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Seismic Hazard Evaluation for a Site near Cubatão, Serra do Mar, SE Brazil: Comparison with the Preliminary PSHA Map for Brazil

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Abstract

A Probabilistic Seismic Hazard Analysis was carried out for a site near Cubatão (SP), in the Serra do Mar ranges. The analysis involved 1) declustering the seismic catalog to remove precursors and aftershocks, using the Reasenberg (1985) method, 2) estimation of the limits of completeness of the final catalog, 3) proposal of three different models (scenarios) for the seismogenic zones, 4) estimation of the Gutenberg-Richter frequency-magnitude relation for each seismic zone, using the Weichert (1980) maximum likelihood method, 5) choice of three ground motion prediction equations (GMPE) typical of intraplate regions, for rock outcrop, 6) construction of a logical tree with nine branches (three scenarios of seismic zone models x 3 GMPEs), 7) calculation of the spectral acceleration levels corresponding to several return periods between 100 and 10,000 years. The R-CRISIS Ver. 18.4 program was used for this calculation. Seismotectonic studies in SE Brazil indicate that the Serra do Mar ranges have lower seismicity than both the continental shelf and souther Minas Gerais (Mantiqueira ranges). The possible seismic zone models, however, include the possibility of Cubatão being part of the more active seismic zone of the continental shelf. The peak ground acceleration (PGA) with probabilities of 10% and 2% exceedance in 50 years were estimated at 0.0079g and 0.026g, respectively. These values agree perfectly well with those calculated by Almeida et al. (2018) for Angra dos Reis, RJ, (0.0075g and 0.028g for the same probabilities of 10% and 2% in 50 years), a region very similar to Cubatão, in seismotectonic terms. However, the preliminary seismic hazard map presented by Assumpção et al. (2016) indicates for Cubatão values of 0.03g and 0.10g, respectively, four times higher than those obtained here. This could indicate that the preliminary seismic hazard map of Brazil (Assumpção et al., 2016) may be overestimating the hazard in regions of low seismicity.

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