Geophysical Research Abstracts
Vol. 17, EGU2015-4539, 2015
EGU General Assembly 2015

Complex rupture process of the March 19, 2013, Rudna mine (Poland) seismic event - local and regional view

Lukasz Rudzinski (1), Simone Cesca (2,3), and Grzegorz Lizurek (1)

(1) Institute of Geophysics PAS, Warszawa, Poland , (2) GFZ German Research Centre for Geosciences Potsdam , (3) University of Potsdam

On March 19th, 2013 a strong shallow induced seismic event struck a mining panel in the room-and-pillar Rudna copper mine, SE Poland. The event caused important damages at the mining tunnel and trapped 19 miners, which were safely rescued few hour later. Despite mining induced seismicity is frequent at this mine, the March 19 event was unusual because of its larger magnitude, its occurrence far from the mining stopes, and because it was accompanied by a strong hazardous rockburst. The mining inspections following the event verified the occurrence of a rockfall with tunnel floor uplift, but also recognized the presence of a faulting structure at the hypocentral location. The availability of three monitoring networks, including local and regional data, short-period and broadband seismometers, as well as surface and in-mine installation, give an optimal set up to determine rupture parameters and compare the performance and results from different installations. We perform waveform and spectral based analysis to infer source properties, with a particular interest to the determination of the rupture processes, using different moment tensor inversion techniques. Our results are surprisingly different, ranging from a dominant thrust mechanism, resolved at closest distances, to a collapse-type rupture, resolved at regional distances. We proof that a complex rupture model is needed to explain all observations and justify these discrepancies. The final scenario indicates that the rupture nucleated as a weaker thrust mechanism, along a pre-existing weakened surface, and continued in a more energetic collapse event. The local surface LUMINEOS network has the potential to resolve both subevents, but not using a standard moment tensor decomposition. We propose here a new moment tensor decomposition and an alternative moment tensor fitting procedure, which can be used to analyze the moment tensor of collapse sources.