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Application of cleat orientation data from field mapping as critical input for modelling in-situ stress orientation around Coal Bed Methane target area in Jharia Coal Basin, India

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Orientation of in-situ stress field around coal bed methane (CBM) reservoir is an essential guide for optimization of exploration drilling and CBM production. All of the critical factors that influence CBM operation, such as: borehole stability; behavior of natural and hydraulically induced fractures; and fluid flow anisotropies, depend on the present day in-situ stress distribution. The orientation of natural fractures, controlling coal seam permeability is governed by the regional stress field. Borehole breakouts, earthquake focal mechanism solutions and stress measurements can give the direction of the horizontal maximum principal compressive stress (S_H). Unfortunately, no borehole image log data were available adjacent to the studied mining areas to determine the cleat orientation.

Therefore, the present study was undertaken (a) to estimate the in-situ stress orientation from field mapping of cleat orientation for 21 open cast mines (OCMs) and 2 underground mines (UGMs) distributed around the study area in the Jharia coal basin (Figure 1), (b) to analyse cleat orientation in 14 major coal seams, as observed in this coal basin [1], (c) to correlate cleat orientation with the geological structures in the Jharia coal basin, (d) to investigate stress pattern using numerical modelling and (e) to compare predicted S_H orientation with previously established stress data.

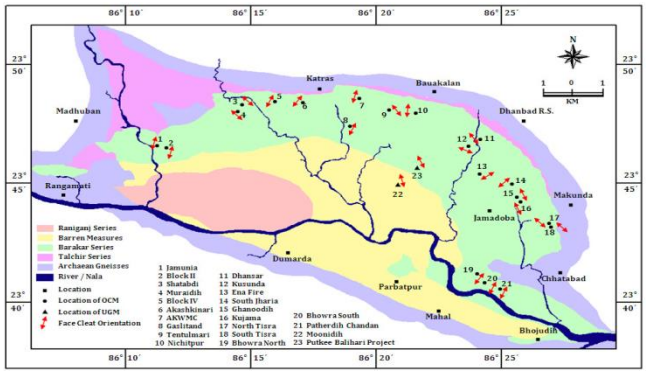

Figure 1: Illustrating the orientations of face cleats at different mines of Jharia Coal Basin, India.

The orientations of cleats and joints have been measured at the selected mines of the Jharia coal basin. It is observed that (i) macro-cleat spacing varies from 0.2 cm to 0.9 cm, (ii) the orientations of cleats are more of less parallel with the adjacent joint planes, (iii) in most of the cases the orientations of both cleats and joints vary from one mine to another for the same seam, (iv) all the seams of any single mine show the same cleat orientation direction, (v) there are two groups of face cleat orientations such as: N10°E–40°E and N30°W–45°W and (vi) the two predominant face cleat orientations in this coal basin are towards N25°E and N35°W respectively [2]. The authors in their previous study in the Moonidih UGM (WJ area) and PB UGM (PBP area) have demonstrated the relation between face cleat and S_H orientation [3]. Following the same principle it is concluded that the face cleat orientation in the mining areas of Jharia coal basin coincides with the S_H orientation during the cleat formation.

References

[1] Pal P K et al. (2015) In*: Petroleum Geosciences: Indian Contexts*: Springer Geology, Springer International Publishing, Switzerland, 143-173

[2] Paul S and Chatterjee R (2011) International Journal of Coal Geology 88:113-122

[3] Paul S and Chatterjee R (2011) International Journal of Coal Geology 87:87-96