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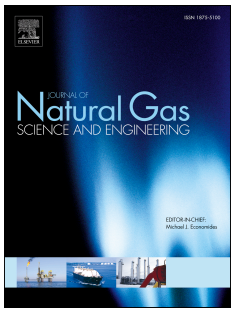

In-situ stress, stress-dependent permeability, pore pressure and gas-bearing system in multiple coal seams in the Panguan area, western Guizhou, China

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PII: S1875-5100(17)30387-6

DOI: 10.1016/j.jngse.2017.10.009

Reference: JNGSE 2321

To appear in: *Journal of Natural Gas Science and Engineering*

Received Date: 24 June 2017

Revised Date: 3 September 2017

Accepted Date: 23 October 2017

Please cite this article as: Chen, S., Tang, D., Tao, S., Xu, H., Zhao, J., Fu, H., Ren, P., In-situ stress, stress-dependent permeability, pore pressure and gas-bearing system in multiple coal seams in the Panguan area, western Guizhou, China, *Journal of Natural Gas Science & Engineering* (2017), doi: 10.1016/j.jngse.2017.10.009.

In-situ stress, stress-dependent permeability, pore pressure and gas-bearing system in multiple coal seams in the Panguan area, western Guizhou, China

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Abstract: Independent superposed coalbed methane (CBM)-bearing systems are widely distributed in coal-bearing strata with multiple coal seams in western Guizhou province, which is liable to cause interference among systems in the multilayer combination production process. Therefore, precisely defining the independent superposed CBM-bearing systems is important for CBM development in this area. However, the recognition of gas-bearing system at present was mostly based on the sedimentary cycle and the sequence stratigraphic framework, of which ignored the control of in-situ stress on physical properties of coal-bearing strata. In this work, the distribution characteristics of in-situ stress and its control on coal permeability was analyzed systematically based on well test parameters of 22-layer coal seams measured within depths from 352 to 1245 m in the Panguan area. Within depths shallower than 500 m, σ_H and σ_h tend to decrease with an increasing depth, and the stress field gradually transforms from $\sigma_H>\sigma_h>\sigma_v$ to $\sigma_v>\sigma_H>\sigma_h$. For immediately coal seams (500-750m), the $\sigma_v>\sigma_H>\sigma_h$ type is dominant, revealing a normal faulting stress type. For coal seams with depth > 750m, σ_H and σ_h increases rapidly instead of continuously decreasing, and the stress field transformed into the type of $\sigma_H> \sigma_v> \sigma_h$ when being deeper than 1000m. Coal permeability shows a low→ high → low→ extremely low trend with the increase of depth, and it was verified with well test permeability measured in other areas of western Guizhou, the essence of which is the compression and deformation of the pore-fracture system under the control of in-situ stress. The correlation between pore pressure and depth was also illustrated, which showed five linear relationships in depth of <200, 200-500, 500-750m, 750-1000m and >1000m, separately. Those five depth ranges represent five independent pressure