

Continental Intraplate Earthquakes: Science, Hazard, And Policy Issues

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The Geological Society of America
Special Paper 425
2007

Seismic hazard and risk assessment in the intraplate environment: The New Madrid seismic zone of the central United States

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ABSTRACT

Although the causes of large intraplate earthquakes are still not fully understood, they pose certain hazard and risk to societies. Estimating hazard and risk in these regions is difficult because of lack of earthquake records. The New Madrid seismic zone is one such region where large and rare intraplate earthquakes ($M \geq 7.0$ or greater) pose significant hazard and risk. Many different definitions of hazard and risk have been used, and the resulting estimates differ dramatically. In this paper, seismic hazard is defined as the natural phenomenon generated by earthquakes, such as ground motion, and is quantified by two parameters: a level of hazard and its occurrence frequency or mean recurrence interval; seismic risk is defined as the probability of occurrence of a specific level of seismic hazard over a certain time and is quantified by three parameters: probability, a level of hazard, and exposure time. Probabilistic seismic hazard analysis (PSHA), a commonly used method for estimating seismic hazard and risk, derives a relationship between a ground motion parameter and its return period (hazard curve). The return period is not an independent temporal parameter but a mathematical extrapolation of the recurrence interval of earthquakes and the uncertainty of ground motion. Therefore, it is difficult to understand and use PSHA. A new method is proposed and applied here for estimating seismic hazard in the New Madrid seismic zone. This method provides hazard estimates that are consistent with the state of our knowledge and can be easily applied to other intraplate regions.

Keywords: New Madrid seismic zone, seismic hazard, seismic risk, probabilistic seismic hazard analysis, seismic hazard assessment.

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Wang, Z., 2007, Seismic hazard and risk assessment in the intraplate environment: The New Madrid seismic zone of the central United States, in Stein, S., and Mazzotti, S., ed., Continental Intraplate Earthquakes: Science, Hazard, and Policy Issues, Geological Society of America Special Paper 425, p. 363–373, doi: 10.1130/SPE425-24. For permission to copy, contact editing@geosociety.org. ©2007 The Geological Society of America. All rights reserved.

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heavily on seismicity as. Continental Intraplate Earthquakes: Science, Hazard, and Policy Issues (Special Paper
(Geological Society of America) by Stein, Seth, Mazzotti, Stephane. DOI: /(01) In book: Special Paper Continental
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