Calibrating the Bakun-Wentworth’s Method for the Macroseismic Estimation of Earthquake Parameters in Italy

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We present the results of a calibration analysis performed on Italian seismicity datasets of the approach proposed by Bakun and Wentworth (1997) to bound earthquakes epicentral area and magnitude from macroseismic data only. The calibration is required as the method derives an intensity magnitude (equal in the mean to moment magnitude Mw) from macroseismic observations by using a regionally suitable attenuation relationship of intensity as a function of Mw and source distance. To this purpose, a training set of earthquakes occurred in Italy since 1980 was selected, for which a large number of intensity observations and reliable instrumental determinations of Mw and epicentral location are available. Following the Bakun-Wentworth’s method, the distribution of intensity data with epicentral distance was analyzed for each one of the events considered and three different functional relations (linear, logarithmic and cubic dependence on distance) were calibrated. We also considered two better constrained (defined on a much larger dataset) intensity attenuation relationships recently proposed for Italy, originally derived as a function of epicentral intensity I0 and, thus, “converted” through an empirical I0-Mw relation. Performance of all the above relationships was then checked both on the training set and on an independent set of recent Italian earthquakes.

A Unified Earthquake Catalogue for Central Northern and Northwestern Europe – CENEC

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New databases motivate improvements and extensions of the catalogue by Grüntahl and Wahlström (2003) - G&W03 - of earthquakes in central, northern and northwestern Europe with Mw ≥ 3.50. Data from over 30 regional catalogues, the ISC and NEIC bulletins for the NE Atlantic Ocean, and many special studies were analysed, largely along the lines of the previous study. Non-tectonic, non-seismic and non-existing as well as duplicate events were identified and removed according to our current stage of knowledge. If not given by the original source, the moment magnitude, Mw, was calculated for each event with a specified epicentral location and a given strength measure (i.e., an original magnitude of any type or, for onshore events only, an intensity). The calculations follow transformation relations derived in the present or in our previous study. The investigated area is subdivided into 22 polygons, in each of which one or more local catalogues, supplemented by data from special studies, are used. If more than one catalogue lists an event, one entry was selected according to a priority algorithm specific for each polygon. If the selected catalogue entry contains more than one strength type, one was selected for the Mw calculation according to another priority scheme. The final Catalogue, CENEC, is confined to the time period 1000-2004 and magnitudes Mw ≥ 3.50. This is an extension of the time period covered by G&W03 (1300-1993). The number of events has increased from about 5,000 to about 8,000. For each entry, available information on the date, time, location (including focal depth), intensity I0, magnitude Mw, and source (i.e., the local catalogue or special study) are given. The strength type and value from which Mw was calculated are also indicated. The Catalogue is available on the website of the GeoForschungsZentrum Potsdam.