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Use of correlation fractal dimension signatures for understanding the overlying strata dynamics in longwall coal mines

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The longwall mining is considered to be the major coal mining practices due to vast recovery of coal over other forms of underground as well as opencast mining methods. A main concern in this method is roof rock cavability behaviour. A reliable prediction of the roof strata behavior of longwall workings has always been a challenge. Irregular caving and sudden failure of roof rock, which are very hazardous for mine workers and equipment. Usually these are major problem faced by bulk of Indian longwall faces and which are due to the presence of thick sandstone beds as overlying strata. Thus to keep an eye on the rock sudden failure, it is very necessary to monitor the stressed zones in the hanging overlying strata above and behind the panel. Earlier Correlation Integral 'C' and Correlation Fractal Dimension 'Dc' has been very helpful in monitoring the stressed zones for several great earthquakes in past. Following the same way, in the present study we have used the mine-induced microseismic data obtained from the retreating longwall panel using various monitoring instruments to calculate the Correlation Fractal Dimension 'Dc' for monitoring the stress levels and fractures in the overlying strata and also for spatio-temporal forecasting of roof-falls. The variation of blast charge size with Fractal Dimension is also studied. The use of Fractal Dimension has been very effective in obtaining the precursory signatures for roof-fall, thus ensuring safety in the mines.

Biography

P. K. Behera is an associate professor of Mining Engineering at the Indian Institute of Technology (Indian School of Mines), Dhanbad, India. He has been involved in research, consulting and education for more than 38 years at various organizations. Having worked for a short spell with Coal India Ltd, he joined Indian School of Mines, Dhanbad. Subsequently he joined B.H.U, Varanasi as a faculty member and shifted to the Indian School of Mines. He worked as Dy. Chief Scientist at Bharat Gold Mines, KGF as well as a Deputy Director at National Institute of Rock Mechanics, KGF, India. He is the author or co-author of several scientific papers published in international and national journals and conference proceedings. His major areas of research interest include rock mass characterization, strata control, support design, and stability assessment for underground & surface structures in rock. He has contributed to the industries and government through various sponsored courses and consultancies.

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