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EMPIRICAL RELATIONS CONVERTING MP (MAGNITUDE USED IN BULGARIAN SEISMOLOGICAL NETWORK) TO mb, ML AND MW

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Magnitude is still the most directly measurable and useful source parameter of an earthquake. Magnitude is the source parameter most often used to specify the strength of an earthquake, based on records of local ground motion. This reflects the original concept of the magnitude scale-that earthquakes releasing the same amount of seismic energy should be assigned the same magnitude. Since Richter first introduced the concept of earthquake magnitude, a number of different magnitude scales have been developed - generally to overcome deficiencies of earlier scales. As each new scale has been developed, an attempt has been made to correlate it with other scales. However, these attempts can be only partially successful, as the various magnitude scales are empirical and are based on rather narrow samplings of the total radiated seismic energy, often at different ends of the frequency spectrum. Considering the central role that magnitude plays in seismology and the fact that a number of different magnitude scales exist, it is useful to know how the scales are interrelated and to understand regional differences that might affect the use of the same scale in different parts of the world.

Several magnitude scales are widely used and each is based on measuring of a specific type of seismic wave, in a specified frequency range, with a certain instrument. The scales commonly used in most of the countries are: local (or Richter) magnitude (M_L), body-wave magnitude (m_b for short period, m_B for long period), surface wave magnitude, M_S, and moment magnitude (M_w).

The broadband P-wave magnitude, Mp, used in Bulgarian seismological practice, is defined by the following equation:

$M_p = \log(A/T)_{max} + \sigma_{BB}(\Delta) + S$,

where $(A/T)_{max} = (V_{max}/2\pi)$, V_{max} is the real peak ground velocity in μm/s of P-phase on vertical-component seismogram, $\sigma_{BB}(\Delta)$ is the calibration function and S is the station magnitude correction.

In this study, an attempt is made to define empirical relations connecting M_p with the body wave magnitude, m_b, the local magnitude, M_L, and the moment magnitude, M_W. In order to accomplish this, a very large sample of data from international seismological sources (ISC, NEIC, USGS, EMSC, etc.) has been collected and processed. The empirical relations connecting magnitude scales that are developed would allow the creation of a homogeneous earthquake catalog, a useful tool for earthquake research.