Real-Time Continuous Response Spectra Exceedance Calculation

Frank Vernon (1), Danny Harvey (2), Kent Lindquist (3), and Mathias Franke (4)

(1) IGPP, UCSD, La Jolla, CA, USA (flvernon@ucsd.edu), (2) BRTT, Boulder, CO, USA (danny@brtt.com), (3) BRTT, Boulder, CO, USA (kent@brtt.com), (4) KMI, Pasadena, CA, USA (mathias.franke@kmi.com)

A novel approach is presented for near real-time earthquake alarms for critical structures at distributed locations using real-time estimation of response spectra obtained from near free-field motions. Influential studies dating back to the 1980s identified spectral response acceleration as a key ground motion characteristic that correlates well with observed damage in structures. Thus, monitoring and reporting on exceedance of spectra-based thresholds are useful tools for assessing the potential for damage to facilities or multi-structure campuses based on input ground motions only. With as little as one strong-motion station per site, this scalable approach can provide rapid alarms on the damage status of remote towns, critical infrastructure (e.g., hospitals, schools) and points of interests (e.g., bridges) for a very large number of locations enabling better rapid decision making during critical and difficult immediate post-earthquake response actions. Real-time calculation of PSA exceedance and alarm dissemination are enabled with Bighorn, a module included in the Antelope software package that combines real-time spectral monitoring and alarm capabilities with a robust built-in web display server. Examples of response spectra from several M$\sim$5 events recorded by the ANZA seismic network in southern California will be presented.