

## EFFICIENCY ASSESSMENT OF SCALAR INTENSITY MEASURES IN PREDICTING ENGINEERING DEMAND PARAMETERS

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### ABSTRACT

How to select strong ground motion records (SGMRs) as the input of the Nonlinear Time History Analysis (NLTHA) is an important challenge because of its significant influence on the response analysis. In the probabilistic based earthquake engineering, the seismic demand will be most valuable, if the dispersion around the mean is reduced, so finding methods to selection and/or scaling of the SGMRs which can reduce the response dispersion is very important. Strong ground motion intensity measures (IMs) are important parameters which can play an important role in the selection and scaling of SGMRs. The main purpose of this paper is to show how the application of different IMs affects the results of nonlinear time history analysis. For this purpose, a 3-story 3-D steel moment frame subjected to a set of 66 SGMRs. The results illustrate that, the sensitivity of the results of NLTHA to the selected IMs are significantly different, So use of the appropriate parameters in the selection and scaling procedure can reduce the dispersion of NLTHA.

### INTRODUCTION

The use of Non-Linear Dynamic Analyses ensues significant uncertainties on the seismic demand, especially when real SGMRs are used. Porter et al. (2002) showed that among all sources of uncertainty such as; material properties, design assumptions and earthquake-induced ground motion the latter seems to be the most unpredictable and variable. Due to the unpredictable nature of earthquake ground motions, to achieve a reliable result, we should either use a large set of recorded ground motions, which can be time consuming, or find a new method to achieve the results with the same level of reliability, but with reduced number of records. Several methods have been proposed to select and scale records using one or more IMs, since SGMR intensity measures (IMs) are significant parameters affecting the results of nonlinear time history analysis.

Shome et al. (1998a) showed that halving the dispersion in ground-motion intensities decreases the necessary number of NLTHA by a factor of 4 keeping the same level of dispersion in estimated engineering