# REGIONALIZATION OF CRUSTAL Q IN THE CONTINENTAL UNITED STATES

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# DIGEST

Recent studies indicate that there are strong lateral variations of anelastic attenuation of seismic waves beneath the continental United States. In this study a detailed crustal $Q_o$ map for the entire continental United States is obtained. The method is based on a scattering model to explain the coda waves of local and near regional earthquakes. These coda $Q_o$ values are in good agreement with Q of Lg-waves. Using 25 WWSSN and 27 LRSM stations and over 250 local earthquakes, short epicenter-station paths were selected which give a maximum coverage to the entire continental United States. Based on a single-scattering model, a generalized inversion method is developed and used to obtain $Q_o$ values.

A frequency dependence of Q is observed in the range of frequencies from 0.5 to 3.5 Hz as considered in this study. The value of frequency dependence $\eta$, is found to vary in different parts of the continental United States. Frequency dependence is maximum in the tectonically active western United States ($\eta$ = 0.4 to 0.6) and least in the stable regions of the central and south central United States ($\eta$ = 0.1 to 0.3). Intermediate values of frequency dependence are observed in the eastern and northeastern United States ($\eta$ = 0.3 to 0.4).

The lowest $Q_o$ values are obtained in the western United States, with values ranging from 140 to 200 in the Coastal Plains. Average crustal $Q_o$ values for the Basin and Range province range from 200 to 300, increasing gradually to 400 in the Colorado Plateau region. $Q_o$ values in the Columbia Plateau range from 200 to 400. $Q_o$ values increase very rapidly along the central and southern Rocky Mountains from 400 to 800. East of the Rocky Mountains $Q_o$ values increase gradually in the Interior Plains to a maximum value of around 1300 in the Mississippi Embayment region. Farther east $Q_o$ values decrease gradually to an almost constant value of 1000 along the Appalachian Mountains. Coastal regions of eastern and northeastern United States have a crustal $Q_o$ value between 900 to 700. Regions of south central and Gulf coastal plains show low $Q_o$ values, ranging from 600 to 400 and less.

The values of the coefficient of anelastic attenuation $\gamma$ obtained from the "coda shape" method agree well with several $\gamma$ values previously determined from other studies. The source factor $B(f_p)$ , a measure of the intensity of scattering, was obtained for several different regions of the continental United States. Regions of high $Q_o$ values exhibit low intensity of scattering.

It is observed that the regions of high $Q_o$ gen-

erally have high $P_n$ velocity, negative travel-time anomalies, high crustal P-wave velocity, low heat flow values, thick crust and low electrical conductivity. Regions of low crustal $Q_o$ in general show the opposite effects. Exceptions to the above are regions of the Sierra Nevada and southern Cascade Mountains, which have low heat flow, thick crust, low electrical conductivity and low $Q_o$.

The detailed crustal $Q_o$ map of the continental United States as obtained in this study has important applications, as an input parameter to the prediction of isoseismal intensity distribution patterns, in establishing local magnitude formulas, in seismic risk analysis and engineering seismology.