurred in the Aspropirgos basin located close to the city of Athens, the capital of Greece. Since no important earthquakes were reported during the last centuries, this event was the strongest that occurred in a region of low seismic activity. Although the earthquake magnitude was moderate, extensive damage was caused. There were 143 killed people, a great number of wounded and several thousands of people became homeless. Consequently it may be considered as one of the most disastrous earthquakes that occurred in Greece during the last centuries. The source parameters of the mainshock were determined by body wave modeling using teleseismic recordings of the FDSN global network. The relocation of the mainshock and the study of the rupture process were performed using data of the Cornet local permanent network. The relocated epicenter of the mainshock is determined at 38.105°N, 23.565°E, about 20 km northwest of the city of Athens. Four foreshocks that occurred during the last twenty minutes before the mainshock were also relocated close to its epicenter. The fault plane solution of the main shock is strike=105°, dip=55° and rake=-80° and represents almost pure north-south extension, the depth is constrained to 8 km and the seismic moment to Mo=1.7 1025 dyn cm. No surface breaks were observed but the fault plane solution is in agreement with the tectonics of the area and with the focal mechanisms constrained by aftershocks. The estimated dimensions of the fault are 15 km length and 10 km width. The relocated hypocenter of the mainshock lies on the deep western edge of the fault plane. The rupture lasted 4 to 5 sec, propagating eastward on the fault, towards the city of Athens. An evident stop phase was observed that was interpreted as a barrier caused by the Aegaleo Mountain.

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