



Estimating Earthquake Parameters Using Macroseismic Intensity Data: Application to Historical Events of the Aegean Area

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A method is proposed for the determination of the main earthquake parameters (location, magnitude, etc.) using macroseismic intensity data. We suggest a strategy based on the formulation proposed by Papazachos (1992) where the main energy source for each event can be represented by a point source and so the Kovesligethy relation can be used. The main modification of the aforementioned formulation compared to other approaches is that the isoseismals are assumed to have an elliptical shape, due to anisotropic radiation of the seismic energy at the source. In the present work we employ the use of a modified weight scheme, taking into account the distance of the observed intensities in order to balance the contribution of each intensity data class. In order to apply the method to real data we used the approach on several catalogs of synthetic intensity data and we performed a large number of tests using different data sets and by applying both the point source theory and the elliptical isoseismal approach. The main conclusion of these tests is that the most important factor for the calculation of the parameters is the number of the intensity data. For the estimation of the earthquake location, we have applied the method in recent events where instrumental data are also available for comparison. For this reason, we have defined a search area around the catalog epicenter of 10×10 and used intensity data to calculate the root mean square error of the two models proposed (isotropic and elliptical), as well as the macroseismic magnitude and the epicentral intensity, the depth, the ellipticity and the azimuth of the major axis of the elliptical isoseismals. The epicenter adopted is

the one with the minimum value of the root mean square error. The method is also applied also to historical events of the Aegean area in order to generate a new updated historical earthquake catalog.