A COMPREHENSIVE DATABASE FOR MINING EXPLOSION DISCRIMINATION

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Historically, event identification for explosion monitoring has focused on the task of separating earthquakes and explosions. This approach was adequate for large events observed at teleseismic distances since there are few other types of manmade sources large enough to be observed. However, with the availability of high-quality regional data, smaller events (mb 3.5 and below) that include many manmade sources are observed. The present challenge of seismic event identification now includes the task of classifying not only earthquakes and single-fired explosions (nuclear or chemical), but also mining explosions, underground mining collapses, and rock bursts.

In order to investigate smaller, mining related events, we have assembled a comprehensive database of earthquakes and mining events. This database consists of events in both Russia and the United States and includes ground-truth data for several different kinds of mines (iron, copper, and coal). The Russian portion of the database includes approximately 25,000 waveforms from five stations (which include 4 IRIS stations and one IMS station) for 850 mining events and 250 earthquakes (Figures 1 and 2). The US portion of the database comprises 132 stations (which include IRIS stations and the IMS Pinedale Array) that provide regional coverage of three mines (Figure 3). Nearly 100,000 waveforms were collected for 900 mining events and 450 earthquakes (Figure 4). All of the data, with the exception of data from 2 IMS stations, were recovered from the IRIS DMC.

This database will be used to develop discrimination tools that specifically consider the physical processes that accompany mining explosions and what makes them unique from earthquakes and other types of explosions for classification purposes. The discrimination tools we are presently investigating are described in Stump et al (2002) and include amplitude ratios, time-varying spectral estimation, waveform correlation, and Ms:mb.


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