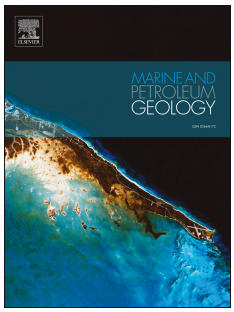
Accepted Manuscript



Evaluation of geological risk and hydrocarbon favorability using logistic regression model with case study

Zhaoqun Zhu, Chengyan Lin, Xianguo Zhang, Kai Wang, Jingjing Xie, Sudong Wei

PII: S0264-8172(18)30056-4

DOI: 10.1016/j.marpetgeo.2018.02.012

Reference: JMPG 3240

To appear in: *Marine and Petroleum Geology*

Received Date: 2 May 2017

Revised Date: 21 January 2018

Accepted Date: 11 February 2018

Please cite this article as: Zhu, Z., Lin, C., Zhang, X., Wang, K., Xie, J., Wei, S., Evaluation of geological risk and hydrocarbon favorability using logistic regression model with case study, *Marine and Petroleum Geology* (2018), doi: 10.1016/j.marpetgeo.2018.02.012.

Evaluation of Geological Risk and Hydrocarbon Favorability Using Logistic Regression Model with Case Study

Zhaoqun Zhu[a], Chengyan Lin[a], Xianguo Zhang[a], Kai Wang[b], Jingjing Xie[c], Sudong Wei[d]

[a] *School of Geoscience, China University of Petroleum (Qingdao), 266580, China*

[b] *Mewbourne School of Petroleum & Geological Engineering，University of Oklahoma, Norman, OK, 73019, USA*

[c] *Shanghai Branch Company, CNOOC Ltd, 200030, China*

[d] *China Oilfield Service Limited, Langfang, 065200, China*

ABSTRACT

A robust and effective evaluation on geological risk and favorability of hydrocarbon occurrence contributes to a meaningful exploration decision. This paper systematically reviewed and discussed the evaluation units, evaluation variables and evaluation models relevant to geological risk and favorability evaluation, and presented a data-driven procedure using logistic regression method. In this method, quantitative logistic regression relationship between the hydrocarbon occurrence and key geologic factors are obtained by integrating available geoscience information and current exploration results. It offers significant convenience to derive the probability of hydrocarbon occurrence in a straightforward and simple form with a more objective and reproductive result.

The proposed method and workflow are further illustrated using an example from the first member of Dainan Formation in Yong'an area of Gaoyou Sag of Subei Basin in China. This case study not only quantified the geological risk and favorability of specific exploration target, but also revealed their spatial variation and highlighted the favorable area for further exploration by the resultant maps. The evaluation results and actual observation displayed a good correspondence and the overall evaluation accuracy was 94.0%, indicating that such an approach could capture the essential spatial characteristics of hydrocarbon accumulations and provide a useful tool in resources appraisal.

Keywords: Geological risk; Hydrocarbon favorability; Logistic regression; Gaoyou Sag

INTRODUCTION

Hydrocarbon exploration is a high-risk venture. Geological risk and favorability evaluation is important to make inference on the likelihood of hydrocarbon occurrence, which could