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The discrimination of man-made explosions from earthquakes using seismo-acoustic analysis in the Korean Peninsula

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Korea Institute of Geoscience and Mineral Resources (KIGAM) operates an infrasound network consisting of seven seismo-acoustic arrays in South Korea. Development of the arrays began in 1999, partially in collaboration with Southern Methodist University, with the goal of detecting distant infrasound signals from natural and anthropogenic phenomena in and around the Korean Peninsula. The main operational purpose of this network is to discriminate man-made seismic events from seismicity including thousands of seismic events per year in the region. The man-made seismic events are major cause of error in estimating the natural seismicity, especially where the seismic activity is weak or moderate such as in the Korean Peninsula. In order to discriminate the man-made explosions from earthquakes, we have applied the seismo-acoustic analysis associating seismic and infrasonic signals generated from surface explosion. The observations of infrasound at multiple arrays made it possible to discriminate surface explosion, because small or moderate size earthquake is not sufficient to generate infrasound. Till now we have annually discriminated hundreds of seismic events in seismological catalog as surface explosions by the seismo-acoustic analysis. Besides of the surface explosions, the network also detected infrasound signals from other sources, such as bolide, typhoons, rocket launches, and underground nuclear test occurred in and around the Korean Peninsula. In this study, ten years of seismo-acoustic data are reviewed with recent infrasonic detection algorithm and association method that finally linked to the seismic monitoring system of the KIGAM to increase the detection rate of surface explosions. We present the long-term results of seismo-acoustic analysis, the detection capability of the multiple arrays, and implications for seismic source location. Since the seismo-acoustic analysis is proved as a definite method to discriminate surface explosion, the analysis will be continuously used for estimating natural seismicity and understanding infrasonic sources.