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Transportability of the P- to S-wave Spectral Slope Discriminant Based on Ground Truth Data

Peter Goldstein, Mark Woods†, Lawrence Livermore National Laboratory, Earth Sciences Division, L-205, Livermore, Ca., 94551, †AFTAC, Patrick AFB, FL, 32925
peterg@llnl.gov

Robust and transportable regional seismic discriminants are needed to monitor the recently signed Comprehensive Test Ban Treaty. We investigate the robustness and transportability of the recently proposed P- to S-wave spectral slope discriminant (Goldstein, 1995) using ground truth data from central Europe, Scandinavia, and the western U.S. Data from central Europe and Scandinavia include earthquakes, quarry blasts, and mining induced tremors. Data from the western U.S. include earthquakes, concentrated chemical and nuclear explosions, and mine collapse events. We compute slopes of Pn/Lg and Pg/Lg spectral ratios and compare results from all the event types in each region. We also compare estimated slopes from different regions and investigate the sensitivity of our results to center frequency and width of the passband, magnitude, and parameters used to correct for attenuation and geometrical spreading. Our results thus far can be summarized as follows: 1) We find excellent discrimination between earthquakes and concentrated explosions in the western U.S. and earthquakes and quarry blasts in central Europe. 2) We do not see any evidence of a dependence on magnitude. 3) Slope estimates can be highly variable when the data with good signal to noise ratio has limited bandwidth. 4) Inaccurate distance corrections can introduce trends with distance that can degrade the performance of regional discriminants.

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Peter Goldstein
LLNL, Earth Sciences Division, L-205
P.O. Box 808
Livermore, CA, 94551 (510) 423-1231