Lg Wave Attenuation in the CEUS

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The presentation describes results obtained to date concerning the modeling of high-frequency Lg wave amplitudes in the Gulf coastal plain. The data were derived from 16 earthquakes that occurred from 2010 through 2012 in Arkansas, Oklahoma and Texas during the time when the EARTHSCOPE transportable array stations were operational in the area.

Lg shows strong attenuation in areas of the Gulf coastal plain underlain by thick deposits of post-Jurassic marine sediments. A regional Q model was determined to model the distance dependent anelastic attenuation in the gulf region, the result being $Q = 365f^{0.624}$, for frequencies between 0.25 and 12 Hz. The regression model estimated Q at 12 Fourier frequencies between 0.25 and 12 Hz, along with site terms for over 100 station locations in the Gulf coastal plain region. The regression assumed a Brune source model for each earthquake with 100 MPa and 50 MPa stress drop, and two alternative tri-linear geometrical spreading models. The estimates of Q in the Gulf region are not sensitive to the assumed stress drop or the assumptions concerning geometrical spreading. The site terms show a strong correlation with thickness of sediments: the effect of the alternative geometrical spreading models is to simply add a constant value to all site terms, with the shape of the site response being constant under the two alternative assumptions. Kappa (k_o) values for each site were determined, and were observed to increase linearly with thickness of post-Jurassic sediment (h): $k_o = 0.043 + 0.0097h$, for h between 0 and 12 km. The values of k_o for stations along the Texas and Louisiana coasts are approximately 150 msec, much larger than values reported elsewhere in eastern North America.