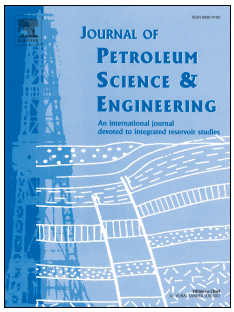
Accepted Manuscript



Characteristics of in-situ stress state and prediction of the permeability in the Upper Permian coalbed methane reservoir, western Guizhou region, SW China

Wei Ju, Zhaobiao Yang, Yong Qin, Tongsheng Yi, Zhengguang Zhang

PII: S0920-4105(18)30144-X

DOI: 10.1016/j.petrol.2018.02.037

Reference: PETROL 4707

To appear in: *Journal of Petroleum Science and Engineering*

Received Date: 6 November 2017

Revised Date: 1 February 2018

Accepted Date: 13 February 2018

Please cite this article as: Ju, W., Yang, Z., Qin, Y., Yi, T., Zhang, Z., Characteristics of in-situ stress state and prediction of the permeability in the Upper Permian coalbed methane reservoir, western Guizhou region, SW China, *Journal of Petroleum Science and Engineering* (2018), doi: 10.1016/j.petrol.2018.02.037.

Characteristics of in-situ stress state and prediction of the permeability in the Upper Permian coalbed methane reservoir, western Guizhou region, SW China

Wei Ju [a, b, *], Zhaobiao Yang [a, b], Yong Qin [a, b], Tongsheng Yi [c], Zhengguang Zhang [b]

a. Key Laboratory of Coalbed Methane Resources and Reservoir Formation Process, Ministry of Education, China University of Mining and Technology, Xuzhou 221008, China;

b. School of Resources and Geosciences, China University of Mining and Technology, Xuzhou 221116, China;

c. Guizhou Research Center of Shale Gas and Coalbed Methane Engineering Technology, Guiyang 550009, China;

** Corresponding author, e-mail: wju@cumt.edu.cn.*

Abstract: Coal permeability and in-situ stress state are important parameters for coalbed methane (CBM) exploration and development; however, the distribution pattern of the Upper Permian CBM reservoir permeability is poorly understood in the western Guizhou region, SW China. In the present study, based on measured injection/falloff and in-situ stress data in the Upper Permian coal seams of western Guizhou region, the present-day in-situ stress field, and its correlation with coal permeability were investigated. The orientation of the horizontal maximum principal stress (S_{Hmax}) indicated a dominant ~NW-SE-trending. In addition, the present-day in-situ stress field showed an important control on coal permeability. The permeability in the Upper Permian coal seams decreased exponentially with the increased effective in-situ stress magnitude. By utilizing the finite element method (FEM), the present-day in-situ stress field in the western Guizhou was numerically analyzed based on a geomechanical two-dimensional (2D) model. Distribution of coal permeability in the Upper Permian CBM reservoir was predicted based on the relationship between coal permeability and effective in-situ stress magnitude. The results indicated that, in the western Guizhou region, vertically, coal permeability was relatively high and widely distributed shallower than approximately 780 m below ground level (bgl), whereas, it was extremely low and regularly varied with burial depth deeper than approximately 780 m bgl. Laterally, the distribution pattern of coal permeability was characterized by strong heterogeneity due to well-developed faults and folds. High values of the Upper Permian coal permeability were located in regions around Nayong-Zhijin, Panxian-Anlong and along Shuicheng-Liuzhi-Ziyun. The present study may provide geological references for the CBM reservoir productivity and subsequent analysis (e.g., wellbore stability, hydraulic fracturing design, and fault reactivation studies, etc.) in the western Guizhou region.

Keywords: coal permeability; in-situ stress state; coalbed methane reservoir; numerical simulation; Upper Permian; western Guizhou region