SEISMIC RISK VARIATION ACCORDING TO SEQUENCES OF SEISMIC EVENTS

by
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ABSTRACT

Evolution of seismic intensity at a site due to events of a seismic cycle generated by a reological model of a seismically active area , is shown. Maximum ground velocity at the site is taken as a scale to measure the intensity. As a statistical law of the mean values of intensity, the expression $N = N_o / v^{\alpha}$ is adopted, where N is the annual frequence with which intensity v is equalled or exceeded.

REOLOGICAL MODEL

The reological model representing the seismically active area is made of three components in series : 1) a system of brittle failure-linear spring elements connected in parallel from whose failure result the seismic events , 2) a Kelvin system representing the deferred deformations, and 3) a linear spring simulating the surrounding volume rigidity.

Rigidities of the brittle failure-linear spring elements are constant and their failing deformations are distributed according to a log-normal statistical law. The energy set free by each element at its failure is a value of another log normal statistical distribution which is independent from that of the failing deformations.

SEQUENCE OF SEISMIC EVENTS

The rigidity of the surrounding volume governs the consecutive shots and the number of elements taking part. Exterior action is represented by a shift at constant velocity applied on the surrounding volume.

In an analyzed example with 500 brittle failure - linear spring elements and shift velocity of 50 mm/year, a seismic cycle of 550 years with the principal earthquake occurring at 521 years, is obtained. For the constant of the Gutenberg-Richter's Law results the value b = 1.17.

EVOLUTION OF INTENSITY

The focus of earthquakes are assumed to be located at distances from the site in agreement with a log-normal statistical law . The intensity is computed in terms of maximum ground velocity that is assumed to be function of the distance to the focus and of the earthquake magnitude.

In the numerical example mentioned above, a distance of 74 km. corresponds to the principal event of magnitude 7.5 . However , the greater intensity is produced by a less severe earthquake -magnitude 6.1 only-that occurred 113 years before the principal one and was located only 4 km. away.

The curve of mean values $N = N_o / v^{\alpha}$ is adjusted through minimum squares resulting for this example $\alpha = 2.61$. The sequence of obtained earthquakes allows the analysis of the variation of α according to the epoches in which it is considered.

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