
S51D-3268 Distributed Acoustic Sensing for Underground Longwall Mines



Friday, 13 December 2024



08:30 - 12:20



Hall B-C (Poster Hall) (Convention Center)

Abstract

Seismic monitoring of underground longwall mines can provide valuable information for managing rock burst risks and understanding the ground response to extraction. However, the underground longwall environment poses major challenges for traditional in-mine microseismic sensors, including: restricted use of electronics due to potentially explosive atmospheres, the need to frequently and quickly relocate sensors as rapid mining progresses, and source parameter errors associated with complex, time-dependent velocity structure. Distributed acoustic sensing (DAS), a technology that uses rapid laser pulses to measure dynamic strain along fiber optic cables, shows potential to alleviate these shortcomings and improve seismic monitoring in coal mine environments. In this work, we present several case studies of DAS deployments in longwall coal mines using different fiber geometries, including: fiber in boreholes, fiber on the floor of the tunnels, deployed on the longwall, and wrapped around support cans. We discuss the strengths, weaknesses, and applicability of each deployment strategy to address specific ground control challenges. We also discuss future research to help address the main technical challenges of cable durability and data management. Although several issues need to be addressed before DAS can be used routinely in these environments, the underground mining industry stands to gain significant safety benefits from this technology.

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