MEASUREMENTS AND PREDICTIONS OF VS30, Z1.0, AND Z2.5 IN NEVADA

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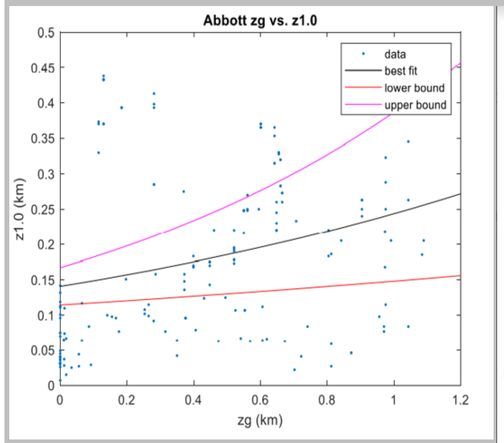
Introduction

- The Nevada Seismological Laboratory has posted a public database of Vs30, Z1.0, and Z2.5 values derived from Refraction Microtremor (ReMi) surveys.
- These values provide a basis for estimating basin effects on earthquake shaking throughout Nevada and Eastern California using current Ground Motion Models (GMMs).
- Comparing the Vs30 and Z-values to gravity-derived basin depths (Zg) correlates the depths and allows development of a practical approach for estimating Z1.0 and Z2.5 using ReMi or gravity data.

Methods

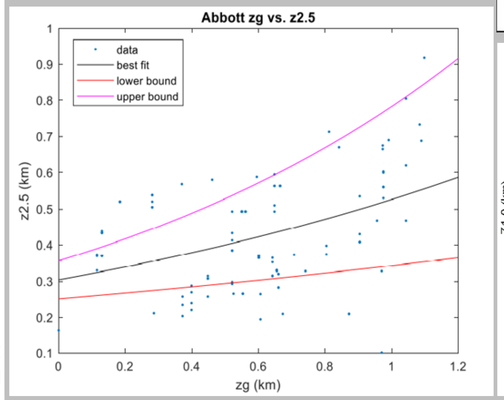
- Only surveys whose seismic shear velocities reached at least 80% of 1.0 or 2.5 km/s and were within 0.5 km of a gravity measurement were considered.
- Z1.0 and Z2.5 were plotted with their corresponding gravity derived basin depth, Zg, from local surveys in the Reno-area and Las Vegas basins.[1][3]
- An exponential model fit the data best for both Z1.0 and Z2.5.
- The equations were applied to all of Nevada using a broader gravity survey that covered the entire Basin and Range area.[2]

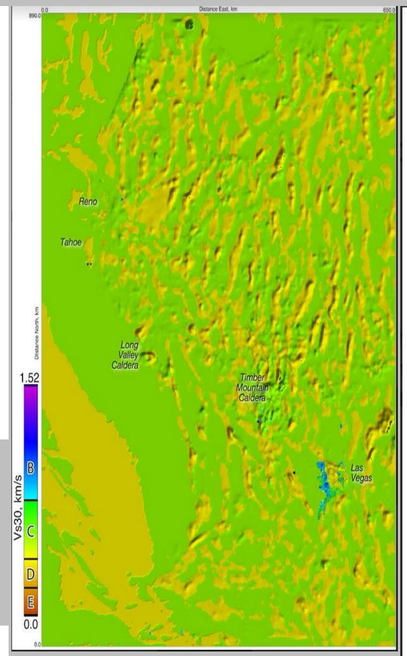
Results

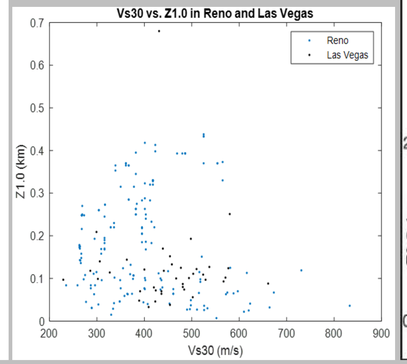


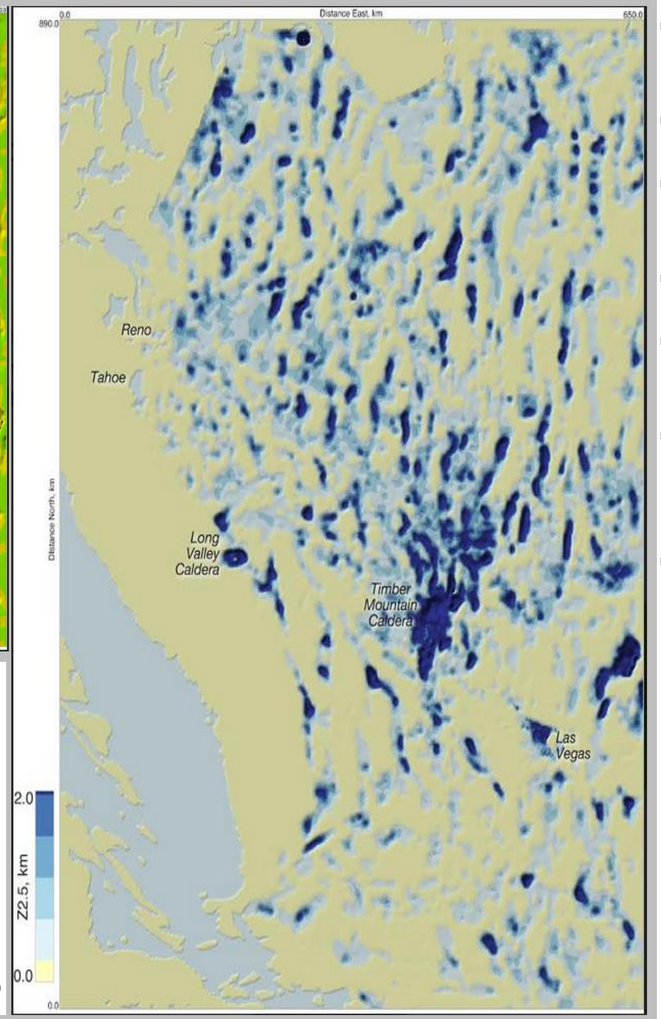
$$Z_{1.0} = 0.1408e^{0.5484Z_g}$$

$$Z_{2.5} = 0.3042e^{0.5478Z_g}$$









Conclusions

- The ReMi database provides a useful set of Vs30 measurements across Nevada and parts of California, in one place.
- Using it we were able to make a map of Vs30 and site classifications throughout Nevada.
- The Z1.0 model used for all of Nevada did not fit the Las Vegas data, so Z1.0 was only predicted for the Reno-basin area.
- Z2.5 can be used for the entire state of Nevada, with a reasonable margin of error.
- Gravity surveys are easier to conduct than ReMi surveys, and gravity datasets on a national scale are much more prevalent.
- While site specific geotechnical investigations are needed to characterize Z1.0 and Z2.5 properly, greater hazard uncertainty raises hazard levels.
- This approach can provide useful regional assessments of hazard, and find areas where hazard may be higher, thus warranting more investigation.

References

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2. Saltus, R. W., and R. C. Jachens (1995). *Gravity and basin-depth maps of the Basin and Range Province, Western United States*, U.S. Geological Survey, Geophysical Investigations Map, Report: GP-1012, 1 *sheet.*
3. *Abbott, R. E., and J. N. Louie (2000). Depth to bedrock using gravimetry in the Reno and Carson City, Nevada area basins, Geophysics, 65, 340-350.*

Acknowledgements

Research partially supported by the USGS, Department of the Interior, under award numbers 03HQGR0068, 05HQGR0078, 07HQGR0029, 08HQGR0015, 08HQGR0046, G09AP00050, G09AP00051, G10AP00002, G16AP00109, and G19AP00082 to Louie; and G11AP20022, G12AP20026, G14AP00020, and G15AP00055 to Optim. Many thanks to Steve Dickenson of New Albion, and to Bill Stephenson and Alan Yong of the USGS.