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Estimation of Instrumental Macroseismic Intensity for Italy from Different Ground Motion Parameters using GMICEs and Naïve Gaussian Bayes Classifiers

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Instrumental Ground Motion Parameters (GMPs), which are estimated in near real-time, can be associated to Macroseismic Intensity (MI) to provide information on the average damage distribution after a seismic event. Resulting maps, displaying instrumental MI values over the struck region, can be useful for rapid organization of first assistance operations by civil defense forces. The aim of this work is the calibration of new relationships for instrumental MI estimation for Italy, based on an updated version of the national accelerometric catalogue enriched with recent high quality data and strong motion datasets. Since the damaging potential of an earthquake does not reside in the shaking amplitude alone, we test a set of eight parameters in order to also cover other seismic features, such as duration and frequency content. Selected parameters are Peak Ground Displacement (PGD), Velocity (PGV) and Acceleration (PGA), Arias and Housner intensities and Pseudo-Spectral Acceleration (PSA) at 0.3, 1.0 and 3.0 seconds. First, we derive empirical Ground Motion to Intensity Conversion Equations (GMICEs) for each of the selected parameters by using two different techniques: the Linear Least Squares regression and the Orthogonal Distance Regression. In order to push the current GMICEs representation towards a more realistic one that takes into consideration the discreteness of MI classes we also apply a different approach, the Naïve Gaussian Bayes Classifiers method, which associates a set of intensity values with different associated probabilities to each GMP value. Results obtained with each methodology are compared in terms of accuracy.