SHALLOW STRUCTURE OF THE ILLINOIS BASIN FROM FUNDAMENTAL AND HIGHER-MODE REGIONAL SURFACE WAVE DISPERSION

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The Illinois Basin provides a unique setting for studies involving near-regional surface wave propagation, including inversion of phase and group velocities plus waveform modelling, and moment-yield for chemical explosions, primarily strip-mine blasts from commercial coal mining operations. Prior studies are few in number and utilized only refracted arrivals or surface wave group velocity information.

This study focuses on near-regional and regional surface wave (Rg) data to extract maximum information from single source-single receiver paths. Fundamental and higher mode group velocity and calculated phase velocity information are used to define the shallow (0-3 km) shear-velocity structure. Q_β structures are determined by matching the waveform amplitudes at various frequencies.

The modeled shear-wave velocity structures provide more detail in the shallow surface, yet are similar to previously obtained values for longer paths. The discontinuities in the shallow surface can be correlated with the generalized stratigraphy for the area. Q_β values are dependent on azimuth, but are similar to values obtained for deep soil sites.

The surface wave data were recorded on stations of the Central Mississippi Valley Seismic Network and portable networks deployed for short (5-20 km) recording paths. Since all stations are well calibrated, their absolute instrument gains are known, and the isotropic moment (M_I)

brated, their absolute instrument gains are known, and the isotropic moment (M_I) for the studied events could be calculated for the 0.5-5.0 Hz band. M_I estimates are greater than values obtained by Denny and Johnson (1994) although the linear relationship with yield is still present.