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SOURCE TIME FUNCTION OF SEISMIC EVENTS AT POLISH COAL MINES DERIVED BY EMPIRICAL GREEN'S FUNCTION APPROACH

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Abstract

The empirical Green's function deconvolution techniques in the frequency and time domains were applied to retrieve the source time functions from the records of *P* waves of 25 seismic events that occurred in 1994 and 1995 at Wujek coal mine and of 5 events that occurred in 1994 at Ziemowit coal mine. The selected events were located within the underground seismic networks composed at Wujek mine of 14 vertical sensors, situated at a depth between 300 and 740 m and within the mining area of about 8 km^2. The network at Ziemowit mine was composed of 16 vertical seismometers located at a depth between 430 and 620 m in the southern part of the mine. Moment magnitude of selected events ranged from 1.1 to 2.2. The records of several smaller events from the same area and with similar source mechanism, with moment magnitude ranging from 0.3 to 1.7, were accepted as empirical Green's functions.

Both applied methods, the spectral division and the projected Landweber deconvolution, provided consistent and stable results. The relative source time functions of 6 events at Wujek mine and of 3 events at Ziemowit mine indicate that the rupture in their source propagated unilaterally, either along or perpendicularly to the longwall extension where the events were originated. The rupture velocity ranged from 0.4 to 0.8 of the *S*-wave velocity, which is distinctly lower than its typical value reported from natural earthquakes.

Key words: Induced seismicity in coal mines, empirical Green's function, source time function, projected Landweber deconvolution, rupture direction, rupture velocity.