

Attenuation Models of the Lithosphere to Predict Expected Signal to Noise Ratios for Regional Phases

We have developed a methodology to construct high-resolution regional lithospheric attenuation models of the earth based on regional P and S-waves. The method uses Pn, Pg, Sn, and Lg amplitudes to simultaneously invert for the crust and upper mantle attenuation structure. The method was initially developed for the Middle East, then expanded to include most of Eurasia, and now we have transported the methodology to North America. Lithospheric structure can cause strong variation in regional amplitudes, which are captured in the models. A key use of the models is in predicting the expected signal amplitude of regional phases for earthquakes of arbitrary magnitude and explosions of arbitrary yield, depth, and emplacement point material properties. We utilize an MDAC source model for earthquakes and have included, tested, and compared a number of existing and emerging explosion source models. Combining the expected signal with the observed noise characteristics of the station provides information on the detection thresholds of regional phases. Merging this information for a constellation of stations can be used to produce network detection maps. The attenuation models are available to the broader community, and the regional models will eventually be incorporated into the NetMOD (Network Monitoring for Optimal Detection) tool.

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