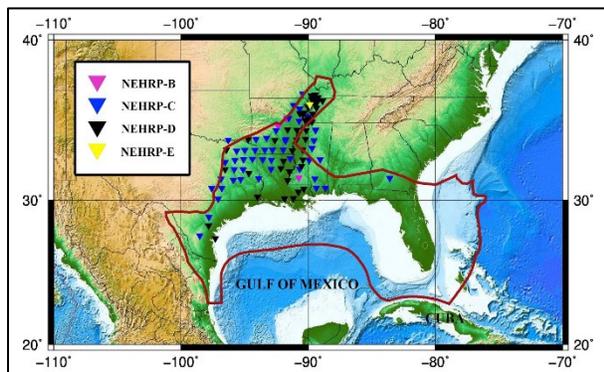




Research Summary

The Estimation of Seismic Parameters for Updating Ground Motion Models for Central and Eastern United States



WHAT WAS THE RESEARCH NEED?

The purpose of the project was to develop a ground motion model appropriate for West Tennessee. An updated ground motion model will provide accurate hazard maps for West Tennessee, which will result in a safer seismic design of bridges that will be built.

Project Number:

RES2020-25

TDOT Lead Staff:

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Principal

Investigator(s):

Dr. Shahram Pezeshk | PI
University of Memphis

Project Term:

August 2019 to February
2022

WHAT WERE THE RESEARCH OBJECTIVES?

The scope of the research project included:

- Performing a comprehensive literature search.
- Compiling earthquake ground motion data.
- Developing a new ground motion model using a hybrid empirical approach.
- Performing a final comparison between the newly developed model and current existing models.

WHAT WAS THE RESEARCH APPROACH?

The team used a genetic algorithm (GA) to determine the weighted geometric mean estimates of horizontal response-spectral acceleration from the empirical NGA-East ground-motion models to successfully estimate a consistent set of seismological parameters that can be used along with an equivalent point-source stochastic model to mimic the general scaling characteristics of these ground-motion models.

WHAT WERE THE FINDINGS?

This study developed or determined:

- Seismological parameters needed to update Ground Motion Models for Central and Eastern United States.
- Seismological parameters that are well correlated and most appropriate for use for the Central United States.
- A new model for vertical to horizontal response spectral ratios for Central and Eastern North America.
- A Ground-motion prediction model for small-to-moderate induced earthquakes for Central and Eastern United States.
- A Ground motion model for the Gulf Coast region of the United States, which includes part of West Tennessee.

IMPLEMENTATION AT TDOT

While this study does not provide TDOT engineers with that which can be immediately implemented, it provides a significant impact on updating seismic hazard maps that will be developed by the United States Geological Survey (USGS). American Associate of State Highway Transportation Officials (AASHTO) will use seismic hazard maps for the future seismic design specifications and, in turn, will be used by TDOT engineers to design bridges in Tennessee. In summary, this research will provide accurate and science-based results that will be used to improve seismic hazard maps employed for the seismic design of bridges in Tennessee.

MORE INFORMATION

Find the final report here: https://www.tn.gov/content/dam/tn/tdot/long-range-planning/research/final-reports/res2020-final-reports/RES2020-25_Final_Report_Approved.pdf.