

# Pure and Applied Geophysics

## Frequency–Magnitude Distribution of -3.7 B MW B 1 mining-induced earthquakes around a mining front and b value invariance with post-blast time

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### Abstract

The authors investigated frequency-magnitude distribution (FMD) of acoustic emissions (AE) occurring near an active mining front in a South African gold mine, using a catalog developed from an AE network, which is capable of detecting AEs down to  $M(\text{sub}W) -5$ . When records of blasts were removed, FMDs of AEs obeyed a Gutenberg-Richter law with similar b values, not depending on post-blasting time from the initial 1-min interval through more than 30 h. This result denies a suggestion in a previous study (RICHARDSON and JORDAN Bull Seismol Soc Am, 92:1766–1782, 2002) that new fractures generated by blasting disturb the size distribution of background events, which they interpreted as slip events on existing weak planes. Our AE catalog showed that the GR law with  $b * 1.2$  was valid between  $M(\text{sub}W) -3.7$  and 0 for AEs around the mining front. Further, using the mine's seismic catalog, which covers a longer time period of the same area, we could extend the validity range of the GR law with the same b value up to  $M(\text{sub}W) 1$ .