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Relative location of excavation induced microseismicity at the underground research laboratory (AECL, Canada) using surveyed reference events

Abstract

Microseismicity is extensively used to monitor induced damage accumulation and stability of underground structures. Classical location routines in this context can often not resolve the potential coalescence of the induced microcracks, since the location accuracy is on the order of magnitude of the largest fractures observed. Most of the uncertainty arises from the poor knowledge of the seismic velocity field. Master event relocation techniques can circumvent this problem and significantly improve the accuracy in hypocenter determination. We relocate events recorded during the excavation of the TSX tunnel at the Underground Research Laboratory (URL) and show that the resolution is enhanced by up to one order of magnitude. The relocated events locate closer to the excavation perimeter than the absolute locations, a result that corresponds with the observed damage. Additionally the relocated events define a clearer structure, with planes of alignment parallel to the tunnel perimeter.

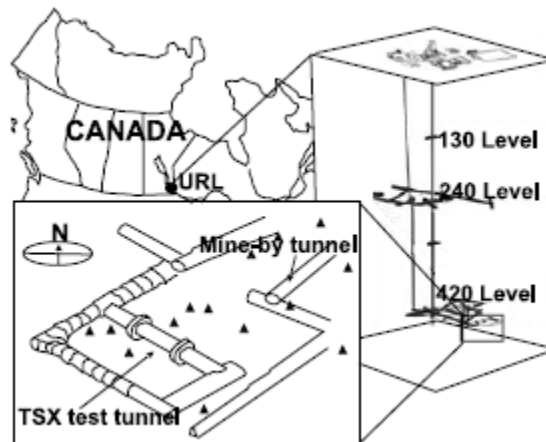


Figure: Location of the URL [Collins and Young, 1998]. The microseismic events used in this study are taken from the excavation stage of the TSX tunnel, located at the 420 m depth level. Black triangles indicate the location of the sensors used in the experiment.

Website: <http://onlinelibrary.wiley.com/doi/10.1029/2004GL021733/full>

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