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Tectonic-Thermal Evolution History and Its Controls on Petroleum Geology of Weibei Uplift

YANG Peng[1, 3], REN Zhanli[2, *], XIA Bin[1, 3, 4], LIU Weiliang[1, 3] and HUANG Qiangtai[1, 3]

1 *Guangdong Key Laboratory of Offshore Oil Exploration and Development//School of Marine Science，Sun Yat-sen University，Guangzhou 510006，China*
2 *State Key Laboratory of Continental Dynamics//Department of Geology，Northwest University，Xi，an 710069，China*
3 *Offshore Oil Exploration and Development Center of Sun Yat-sen University， Guangzhou 510006，China*
4 *State Key Laboratory of Ore Deposit Geochemistry Chinese Academy Of Sciences, Guiyang 550002, China*

1 Introduction

The Weibei Uplift is located in the southwest of the North China Plate, where is the stable block (the Ordos Block) in the north and the active belt (the Qinling Orogenic Belt) in the south (Ren et al, 2014, 2015). And the belt is separated from the Weihe basin. The Weibei uplift has a uniform crystalline basement with the North China plate and the main genetic units are Middle-Upper Proterozoic, Cambrian, Ordovician, Carboniferous, Permian, Jurassic and lower Cretaceous series (Wang et al., 2010; Ren et al, 2014, 2015). The uplift generally trend EW- NWW and the stratigraphic ages get younger from south to north and east to west. The results of the Lower Cretaceous residual strata distribution, marginal coarse clastic sedimentary characteristics and conglomerate analysis indicate that there was no uplift in Weibei eare blocking North Qinling Mountains sourcen in the early Cretaceous and the present remnant boundary is not the original sedimentary boundary, and the southern boundary of the Ordos basin should be in the southern part of Weibei Uplift.

This article mainly describes the tectonic-thermal evolution history and its controls on petroleum geology of Weibei Uplif.

2 Tectonic-Thermal Evolution History and Its Controls on Petroleum Geology

The apatite and zircon fission track analysis show that Linyou area located in the southwestern margin of Weibei Uplift happened these tectonic deformation and regional uplift events firstly in early Cretaceous about 146Ma ~ 125Ma (Wang, et al., 2010; Qi, et al., 2017), which is premonition of uplift of Weibei area. The Weibei Uplift has experienced two major uplift and denudation events since the late period of early Cretaceous. The first uplift event began with the characteristics of earlier in the south(114~73Ma) than the north(65~59 Ma) (Xiao, et al., 2013; Ren et al, 2014, 2015). The second uplift event occurred at Eocene middle-late~Oligocene about 40~27.3Ma. Simulation results of apatite fission track thermal history with AFTsolved shows that Weibei area rapid uplift in 125 ~ 100 Ma, slow rise in 100-40 Ma and since late Eocene about 40 Ma, especially since 5 Ma occurred rapid uplift and cooling.

The thermal evolution history of Ordovician carbonate rock with bitumen reflectance indicates that the Weibei Uplift Ordovician strata has experienced maximum Paleotemperature in the Early Cretaceous which occurred a tectonic-thermal event, and paleogeothermal gradient reached 4.60℃/100m. The early Cretaceous was the main gas generation period of Ordovician source rocks, which was controlled mainly by tectonic-thermal event of early Cretaceous.

The Weibei Uplift is in a unique and important structural position. The timing of the two rapid uplift events since Cenozoic era in the Weibei Uplift is consistent with the timing of uplift in the Qinling Orogenic Belt. The overall rapid uplift in the Weibei Uplift since 40 Ma displays good correlation with the rapid subsidence of the Weihe basin during the Cenozoic. The determination of the Weibei Uplift tectonic-thermal evolution history is of great significance to the study of marginal orogenic-basin-forming, basin dynamics and petroleum geology.

* Corresponding author. E-mail: renzhanl@nwu.edu.cn.

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