# LATERAL VARIATIONS OF SHEAR VELOCITY AND ANELASTICITY IN THE UPPER MANTLE OF THE WESTERN UNITED STATES FROM RAYLEIGH WAVE OBSERVATIONS

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## DIGEST

Rayleigh wave phase and group velocities and attenuation coefficients in the period range 18 to 120 sec have been determined for three regions along nine paths across the western United States using a two - station technique. The attenuation coefficients were found to increase systematically from east to west between the Rocky Mountains and Pacific coast. This contrasts with the results for the eastern and central United States where no systematic variation of long - period Rayleigh wave attenuation could be discerned in earlier studies.

The Rayleigh wave group and phase velocities were simultaneously inverted, using a differential inversion procedure, to obtain shear wave velocity models. These velocity models were then used in an inversion process obtain internal friction ($Q_\beta^{-1}$) as a function of depth from attenuation measurements. Both shear wave velocities and $Q_\beta$ values decrease from east to west at all depths. The decrease in $Q_\beta$ values is much more severe than the decrease in velocities. The inversion results show that $Q_\beta$ values in the western United States are lowest for the coastal regions and westernmost Basin and Range, highest for the Rocky Mountains and western Great Plains, and intermediate for the Basin and Range, Columbia and Colorado Plateaus. Low values of $Q_\beta$ (70 - 30) occur in the upper crust, higher values occur in the lower crust (230 - 90), and highest values occur in the uppermost 20 km of the mantle (835 - 300). These overlie a low - Q zone which is shallower than the low - velocity zone in all regions. This is consistent with a mechanism for low velocities and low Q values which is controlled by temperature.