ISOSEISMALS OF SELECTED EVENTS OF CENTRAL GREECE AND EARTHQUAKE HAZARD ASSESSMENT IN RELATION TO GEOLOGICAL AND TECTONIC STRUCTURES

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Greek-Czech Bilateral Cooperation on Science and Technology (2000-2001)
"APPLICATION AND RELIABILITY OF DIFFERENT SEISMIC HAZARD MODELS – USE AND UPDATE OF STRONG MOTION DATA"

Program for the Support of the Target Research and Development, the Academy of Sciences of the Czech Republic, No. S 3012007 (2000-2004)
"GEOPHYSICAL OBSERVATIONS AND PREDICTIONS OF GEOPHYSICAL FIELDS FOR USERS"

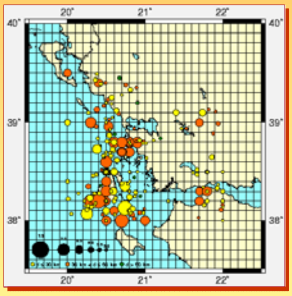
Project of the Grant Agency of the Academy of Sciences, the Czech Republic, No. A 2071002/046/00 (2000-2002)
"METHODS OF DESCRIPTION OF SEISMIC EXCITATIONS WITH REGARDS TO THE ASSESSMENT OF RISK OF DAMAGES OF MECHANICAL SYSTEMS"

Abstract: The macroseismic data of 17 earthquakes, that occurred in the territory of Central and Western Greece in the period 1973-2001, for which strong motion records are available, were analyzed. It was developed an approach which allowed for every individual earthquake, slightly smoothed isoseismal map to be automatically drawn, local differences (residuals) between the smoothed map and original macroseismic observations to be identified and attenuation laws to be determined.

Relations between residuals of macroseismic intensities and local geologic cover were assessed and discussed to define corrections of geological effects to the observed macroseismic data. To this purpose the geological map for Greece on the scale 1:500 000 and the geological map for Cephalonia on the scale 1:50 000 were vectorized. Using 1-D algorithm transfer functions for layers of different thickness and velocities of P and S waves were calculated.

The corrections of the macroseismic intensity defined with respect to the physical properties of sedimentary covers (V_P, V_S and bulk density) were introduced into the probabilistic earthquake hazard assessment of selected part of Western Greece.

EPICENTRES AND MACROSEISMIC OBSERVATIONS



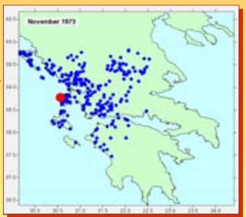
List of earthquakes that data were processed:

1973 November 4
1981 March 10
1985 August 31
1988 April 24
1988 May 18
1988 May 22
1988 December 22
1989 August 31
1992 May 30
1993 July 14
1993 November 4
1994 February 25
1994 November 29
1994 December 1

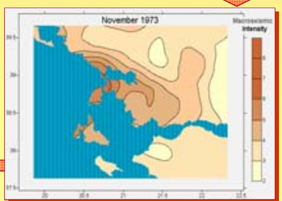
1995 May 15
1999 September 7
2001 July 26

EXAMPLE
EQ November 1973

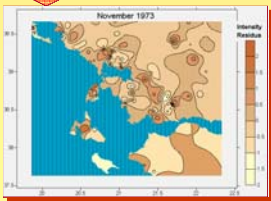
MACROSEISMIC OBSERVATIONS



ISOSEISMAL MAP



MACROSEISMIC RESIDUA



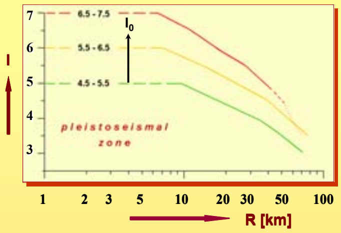
GEOLOGICAL MAP

MACROSEISMIC ATTENUATION

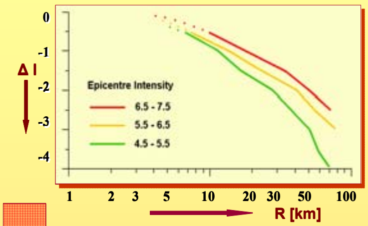
$$I_0 = I + \Delta I$$

Decrease of Intensity I

approx. $I = I_0 + 2.13 - 1.06 \ln R$, where $R \geq R_E$

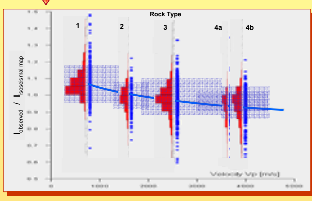


Decrease of Δ I

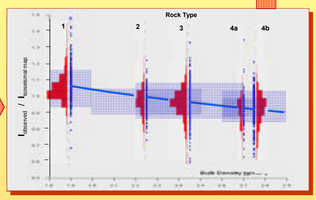


INFLUENCE OF LOCAL GEOLOGY TO MACROSEISMIC INTENSITY

Type	V_p [m/sec]	Bulk Density [g/cm³]	Rock Type	Surficial Water Table	Thickness	Intensity Increase [%]
1	300 – 1400	1.8 – 2.0	Sands, clays, pebbles – alluvial-eluvial-fluvial materials, cones, dunes, volcanic aggromerates	no	a few to tens metres, locally exceeded 100m	8
2	1300 – 2000	2.0 – 2.5	Sands, clays, loams, loose Terra-rossa, clays, grits, pebbles Pumice, ash, tuffs	yes no no	up to 60 m around 20 m 20 – 60 m	3
3	1800 – 3500	2.2 – 2.7	Marles, limestones, sandstones, clays, sands, conglomerates Shales, siltstones, sandstones, conglomerates, limestones Marly limestones, breccio-conglomerates	no	a few tens metres 100 – 1500 m 1000 – 2000 m	–
4a	3000 – 4500	2.6 – 2.7	Limestones schist-sandstones Schist-cherts, schists-sandstones		up to 1000 m up to 400 m	- 5
4b	3500 – 4500	2.6 – 2.9	Limestones, dolomites, chert and schist		more then 1000 m	- 8
5	4300 – 6000	2.5 – 2.96	Plutonic and volcanic rocks, crystalline schists, gneiss, amphibolites		over 100 m	~ 10 ÷ 12
6	5900 – 8600	2.8 – 3.33	Basic and ultra-basic igneous rocks			



$$I_{observed} / I_{isoseismal\ map} = 1.623 - 0.083 \log V_P$$

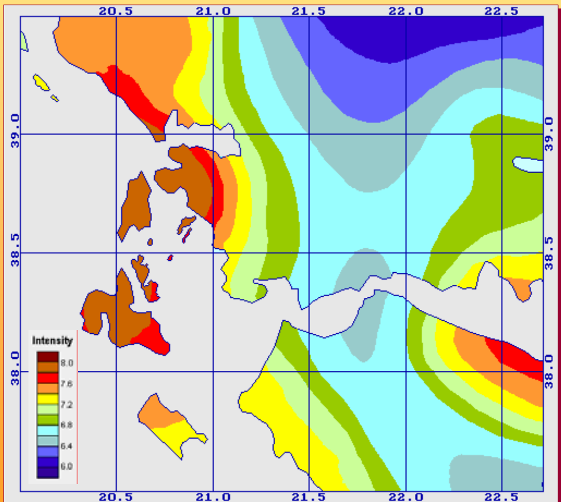


$$I_{observed} / I_{isoseismal\ map} = 1.303 - 0.372 \log Bulk_{Density}$$

EARTHQUAKE HAZARD ASSESSMENT

for the return period of 475 years

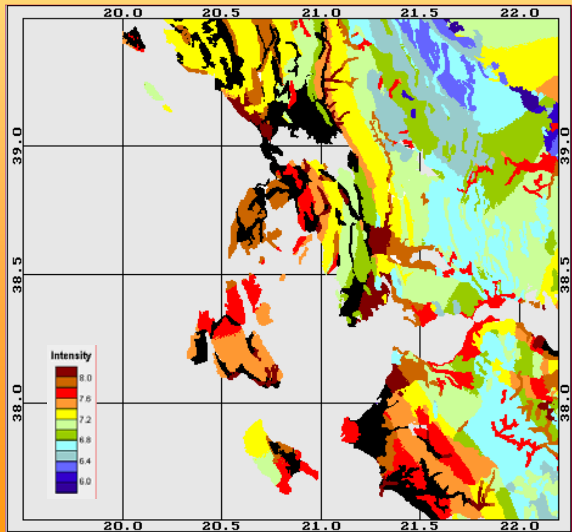
(a standard approach)



EARTHQUAKE HAZARD ASSESSMENT

for the return period of 475 years

(the standard approach extended for local geology effects)



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