Quantifying Seismic Hazard and Providing Realistic Ground Motions for Engineering Applications Primarily in the Eastern United States

by Klaus Jacob

Abstract

NCEER's research program on Seismic Hazard and Ground Motions is a comprehensive and systematic program to produce quantitative hazard estimates and ground motion predictions for engineering research and practical applications. In eight years, this program has successfully contributed to NCEER s goal of mitigating the risk from earthquakes in several innovative ways. One important contribution is the development of a fundamentally new way of collecting strong-motion data and redistributing these data to a diverse user community. A 33-station digital strong-motion network is operated, the data of which are retrieved remotely by computer and phone. It has greatly increased the number of strong-motion recordings in the eastern U.S. The NCEER and other, global strong-motion data are maintained in a relational digital data base called STRONGMO, from which users can query and retrieve data by computer or phone/modem from anywhere in the world. Another important contribution is a new eastern U S. earthquake catalog, NCEER-91, which has become an acknowledged standard for seismic hazard assessments in that region. A new method has been developed to predict ground motions based on a combination of geophysically constrained Earth models and stochastic models of wave propagation. NCEER's probabilistic seismic hazard mapping and site response studies have had a strong impact on acceptance and technical updating of national and local building codes. Realistic, hazard-consistent design ground motions that account for non-linear site response have been delivered for immediate engineering applications in seismic retrofit projects of large east-coast bridges. Ambient vibration measurement techniques that use modern, microprocessor-controlled seismic instrumentation have been developed and have revolutionized how the modes of large structures can be cost-effectively determined. The impact of this program is strongest in the U.S. east of the Rockies, but results have contributed to basic knowledge and data that effect engineering practice, code development and seismic mitigation measures nationally and internationally.

Collaboration

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