

Brief technical note on pulse-like ground motion identification within the near-source set of the Engineering Strong-Motion database

The identification of pulse-like ground motions from within the near-source motion set compiled from the Engineering Strong Motion database (Luzy et al., 2016) employs the algorithms developed by Baker (2007) and by Shahi and Baker (2014). Both algorithms use a continuous wavelet transform of a single-component's velocity time history to assign a Pulse Indicator (PI) score and share a common definition of pulse period, namely the pseudo-period of the extracted wavelet that qualifies as a pulse. The algorithm in Baker (2007) is applied to all non-trivial horizontal orientations of each station's records and the PI score and lateness indicator are recorded without imposing any limits on peak ground velocity (PGV) as originally suggested by Baker. Furthermore, the result of the Shahi and Baker (2014) criterion is obtained and recorded for each pair of horizontal components. In a first stage, ground motions with a $PI > 0.85$ according to Baker (2007) that also exhibit $PGV > 20$ cm/s and/or trigger both criteria are flagged as pulse-like. In a second stage, all remaining ground motions that either trigger the Shahi and Baker (2014) criterion alone or exhibit a $PI > 0.50$ are pooled together. These motions are subjected to visual inspection of their velocity traces in the relevant orientations as well as of the azimuthal variation of their PI score. The pulse-like flag is also attributed to some of the ground motions in the second pool based on expert judgement. It should be noted that the pulse-like waveforms identified in this manner may be due to various effects such as rupture directivity, site response (geotechnical) effects and hanging wall or basin wave-entrapment effects; the pulse-like flag attributed to some of these ground motions is based on the characteristics of the signal and is not intended to distinguish among these causal effects.

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