

Statistical Approaches for Assessing Recent Seismic Damage Data in Turkey

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Abstract

Three alternative statistical methods are presented for the estimation of potential seismic damage to residential reinforced concrete buildings in Turkey. These methods employ damage assessment data collected in the aftermath of some recent major earthquakes in Turkey. The first method, being entirely empirical, presents “best estimate” damage probability matrices for each seismic zone, which are developed by combining expert opinion on damage distribution and the damage statistics compiled from the recent earthquakes occurred in Turkey. Second method is based on a reliability-based model, where the earthquake force and seismic resistance are modeled as lognormally-distributed random variables. This semi-empirical model expresses potential seismic damage in the form of a damage rate distribution, which is a function of modified Mercalli intensity or peak ground acceleration. As the final methodology, discriminant analysis technique is utilized to perform a statistical evaluation of the damage data compiled during recent earthquakes that occurred in Turkey. These three methods are applied on the building damage databases compiled in the aftermath of several recent earthquakes in Turkey, namely: 1992 Erzincan, 1995 Dinar, and 1999 Düzce earthquakes. The stochastic damage profile obtained based on these three methods is expressed in terms of damage ratios and the resulting damage distributions are compared with each other.