RAYLEIGH WAVE ATTENUATION
IN
BASIN AND RANGE PROVINCE

Wen-Jack Lin, B. S.

A Digest Presented to the Faculty of the Graduate
School of Saint Louis University in Partial
Fulfillment of the Requirements for the
Degree of Master of Science (Research)

1989

DIGEST

Surface-wave data along a short path between stations Mina (MNV) and Elko (ELK), were used to investigate the shear wave velocity and Q_β structure of the crust in the Basin and Range province. In addition, the possible frequency dependence of Q_β was examined. Using an initial phase estimate from multiple-filtering, phase-matched filtering was used to reconstruct the single-station phase estimate and group velocities for one particular mode. A frequency-variable filter was then used to isolate the mode of interest. The interstation phase and group velocities as well as attenuation coefficients were obtained from the interstation Green's function using a Wiener-filtering technique.

A differential inversion using both fundamental and first-higher mode group and phase velocities yielded a shear-velocity model of the crust and upper mantle. The model is characterized by a crustal thickness of about 30-35 km with a well-resolved low-velocity zone occurring at depths between 9 and 18 km. These results are consistent with previous studies of this region. Using this velocity model and observed fundamental-mode and first higher-mode attenuation coefficients, a Q_β model was obtained, with the assumption that Q_β is independent of frequency. The Q_β model is characterized by very low values in the upper crust and high values in the lower crust. Using both velocity and Q_β models, we obtained the fall-off rate of theoretical amplitude spectra, consisting of 30 modes using a least-squares method. The predicted 1-sec Lg attenuation coefficients was compared to the observed values. This procedure enables us to separate the depth dependence and frequency dependence of Q_β, because the fundamental-mode and higher-mode

surface waves sample different depths for the same period. We found that the predicted attenuation coefficients agree fairly well with observed 1-sec Lg wave value. This result suggests that Q_β is independent or weakly-dependent on frequency over the period range 1-10 sec in the Basin and Range province.