

ISNL-- an new parameter of soil nonlinearity used for Taiwan and New Zealand earthquake

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Previous studies indicated that nonlinear site response occurred when strong ground motion wave propagating through surface soft soil layers. This phenomenon can be identified from comparing site transfer functions (i.e. Horizontal to vertical spectral ratio method, HVSR, Wen et al., 2006) of strong ground motion against the reference weak motion.

Meanwhile, Noguchi and Sasatani (2008) constructed a quantitatively method to identify soil nonlinearity (Degree of nonlinearity, DNL) that was calculated from the summation of differences between HVSR of strong and weak motions. However, basic idea of DNL calculation might miss some hint from identification of de-amplification or amplification in high frequency band.

Therefore, this study attempts to build a new and improved nonlinearity method ISNL (Index of soil nonlinearity) to avoid the traditional DNL only considering the difference between HVSR of the strong and weak motions that it couldn't recognize dominant frequency drop and de-amplification of high frequency band correctly. Finally, in this study, comparison from traditional DNL and improved ISNL were checked with PGV/Vs30 (Strain proxy, Idriss, 2011) from 2016 Meinong, Taiwan; 2010 Jiaxian, Taiwan and 2018 Hualien, Taiwan earthquakes.

Finally, higher correlation between both DNL, ISNL against PGV/Vs30 proxy was resulting in 2018 Hualien earthquake comparing to 2016 Meinong as well as 2010 Jiaxian earthquakes. Moreover, ISNL behaved better linear correlations with PGV/Vs30 than DNL. Then, earthquake sequences in New Zealand will be also checked in this study to test the ability of newly constructed ISNL for application to worldwide regions.

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