# AN EARTHQUAKE INTENSITY SCALE BASED ON STABLE DYNAMIC RESPONSE PARAMETERS

by

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Attention is focused on replacement of peak ground acceleration as a normalizing parameter in response spectra by physical parameters of response that are a function of period and damping such as RMS, potential energy and duration.

A set of 45 earthquakes is considered in the study. For each record, the response time history (absolute acceleration and relative displacement) of a damped linear single degree of freedom system is computed for 60 periods.

For each response a probability distribution is fitted to the variation in height of peaks of accelerations. Both Gamma and Exponential distributions provide good fits.

The following quantities are obtained from the response histories:

- -RMS of response.
- -10% probability of acceleration exceedence.
- -$RMS_{resp}/RMS_{input}$
- -Number of crossovers in response.
- -$Duration_{resp}/Duration_{input}$
- -Cumulative potential energy.
- -Mean potential energy per peak.

The following remarks can be made:

- The RMS and 10% of exceedence (which are not independent quantities: $RMS/A_{10}$ = constant), even though they are somewhat erratic, are more stable than the Acceleration Response Spectrum.
- The duration and the number of crossovers (two dependent quantities) behave consistently with respect to the input and the period considered.
- From the potential energy one can develop an acceleration design spectrum for an earthquake of given duration. It has to be modified as the expected duration varies.
- Compared to the acceleration response spectrum, the design spectrum shows consistently a major decrease for short range periods ($T \leq 0.8$ sec), the peak at periods between 1.0 and 1.5 sec and a second smaller peak at periods between 1.5 and 3.0 sec.

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