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Development of Shakemap Methodologies for Europe

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For almost-real time estimation of the ground shaking after a major earthquake in the Euro-Mediterranean region the JRA-3 component of the EU Project entitled "Network of research Infrastructures for European Seismology, NERIES" foresees:

1. Finding of the most likely location of the source of the earthquake using regional seismotectonic data base, supported, if and when possible, by the estimation of fault rupture parameters from rapid inversion of data from on-line regional broadband stations.

2. Estimation of the spatial distribution of selected ground motion parameters at engineering bedrock through region specific ground motion attenuation relationships and/or actual physical simulation of ground motion.

3. Estimation of the spatial distribution of site-specific ground selected motion parameters using regional geology (or urban geotechnical information) data-base using appropriate amplification models.

4. Correlation/verifyication/enrichment of the estimated ground shaking information with the available on-line strong motion data.

These shakemaps maps will enable the first estimates of damage and casulaties, and consequently provide vital information within minutes after an earthquake to European emergency response agencies.

There are regional dependencies and multiple sources of uncertainty in such estimations stemming from empirical ground motion predictions, non-existent or sparse ground motion measurements, considerations involving fault finiteness and directivity, data interpolations and site modifications. The methodology used by USGS is not

directly transportable, due to a region specific characteristics of the empirical attenuation relationships and methods of modification of ground motion for the near-surface geology.

Together with researchers from Imperial College, NORSAR and ETH-Zurich, we are developing and testing algorithms for the preparation of shakemaps and the quantification of associated uncertainties.

In this connection we have estimated the distribution of EMS'98 intensities and assesed the associated uncertainties in the Marmara Region associated with the 1999 Kocaeli Earthquake

1. Through available strong motion data and using various intensity correlations with PGV, PGA, Fourier Amplitude Spectrum and Response Spectrum
2. Through use of local and regional one- and two-dimensional intensity attenuation relationships based on regression of regressions of intensity with the size of the earthquake, distance and site geology
3. Through synthetic simulation of strong ground motion and using various intensity correlations with PGV, PGA, Fourier Amplitude Spectrum and Response Spectrum

and critically compared these estimations with the observed intensity distributions.