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Interpretation of fracture geometry from excavation induced microseismic events

Abstract

Microseismicity provides a unique means of monitoring induced damage in the rock mass surrounding underground structures. The spatio-temporal distribution of the induced microseismic events can be used to interpret the evolution and extent of the damage zone. We present results from the analysis of 1889 events induced following the excavation of the TSX tunnel at the Underground Research Laboratory (AECL, Canada). The events were located using the relative location technique. A statistical analysis based on the three point method is applied to extract fracture orientation information from the clusters of microseismic events in the damage zone around the void. A series of numerical experiments validate the capability of this method to identify the existence of preferential orientations within a cluster of events. The method revealed the evolution of seismicity from initially scattered to a structured distribution along planar features, with different dip and orientation for the lower and upper halves of the tunnel.

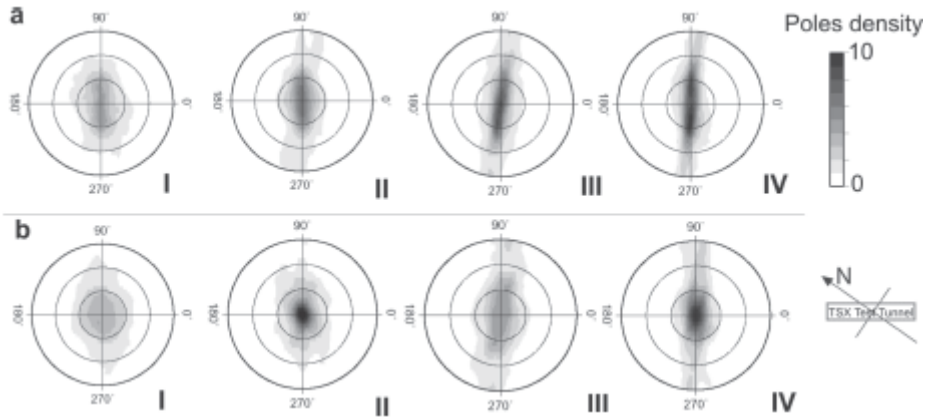

Figure*: Evolution of the structure underlying the MS location distribution in the floor (a) and roof (b) regions following the excavation of rounds 8 to 12 of the TSX tunnel. The stereographs for each time interval (I–IV) are calculated gathering the pole distributions obtained for the different rounds. Each time interval represents the time of occurrence of successive intervals of 40 events for the different excavation rounds. Azimuths are taken anticlockwise with origin in the tunnel axis.*

Website:
https://books.google.ca/books?id=GFBsBgAAQBAJ&pg=PA205&lpg=PA205&dq=Interpretation+of+fracture+geometry+from+excavation+induced+microseismic+events&source=bl&ots=D4lcpcMQGL&sig=YnuVqePw5rsEPS4fnCBL61u_1CM&hl=en&sa=X&ved=0ahUKEwjk3KS4pJHSAhUp6IMKHSKLD8QQ6AEIJzAC#v=onepage&q=Interpretation%20of%20fracture%20geometry%20from%20excavation%20induced%20microseismic%20events&f=false

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