Study on the backtracking factors of Arias Intensity based on the Ground-motion response spectrum and time-period envelope function parameters

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Arias intensity, as a parameter descripting ground motion amplitude and duration characteristics, has good correlation with earthquake damage such as landslide and sand soil liquefaction. The study on the relationship between the Arias Intensity and the ground-motion response spectrum has important application value in the rapid assessment of earthquake disaster, seismic landslide hazard analysis and so on.
Our previous research found it was difficult to backtrack or reproduce Arias Intensity by using only response spectrum through artificial ground-motion. *Ts*, a critical parameter of the envelope function, defined as the duration of stationary portion of an earthquake record, was found to have great influence on the backtracking results of the artificial Arias Intensity. However, *Ts* could vary a lot due to different rules of definition. Thus, one proper definition of *Ts* is needed to meet the demand for backtracking of Arias Intensity.
In this paper, a set of strong ground-motion records chosen from U.S. PEER NGA database were used as the basic data. The corresponding response spectrum (5% damping ratio) and Arias Intensity was calculated. *Ts* for each record were calculated using several frequently-used definitions. Artificial ground-motion acceleration time periods were generated and were used to reproduce artificial Arias Intensity.
The statistical difference between real values of Arias Intensity and artificial ones were identified. The proper *Ts* was defined as the one that minimizes the difference between the statistical mean of artificial Arias Intensity and the real values. Additional tests showed that backtracking of Arias Intensity could be improved in a statistical sense by using both the response spectrum and proper *Ts* parameter.

Keywords: Arias Intensity, Strong ground-motion, Response spectrum

