



Features and geotectonic evolution of the Alxa Terrane at North Qilian Mountains in China

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The Alxa Terrane in west China, covered with Badain Jaran and Tengger Deserts at the earth's surface, lies geographically on the north of the Qilian-Mountains Structural Belt and the Qinghai-Tibet Plateau with intense tectonic activities. The Mongolian Plateau with Cenozoic activities and the Ordos Plateau are on the north and east of the terrane separately. Tectonically the terrane lies among the Central Asian Orogenic Belt, the Qilian-Qinling Orogenic Belt in the Tarim Plate, and the North China Craton. In view of its special geotectonic location, the knowledge about the Alxa Terrane generation and evolution would be significant to the understanding of plates and terranes convergence and evolution in west China and to hydrocarbon exploration in those small and medium basins in the Hexi Corridor.

The conclusions include (1) the Alxa Terrane is a component part in the west of the North China Plate instead of a part separated from the Tarim Plate. Neoproterozoic rocks occurring in the Beidashan area in west Alxa are mainly composed of granodiorite gneiss with typical TTG gneiss features. The age of the magmatic zircon nucleus is about 2522 ± 30 Ma, which is basically consistent with that of TFG gneiss pervasively distributing in the North China Craton; (2) the Alxa Terrane was a relatively isolated small terrane in the Archaean and Proterozoic Eras. The lithologies of the crystalline basement are different from those in the Tarim and North China Plates. Tectothermal events took place 800-1000 Ma and 400-600 Ma ago separately in Alxa, which had few signatures in the North China Plate. The North China Plate and the Alxa Terrane converged in the south and diverged in the north due to the impact of the Caledonian Movement and then merged at the early stage of the Middle Ordovician. During the Middle Hercynian Movement, the Paleoasian Ocean in the north closed and new crust appeared in the Early Permian to form the trench-arc-basin system at the north margin. During the Late Hercynian Movement, the Alxa Terrane dived southwards and the Paleo-Qilian Ocean closed. The crust thickened and the Alxa Terrane merged into the Tarim and North China Plates; (3) due to its special tectonic setting, the Himalayan Neotethys Movement had a great influence on the Alxa Terrane. Intense strike slipping occurred through the Altun Fault zone between the Tarim and North China Plates, which had a great tectonic significance to the Alxa Terrane with the characteristics of activation between these two plates. The south margin of the terrane shows left-lateral slipping and the north margin shows right-lateral slipping. The structural belts forming in the Paleozoic Era have consequently been strongly reconstructed by Cenozoic NE structures; (4) frequent tectonic movements of the Alxa Terrane have given rise to rapid subsidence and uplifting of those small and medium coal-measure basin groups (the Alxa-Yin'e basin group, the Beishan basin group, the Hexi Corridor basin group, the basin group in east Qilian Mountains, the basin group in west Qilian Mountains, the Altun basin group, and the basin group around the Qaidam) forming in the south and north during the relatively stable Yanshan Period, which had all been strongly reconstructed and destroyed at the later stage, resulting in immature source rocks or tight reservoir rocks unfavorable for hydrocarbon generation, migration and accumulation. So hydrocarbon exploration in these areas is not promising.