



Meso-Cenozoic thermal-rheological evolution in Jiyang sub-basin, Bohai Bay Basin and its implication for basin extension revealed by numerical modelling

Lu Li (1,2), Nansheng Qiu (1,2), Wei Xu (1,2)

(1) State Key Laboratory of Petroleum Resources and Prospecting, China University of Petroleum, Beijing, 102249, China, (2) Research Center for Basin and Reservoir, China University of Petroleum, Beijing 102249, China

Jiyang sub-basin is an oil-rich depression located in the southeast of Bohai Bay Basin, which is one of the most important hydrocarbon area in east of China. The thermal-rheological structure of the lithosphere can explain the dynamics evolution processes of basins, continental margins and orogenic belts, which directly reflects the characteristics of the lithosphere geodynamics. Nevertheless it is poorly to understand the evolution of lithospheric thermal-rheological structure in Jiyang sub-basin and its implication for basin extension. In this study, two dimensional numerical modelling is applied to calculate the paleo-temperature field and the thermo-lithospheric structure, which are used to estimate the evolution of lithospheric thermal-rheological structure. The results of study show that in Mesozoic the lithosphere was of relative rigidity and stable, as featured by large thickness and strength whereas after late Cretaceous the lithospheric strength decreased rapidly. The analysis of thermal-rheological properties shows that the lithospheric thermo-lithospheric structure is sandwiched-like with two ductile layers and two brittle layers. The upper crust is usually brittle. The brittle layers appear at outer 20km of the crust, below 20km ductile deformation predominates. There is also a 10km brittle layer on the top of the upper mantle. The integrated lithospheric yield strength is about $1.3-4.5 \times 10^{12} \text{N/m}$, showing a weak lithosphere which may support the idea that the extension achieved by the ductile flow below the brittle layers.

Keywords: lithospheric thermal-rheological structure; Jiyang sub-basin; Numerical modeling