Investigating Basin Amplification Factors for Shaking in the Reno, Nevada Region for Local and Regional Events

M. Dunn[1], J. Louie[1], K. D. Smith[1], E. Eckert[1], S. Dickenson[2]
1 University of Nevada, Reno
2 New Albion Geotechnical, Inc., Reno, Nevada

IRIS 2018 Poster Abstract

The impacts of seismic shaking on urban basins have been in the news again this past year. Construction projects for tall buildings have been delayed out of concerns that current design standards may not sufficiently account for the shaking amplification that occurs in geologic basins. Building codes in Nevada pertaining to seismic hazard use the USGS National Seismic Hazard Mapping Program (NSHMP), which does not include site or basin amplification factors. The NGA-West2 ground motion prediction equation (GMPE) incorporates basin amplification factors homogeneously in one dimension, based on minimum depths to certain shear-velocity values (e.g., Z1.0, Z2.5) and on the geotechnical average velocity to 30 m depth (Vs30). We investigate whether such GMPEs may adequately predict amplifications recorded in the Reno-area urban basin of western Nevada. Several years of locally and NEHRP-sponsored deep ReMi surveys with 30 to 90 vertical 4.5 Hz geophones in arrays 3 km to 22 km long have made the Reno-area basin unique in its shear-velocity characterization to basement at up to 1 km depth. We are quantifying and comparing basin amplification factors recorded from a series of local and regional events in and around the Reno-area basin. The focus of our current analysis lies in the variation of amplification factor with spatially distributed source locations relative to the Reno-area urban basin. Broadband records we are examining include the: 2008 Mogul sequence; 2015 M4.3 Thomas Creek; and three 2016 M~5.5 Nine Mile Ranch events. Initial investigation is into peak ground velocity (PGV) ratios of basin over bedrock stations; leading to including other measures of shaking intensity such as H/V spectra and duration. We have generated 3D physics-based SW4 synthetic seismograms for these events that partially account for basin effects at low frequencies of shaking (<1.0 Hz), and we can examine how well the synthetic PGV ratios predict the recorded ratios. Using the computational models, we can perform sensitivity testing on the model through varying Vs30, basin shear velocity profiles, and incorporating deep volcanic sub-basins.