SURFACE WAVE GENERATION BY CENTRAL UNITED STATES EARTHQUAKES

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DIGEST

Using the P wave first motions and the surface wave amplitude spectra of ten earthquakes in the central United States, the focal mechanism, focal depth and seismic moment were determined for each event. Normal faulting, reverse faulting and strike slip faulting on approximately vertical fault planes were all found to occur in the region containing the states of Illinois, Missouri, Kentucky, Arkansas, Tennessee, and Mississippi.

In order to understand the complexity of determining earthquake source characteristics, the theory of surface wave generation in a flat layered elastic halfspace was considered in detail. The effects of the choice of an earth model, focal depth, focal mechanism, anelastic attenuation, and rupturing processes on the observed amplitude spectrum of the fundamental and higher mode Rayleigh and Love waves were considered in detail. For the data analysis of actual earthquakes, the vertical component fundamental mode Rayleigh wave amplitude spectra in the 4 - 70 second period range were used together with the observed fundamental mode Love wave amplitude spectra in the 4 - 60 second period range.

For each earthquake the strike, dip and slip

angles of the two nodal planes were determined as well as the focal depth and seismic moment. To determine these quantities, a special systematic search technique was developed which maintained the independence of the best source parameter estimates by the separate Rayleigh and Love wave observations. This technique allowed a broad enough solution space so that a combination of the five source parameters could be found which adequately accounted for the surface wave observations and the P wave first motions for each earthquake.

As a by-product of the source parameter estimation, the anelastic attenuation coefficients of the fundamental mode Rayleigh and Love waves in the 4-50 second period range were also determined. To successfully accomplish this, a statistical inference test was used to check the appropriateness of the observed data for the anelastic attenuation determination. This test proved very useful. Ninety-five percent confidence levels were placed on the resultant determinations.