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Updating Newmark Displacement Empirical Formula with Six Important Strong-Motion Data Set From Recent Major Earthquakes

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The use of Newmark displacement is an effective approach to measure the stability of a natural slope under shacking of an earthquake. The Newmarkąęs method helps to calculate the co-seismic relative cumulative displacement of a sliding block by integrating the acceleration time history data of a strong-motion record. It may also be estimated by applying an empirical equation, like the Jibsonąęs formula. This research employs strong-motion data of the 1999 Chi-Chi Earthquake, the 1999 Kocaeli Earthquake, the 1999 Duzce Earthquake, the 1994 Northridge Earthquake and the 1989 Loma prieta Earthquake to refine the relationship among critical acceleration (Ac) Arias Intensity (Ia), and Newmark displacement (Dn). The result revealed that Dn is just as expect to be proportional to Ia, when Ac is small. As Ac gets larger, the linearity becomes less. We also found that logDn is proportional to Ac, when Ia is large. As Ia goes small, the linearity becomes less. These features are common in the six set of data. Therefore, we add a third term in addition to the Jibsonąęs form to cover the abovementioned problem, and propose two new forms for the relationship among Ia, Ac and Dn. Two alternative forms were tested by using each of the data set from the six, and a final form was selected. Parameters for the selected form were regressed by using the total data set, and a final empirical formula is proposed.