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Tectonic Evolution and Stress Field Distribution in the Basin of the North Jiangsu-South Yellow Sea, China

TANG Yong[1, *], TANG WenJun[2] and HUANG Wenfang[3]

[1] *Hubei Cooperative InnovationCenter of Unconventional Oil and Gas (Yangtze University), Wuhan430100,Hubei,China*
[2] *Zhundong Oil Production Factory, Xinjiang Oilfield Company, CNPC, Fukang831511,Xinjiang, China*
[3] *Research Instituteof Exploration and Development,Changqing Oilfield Company, CNPC, Xi'an 710018, Shaanxi, China*

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Abstract: The North Jiangsu-South Yellow Sea Basin was formed during the Late Yanshanian Wubao Movement, which was developed on the basis of inheriting the early topographical features in a continuous extensional environment. After the seismic section study, the sedimentary mantle of the North Jiangsu-South Yellow Sea Basin is divided into the tectonic layer during the fault period and the tectonic layer during the fault depression. The finite element technique is used to calculate and analyze the stress field changes during the development and evolution of the North Jiangsu-South Yellow Sea. The stress distribution states of different tectonic periods in different regions are quantitatively characterized, and the tectonic evolution of the entire North Jiangsu-South Yellow Sea is clearly understood.

Since the late Cretaceous, the Kula plate has subducted toward the Eurasian plate from north-northwest-north-northeast, gradually deflected westward to northwest and near east-west direction. At the same time, the Indian plate subducted from the southwest to the northeast to the Eurasian plate. Since the rate of the Indian plate is greater than the rate of the Pacific plate, the material in the Chinese mainland flows eastward (Suo et al., 2012; Liu, 2010; Xu et al., 1999; Yang, 1998), which makes the eastern part of China in the SE-NW direction of the right-handed torsional stress field (Fig. 1).

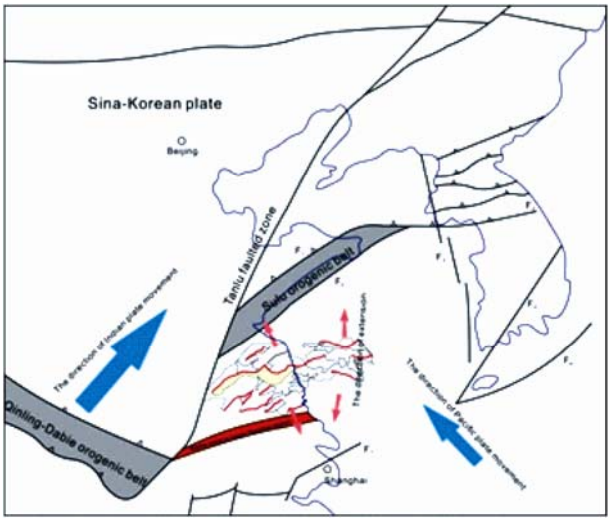

Fig. 1. Schematic diagram of basin formation in the basin of the North Jiangsu-Southern Yellow Sea during the fault development period
F1: Wulian-Zhucheng fault; F2: Lujiang-Guanyun fault; F3: Fault on the western margin of the Korean peninsula; F4: Linjinjiang fault; F5: Honam fault; F6: Fault on the southern margin of Cheju Island; F7: Suzhou-Kunshan fault

The fault period occurred after the deposition of a section of the Funing Formation, before the deposition of the Dainan Formation.The calculation shows that the extension rate of the Nanwu depression, the Qiantong depression and the Gaoyou sag is the largest in this period, which are 19.3%, 15.3% and 12.1% respectively. It is claimed that the stress intensity is the strongest in the Nanwu Depression, and the secondary stress is 253.7MPa, 223.8MPa and 207MPa, respectively in the Qiantong depression and the Gaoyou sag. Among them, the Nanwu depression is the most stress-strength in the central part, and the CZ24-1-1 with the most developed fault is the most obvious. The Qiantong depression is said to be concentrated in the southwestern part of the sag, and the northeast-southwest is gradually increasing, while the Gaoyou sag is claimed that the high value area of stress intensity is mainly concentrated in the southern part of the depression. The high value area of the Jinhu Sag is concentrated in the area between Jinhu and Baoying, with a maximum of 195.2 MPa. Each bulge claims that the stress is only about 140 MPa, and the lowest value appears in the Dadong bulge and the Nansi bulge region. The overall performance is: the stretch rate on both sides of the basin is the largest, while the stretch rate in the middle is relatively small (Fig. 2a).

The fault depression occurred after the deposition of the Dainan Formation and before the deposition of the Sancha Formation. The calculations show that the Gaoyou sag and the Nanwu depression stretched the most during this period, which were 11.7% and 9.8% respectively. In the late period of the fault, the stress intensity is the strongest in the Gaoyou sag, followed by the Nanwu sag, and the tensile stress is 142.8 MPa and 134.2 MPa, respectively. The Gaoyou sag claims that the high stress intensity area is mainly concentrated in the southern part of the sag, while the Nanwu sag is centered on the stress. The highest intensity, the most developed CZ24-1-1 is the most obvious. The high value area of the Jinhu sag is concentrated in the area between Jinhu and Baoying, with a maximum of 118.6 MPa. Each bulge claims that the stress is only about 90 MPa, and the lowest value appears in the Dadong bulge, Yuhua bulge and the

* Corresponding author. E-mail: water_0820@163.com

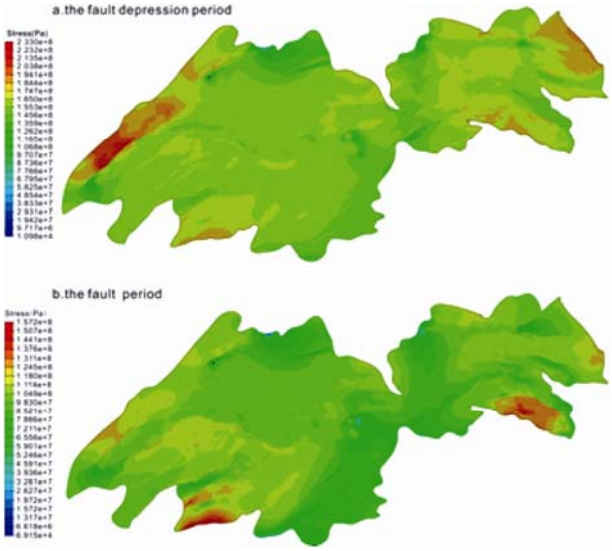

Fig. 2. Stress intensity of the North Jiangsu-South Yellow Sea Basin during the different periods.

Nansi bulge (Fig. 2b).

Key words: stress field, tectonic evolution, differential distribution

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About the first author

Tang Yong, male, born in 1981 in Jingzhou City, Hubei Province; doctor; graduated from China University of Geosciences (Wuhan), lecturerof Hubei Cooperative Innovation Center of Unconventional Oil and Gas, Yangtze University. He is now interested in the study on structural analysis and numerical simulation. Email: water_0820@163.com; phone: 13871077429.