SEISMIC WAVE ATTENUATION, INTENSITY AND MAGNITUDE RELATION FOR ROCKY MOUNTAINS

by

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The problem which has been investigated in this thesis is the relation between the magnitude and felt area of the earthquakes in the Rocky Mountain region. It is concluded that the felt area versus magnitude (both body-wave and surface-wave) relation for Rocky Mountain region earthquakes is closer to that for earthquakes in California and other regions of the western United States than for eastern and central United States earthquakes. That is, the felt area and the radius of perceptibility of California and Rocky Mountain region earthquakes are smaller than those of earthquakes of comparable magnitude in the western and central United States.

To give some theoretical support to the felt area versus magnitude relationship and to the empirical formula, an attempt has been made to determine the anelastic attenuation of short-period and long-period surface waves for Rocky Mountain region earthquakes and to compare those values with absorption values obtained from a study of the California earthquakes.

The observational data on the attenuation of Lg waves from Rocky Mountain earthquakes yield the following average values for the coefficient of anelastic

attenuation: 0.07-0.1 deg^{-1} for one second period waves for the ray path segments across the eastern United States and 0.2-0.4 deg^{-1} for the ray path segments in the western United States. The absorption coefficient γ, for 3-4 second period surface waves has the following values: 0.3-0.4 deg^{-1} for the paths to the western United States and 0.07-0.1 deg^{-1} for the paths to the central and eastern United States. Longer period surface waves (3-16 seconds period) for the earthquakes of the Rocky Mountain region give 0.07-0.1 deg^{-1} for the paths to eastern United States and 0.1-0.15 deg^{-1} for the path to the western United States.

In general, stations of closer epicentral distance which are located in the Basin and Range Province or Colorado Plateau have shown higher absorption value of 1.0 deg^{-1} for one second period waves. Within the western United States itself, somewhat abnormal values have been found for California-Nevada border earthquakes (low absorption and greater felt area) and Colorado-New Mexico earthquakes (high absorption and smaller felt area) in comparison with southern California earthquakes. It has been suggested that this may be due to variation in heat flow values, variation in the thickness of the low

velocity channel, and in general the complex structural geology of the area.