Characteristics and evolution of geothermal field in the Bozhong Sub-basin, Bohaiwan Basin, China

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Based on the analysis of tectonic evolution, characteristics and evolution of the geothermal field in the Bozhong sub-basin of the Bohaiwan basin in eastern China have been summarized by means of measured temperature data, vitrinite reflection gradient and numerical simulation.

Measured formation temperature data show that the present geotemperature field has a good correlation with the depth, but temperature gradients are different in various areas and layers. Temperature gradients decrease from the Shahejie Formation to the Dongying Formation in the Paleogene System and increase from the Guantao Formation to the Minghuazhen Formation in the Neogene System. Temperature gradients in the uplifts (about 3.0~4.0°C/100m) are higher than that in the depression (about 2.5~3.5°C/100m) that maybe result from the effect of lower rock thermal conductivity in the depression and the hot fluid flow along main faults in these uplifts.

The paleo-geothermal gradient, calculated from the vitrinite reflection gradient, is about 3.5~5.8°C/100m and observably higher than that in nowadays, which indicates not only the thermal field in the study area was continued cooling during the post-rifting period in the Neogene (25Ma ~ nowadays), but also there occurred higher maturity of organic matters and more active fluid flow in this sub-basin during the syn-rifting period in the Paleogene (50 ~ 25Ma). The numerical simulation similarly shows the higher paleo-geothermal gradient and the rapid thermal mature of source rocks. The source rock in the 3rd member of the Shahejie Formation in the deep depression center had matured in 27.4Ma at latest and had entered producing-gas stage from producing-oil stage in a short time.

Carbonate and its stable isotopes for the reconstruction of hydrological changes in the Holocene Bosten Lake in China

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Carbonate content in the Bosten Lake core sediments in the mid-latitude arid China and the mineral calcite, aragonite and dolomite contents, carbon and oxygen isotopes have been analyzed in this paper, it is shown that calcite and aragonite content, the characteristics of stable isotopes and the correlation coefficient between these carbon and oxygen isotopes have an obvious relation with the hydrological changes in the Bosten Lake that supplies by the ice-snow melt-water. In the period of 8500~8100a B.P., stable isotopes of sediment carbonate are $\delta^{13}C$=0 ~ -4‰, $\delta^{18}O$=-6 ~ -5‰, r=0.04 (coefficient), little aragonite in the carbonate. It implied that climate was cold and a little water inflowed into the lake; From 8100 to 3100a B.P., $\delta^{13}C$=-1 ~ +5‰, $\delta^{18}O$=-6.5 ~ -+2‰, r=0.7. The climate had several cold-warm alternation in the warm background. Lake water enlarged as judged from the result of stable isotopes and calcite, aragonite content; From 3100~2200a B.P., $\delta^{13}C$=0 ~ +1‰, $\delta^{18}O$=-6 ~ -4‰, r=0.1. The temperature fell in this period and made the evaporation down also, so the lake water minished and the ice-snow melt-water took a great influence to the stable isotopes, and let a lower correlation. Although the isotope characteristics in this period was similar with that in the 8500~8100a B.P., the hydrological change was an obvious different; From 2200 a B.P., $\delta^{13}C$=+2 ~ +4‰, $\delta^{18}O$=0 ~ +1‰, r=0.9, aragonite content is 30~40%. It was shown that the temperature ascended in this area, and lake water had been influenced largely by the evaporation.