

Homogenization of the moment magnitude estimates available in the French datasets and implications on ground motion model variability

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Abstract

Probabilistic seismic hazard assessment requires earthquake events characterized in terms of the moment magnitude (M_w) scale both in the earthquake catalogues and in the ground-motion databases. These magnitudes can be either estimated directly after an inversion of the moment tensor or can be deduced from other magnitude scales using a scale conversion formula. However, for the same event, even its moment tensor based M_w estimates provided by different agencies may differ due to differences in computation methods, inverted data or seismic networks – especially among small-moderate sized events. A few recent studies have shown that erroneous M_w estimates may bias the magnitude-scaling of ground-motion in GMMs, and that merging of inhomogenous M_w estimates leads to a larger ‘apparent’ between-event variability of the Ground-Motion Models [GMMs].

Various strategies have been adopted in the literature to define a unique, reference M_w for each event in earthquake catalogues and ground-motion databases. Some strategies follow a priority scheme to prefer an M_w source over another, e.g. the European-Mediterranean Earthquake Catalogue. While others prefer to correct the M_w estimates of each source for their systematic deviation relative to an M_w reference source, and then average the available M_w estimates for each event, e.g. the Italian Catalogue. In this study, we first attempt such homogenisation of M_w in the French RESIF-RAP dataset, and then assess its impact on GMMs’ between-event variability. Since in low-moderate seismicity regions of Europe,

small-moderate sized events significantly contribute to hazard estimates, it becomes critical that their M_w estimates are homogenised prior to development of regional seismic source models and GMMs. We present the progress towards such homogenisation of M_w in the French context.