Assessing Earthquake Hazard Map Performance Using Historical Shaking Intensity Data and Instrumental Data

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Assessing the performance of earthquake hazard maps is important but challenging, and various approaches can be taken. In principle, map performance can be assessed for any given observation period t years and map return period T, because the probability p that shaking will exceed the mapped value should be described by Poissonian probability $p = 1 - \exp(-t/T)$. However, because any real earthquake shaking history is one sample of many possible ones, a real history could easily deviate from this ideal behavior for t/T small, even if the hazard map is quite good. The observed shaking should be closer to ideal behavior for larger t/T. Hence the longer the observation period is compared to the map return period, the better the map's performance can be assessed. Given the short time period since hazard maps began to be made, typical maps with return periods of hundreds or thousands of years may be usefully assessed using historical intensity data. We are using such data for Italy and Japan, comparing historical intensity catalogs to national hazard maps.