



## Structural Characteristics and Favorable Zone for Marine Hydrocarbon Exploration of the Laoshan Uplift in the South Yellow Sea Basin

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**Abstract:** The South Yellow Sea Basin is the part of the sea area of the North Jiangsu-South Yellow Sea Basin (Fig. 1), the extension of the Yangtze platform in the sea area, and the main body of the Lower Yangtze block (Chen et al., 2016). It is also a multi-cycle superimposed basin on the basement of the Sinian

metamorphic rocks of the Lower Yangtze platform, consisting of the Neoproterozoic Sinian-Mesozoic marine residual basin and the Mesozoic-Cenozoic continental fault basin (Zhang et al., 2014; Duan et al., 2015; Stern et al., 2018).

The Laoshan uplift in the South Yellow Sea Basin is a

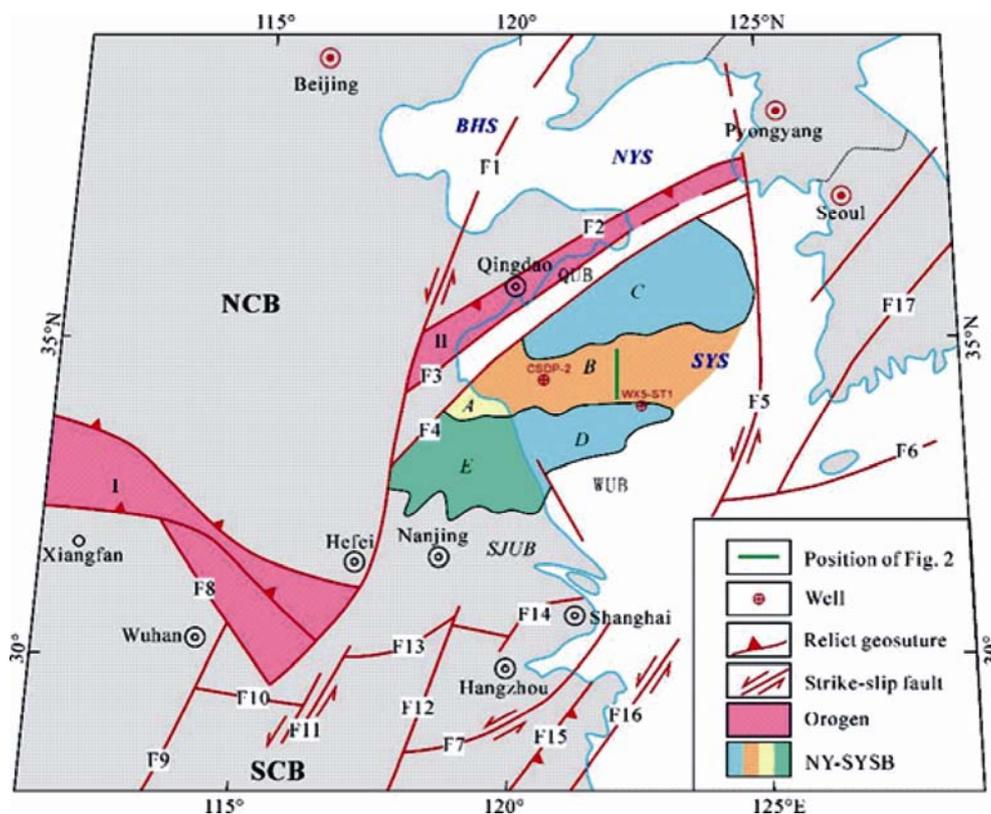


Fig. 1. Location and tectonic unit map in the South Yellow Sea and the adjacent areas (modified after Yao et al., 2010)

I, Qinling orogen; II, Sulu orogen (other Yanshanian orogens not marked). NCB, North China Block (also known as the SinoKorean Block), SCB, South China (including Yangtze and Cathaysia). F1, Tanlu fault (Tancheng-Lujiang); F2, Wulian-Zhucheng fault; F3, Lianyungang-Qianliyan fault; F4, Jiashan-Xiangshui fault; F5, west margin fault of Korea Peninsula (EMFYF); F6, south margin fault of Jeju Island (SMFJI); F7, Jiangshao fault (Jiangshan-Shaoxing); F8, Yingdian-Qingshankou fault; F9, Tuanfeng-Macheng fault; F10, Xianning-Yangxin fault; F11, Yangtze shear zone; F12, Jixi-Gandongbei fault; F13, Jiangnan fault; F14, Suzhou-Qunshan fault; F15, Lishui-Zhenghe-Dapu fault; F16, Changle-Nan'ao fault; F17, Wochuan fault. BHS, Bohai Sea; NYS, North Yellow Sea; SYS, South Yellow Sea. QUB, Qianliyan uplift belt; WUB, Wunansha uplift belt; SJUB, South Jiangsu uplift belt; NY-SYSB, North Jiangsu-South Yellow Sea basin (A, Yantai depression, including Qunshan depression; B, Laoshan uplift; C, Qingdao depression; D, North Jiangsu basin; E, Binhai uplift).

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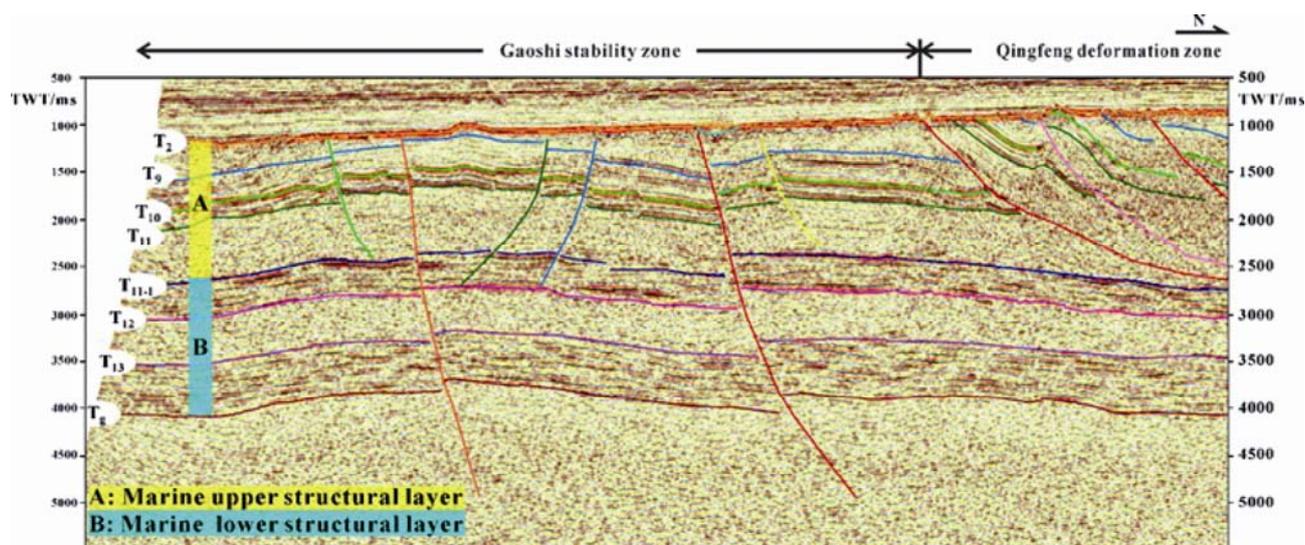


Fig. 2. Seismic interpretation section of Laoshan uplift

relatively stable area of the Lower Yangtze block under the adjustment and coupling of the peripheral and intraplate deformation. The marine stratigraphic development in the area is relatively complete, and the buried depth is shallow (widely covered by the Neogene and the Quaternary system of about 500~1000m thick). It is a new layers and new fields of hydrocarbon exploration, is also the next direction in oil and gas strategy discovery and exploration breakthrough. In recent years, new progress has been made in the study of basin tectonic geology and petroleum geology.

The Laoshan uplift can be divided into the Qingfeng deformation zone in the north, a cap-decollement-overthrust-nappe system as a whole with NE-trending reverse faults, and the Gaoshi stability zone in the south, a stable zone with weak deformation in the whole and NW-trending echelon faults in small scale (Fig. 2). The faults in Laoshan uplift can be divided into three groups according to their strikes, namely the NE-, NW- and near EW-trending groups, with the boundary faults being near EW-trending inverted faults. The deformation of its marine structural layer is stronger in its north, west and upper intervals than that in the south, east and lower ones. The evidences of compression during the Indosinian-Early Yanshanian epoch and weak extension/transension during the Late Yanshanian-Early Himalayan epoch are obvious. Four structural patterns, including compression, extension, strike-slip and inversion, occur in the uplift. The analysis of tectonic evolution reveals that the area where the Laoshan uplift is located was a paleo-uplift during the Caledonian, a stable platform during the Hercynian, a forebulge flexure belt of the northern foreland basin during the Indosinian leading to an anticline with an enlarging amplitude, and a reformed faulted anticline during the Early Yanshanian, while the basic shape of Laoshan uplift came into being during the Middle Yanshanian. Followingly, it was denudated and developed locally some small residual sags during the Late Yanshanian-Early Himalayan, and began to subside as a whole during the Late Himalayan. The Gaoshi stability zone of Laoshan uplift is a favorable zone for exploration of the marine oil and gas in the South Yellow Sea Basin; meanwhile its marine lower structural

zone features weak structural reformation, so is favorable for hydrocarbon exploration.

**Key words:** marine stratum, tectonic evolution, hydrocarbon exploration, Laoshan uplift, South Yellow Sea basin

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