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How long time will we go with so many uncertainties in evaluation of hazard and seismic risk ?

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The core methods behind probabilistic seismic hazard analysis (PSHA) were first formalized by Cornell in 1968.Since that time, two methods are commonly used: PSHA and deterministic seismic hazard analysis (DSHA). Regions far from the edges of tectonic plates present some of the most difficult conditions for PSHA. The values of the maximum earthquake magnitudes that will ever happen on faults are some of the least defensible elements of PSHA. What is wrong with traditional PSHA or DSHA? PSHA is using four assumptions developed by Cornell in 1968:(i)-Constant-in-time average occurrence rate of earthquakes; (ii)-Single point source; (iii)-Variability of ground motion at a site is independent;(4)-Poisson(or "memory - less") behavior of earthquake occurrences. All of them are probabilistic methods and „when the causality dies, its place is taken by probability, term meant to define the inability of us to predict the course of nature" (Nils Bohr).More, PSHA was developed from mathematical statistics and is not based on earthquake science (invalid physical models- point source and Poisson distribution; invalid mathematics; misinterpretation of annual probability of exceeding or return period etc.) and become a pure numerical "creation" (Wang,PAGEOPH.168(2011),11–25). An uncertainty which is a key component for classic seismic hazard assessment is the ground motion attenuation relationship(GMPE). So far, no one is taking into consideration strong nonlinear behavior of soils during of strong earthquakes. Soils exhibit a strong nonlinear behaviour under cyclic loading conditions. How many cities, villages, metropolitan areas etc. in seismic regions are constructed on rock? Most of them are located on soil deposits? A soil is of basic type of sand or gravel (termed coarse soils), silt or clay (termed fine soils) etc. So far, almost all ground motion estimation techniques are depending only upon the definition of two parameters, earthquake magnitude and distance to epicenter. What is happening when PGA's recorded by seismic stations are showing values larger than epicenter one. In all extra-Carpathian area to last strong Vrancea earthquakes (August 30, 1986; MW=7.1; h=130.4 km; May 30,1990; MW=6.9 ; h=90.9 km; May 31,1990; MW=6.4; h=86.9 km) there are many PGA records in Romanian and Republic of Moldavia seismic stations where many of them are larger than in epicenter Vrâncioaia seismic station. Consequently, classic seismic hazard analysis is not applicable at all to strong and deep Vrancea earthquakes. In more than 30 seismic stations from extra-Carpathian area (with large soil deposits etc.), recorded soil accelerations are larger than epicenter one instead of strong nonlinear behavior of soils from sites. For example: in epicenter Vrâncioaia: PGA=162.60 cm/s2 and at seismic station Focşani, PGA=297.10 cm/s2 on August 1986(MW=7.1 and h=130.4 km) etc. The amplification factors are strong nonlinear decreasing with increasing the magnitudes of deep strong Vrancea earthquakes and these values are far of that given by Regulatory Guide 1.60 of the U. S. Atomic Energy Commission and accepted also by IAEA Vienna. The authors are coming in using the variability of spectral amplification factors (SAF) with Vrancea magnitude as new method of real seismic hazard analysis.

Key words: Seismic Hazard analysis; Uncertainties; Nonlinear seismology; Spectral amplification factors (SAF), Nonlinear soil behaviour, Nonlinear Seismology.