STUDY OF S WAVE SPECTRAL PROPERTIES

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The use of seismic body-wave spectra to determine the structure of the crust and mantle recently has gained considerable importance, owing to advances in theory as well as instrumentation and computer technology.

A body of theory has been developed which predicts how the character of the spectra of the components of the S wave ground motion depends on earth structure, angle of incidence and frequency of the arriving wave. Some of the predicted spectral aspects for SV and SH can be employed to study the earth's structure by comparing with observational data.

In this work, seismograms of the Long Range Seismic Measurements (LRSM) network stations were analyzed to obtain spectra of the components of the S wave motion for five earthquakes. Epicentral distances were selected between 50° and 70°. In this range the ground motion is less complicated because the S wave motion is linearly polarized. Moreover, other phases such as PS, SP, sS can be distinguished easily from S phases because there is sufficient separation in their time of arrival.

The S-wave portions of seismograms were digitized manually at about 0.5 second interval. S waves were resolved into their components and each

component was Fourier analyzed to obtain the amplitude and phase spectra. The spectra and spectral ratios were compared with the theoretical S wave surface motion, which was obtained using Haskell's matrix formulation for horizontally layered earth models. Some modifications of model parameters were necessary to find better fits to the observational data. Estimations of crustal structure, especially thicknesses, were made from the comparisons. The effects of thickness appear in the position (with regard to frequency) of the spectral peaks rather than in the spectral amplitudes, which are mainly affected by velocity contrasts.

Crustal thicknesses found for five of the stations analyzed agreed with those obtained from surface wave and refraction studies. However, for the seventeen other cases considered the results were disappointing, in the sense that no reasonable earth models could be found which were compatible with the spectral data.