

P-wave amplitude full moment tensor inversion as a practical tool in anthropogenic seismicity studies in Poland

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Tectonic seismicity in Poland is sparse. About 100 accounts of earthquakes are known from Polish history, starting from the year 1000 A.D, with the biggest event located near Myślenice in XVIIth century of magnitude estimated at 5.6. On the other hand the anthropogenic seismicity is one of the highest in Europe. Main sources of the anthropogenic seismic activity are industrial activities: underground mining in Upper Silesian Coal Basin (USCB) and Legnica Głogów Copper District (LGCD), open pit mining in “Bełchatów” brown coal mine and reservoir impoundment of Czorsztyn artificial lake. Seismic activity in this areas is various from very of about 3000 events per year in USCB, several hundreds in LGCD to several tens annually in the Bełchatów and Czorsztyn lake vicinities. Focal mechanism and full moment tensor (MT) decomposition allows for deeper understanding of the seismogenic process leading to tectonic, induced and triggered seismic events. The non-DC component of focal mechanism solution was considered as an indicator of the induced seismicity. Moreover, recommendation for discrimination of anthropogenic and natural seismicity included use of MT inversion in the complex investigation procedure described in Dahm et al., (2013). In this work the MT decomposition is proved to be a robust tool for unveiling collapse-type events as well as the other purely induced events in Polish underground mining areas. The limitation of the methodology of the P-wave first pulse displacement amplitude is also shown basing upon the full MT studies of the weak tectonic earthquakes occurred in Poland and synthetic tests.