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Taiwan Conditional Prediction Equation for Horizontal PGD for Crustal Sources

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A conditional ground-motion model (GMM) is developed for peak ground displacement (PGD) for Taiwan. The conditional GMM includes the observed pseudo-spectral acceleration (PSA(T)) as an input parameter in addition to magnitude and distance. The conditional PGD model can be combined with the traditional GMMs for PSA values to develop a GMM for PGD without the dependence on PSA. The main advantages of the conditional model approach are that it can be quickly developed, is easily understandable, can fully capture the magnitude, distance, and site scaling of the secondary parameters that are compatible with the design response spectral values, and also has much smaller aleatory variability than traditional GMMs. In this study, we use part of the database of Taiwan SSHAC Level 3 project (13691 strong-motion records from 158 crustal events occurred between 1992 and 2018 with $4.5 \leq M_w \leq 7.65$) to develop a new conditional scaling model for horizontal PGD consisted from the suite period of the PSA, rupture distance and moment magnitude. Furthermore, we combine this conditional model with each of two SSHAC Level 3 models and NGA-West2 ground-motion models for PSA(T) to derived new GMMs for the median and standard deviation of PGD. The results show that the new PGD GMMs include the more complex ground-motion scaling which capture from the GMMs of PSA, such as hanging-wall effects, sediment-depth effects, soil nonlinearity effects, and regionalization effects.