

# **Analysis of Nonlinear Site Response using the LSST Downhole Accelerometer Array Data and Miyagi-Oki Earthquakes Data**

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## **Abstract**

The nonlinear ground response during large earthquakes is a controversial subject between seismologist and geotechnical engineers. Seismologist often suppose the propagating waves as a linear elastic behavior when earthquake occurs. In this study both linear and nonlinear behaviors of soil deposits were evaluated by strong and weak motion data at the Large Scale Seismic Test (LSST) array in Lotung, Taiwan. Records of 13 earthquakes are used. One-dimensional equivalent-linear and nonlinear method are used to evaluate the responses. The synthetic records are compared with the actual records at corresponding depth. The linear, equivalent-linear, and nonlinear model are used in this study. For small input motions, the synthetic records obtained from a linear model match well with the actual records, but the result obtained from a nonlinear model match poorly. The synthetic records using both the nonlinear model and equivalent-linear model are in good agreement with the actual records for large input motions. The dominant frequencies shift toward lower values when input motions become large. The observed records at the LSST site manifest nonlinearity of soil response.

Nonlinear site response also was estimated by comparing site response from the 16 August 2002 ( $M_j = 7.2$ ) and 26 May 2003 ( $M_j = 7.0$ ) Miyagi-Oki earthquakes. These earthquakes were recorded by the KiK-net and K-NET stations. Site response is solved by a spectral inversion technique to separate source, path, and site components. Comparing site response with input ground motion level, the predominant frequency and the site response values tend to decrease as the level of input ground motion increases.

*Keywords* : LSST, Equivalent-linear, Nonlinear site response, 2003 and 2005 Miyagi-Oki earthquakes

## **References**

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