

Using spectral ratios to discriminate between low-magnitude earthquakes, explosions and mining events in Canada

Many regions in Canada contain a mixture of natural seismicity of variable depth, low-magnitude explosions (arising from construction and/or mining activity) and mining induced events. Their correct classification is critical for seismic monitoring and for ensuring that anthropogenic events do not inflate seismic hazard calculations. Recently, local- to regional-spectral ratio discriminants across multiple phases and frequency bands have successfully been used in Canada to improve the accuracy and efficiency of event screening, particularly at low magnitudes ($M < 3$) where other explosion discriminants often fail. This work will present results from several case studies where spectral ratio discriminants have been used with varying degrees of success. In a test study in the New Brunswick, Canada, both high-frequency Pg/Lg and low-frequency Lg/Rg spectral ratios consistently discriminated between small ($M < 2$) blasts and earthquakes. In the mining-rich district of Sudbury, Canada, successful discrimination was possible for roughly 80 % of a test sample of M2 to M3 blasts and rockbursts. However, no single spectral ratio consistently provided adequate discrimination, and optimal spectral ratios needed to be calculated/tuned for particular stations. Preliminary results from other regions in Canada will also be presented.

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