

Yanshanian tectonic transform and magmatic activities  
in Shandong Province, China

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**Abstract:** The crustal movement was intense in Yanshanian, from 205Ma to 65Ma in Shandong Province. When the tectonic system completely changed from paleo-Asian tectonic circle to shore Pacific tectonic circle, and established the elementary tectonic framework of Shandong Province. From then on, the tectonic movements of Shandong were ascribed to the subduction (north-west-trending) of Pacific plate under Eurasian. Due to the subduction, fast collapse (delamination) may take place and the mantle plume emerged in Jiaodong. In addition, owing to the subduction of Pacific plate under Eurasian, there appeared left-lateral advection and extension for Tan-Lu faults (named as Yishu fault in Shandong), and together with the collapse of Yanshanian orogenic belts, all induced the crustal extension in Shandong.

The Yanshanian mafic dikes, volcanic rocks and alkaline rocks resulting from extensional setting widely appeared in Shandong Province. On the base of studying of the K-Ar and SHRIMP U-Pb zircon ages, geochemical and Sr-Nd-Pb isotopic features of Yanshanian mafic dikes and volcanic rocks from Shandong Province. In addition, in view of the high gold contents in the lamprophyres, and the significance of Yanshanian for gold mineralization in Shandong, the relation between lamprophyres and gold deposit is also discussed in this paper. By studying, the main conclusions have been achieved as follows:

1. The mafic dikes, volcanic rocks and alkalic-ultramafic dikes as the result of the partial melting of enriched mantle, are terrestrial, and were all formed in the extensional settings. In Qingshan formation volcanic rocks, there exist adakitic lavas resulted from partial melting of delaminated lower continental crust, which provide further evidence on the foundering of lower continental crust in NCC.

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**Key words:** Yanshanian era, subduction, crustal extension, lamprophyres, gold deposit, Shandong Province

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2. The formation of the enriched mantle (EM1) is attributed to the strong metasomatism-taking place between subducted Yangtze lower crust and North China Craton (NCC). Due to the subduction of Pacific plate under Eurasian in early Cretaceous, at about 140 Ma, fast collapse (delamination) took place and the mantle plume emerged, both resulted in the large-scale crustal extension in Jiaodong. In addition, owing to the subduction of Pacific plate under Eurasian, there appeared left-lateral advection and extension for Tan-Lu faults (named as Yishu fault in Shandong), and which induced the crustal extension in Luxi. Under the cooperation of lifts and mantle fluids, the melting point of mantle peridotite fell, and then, extensive melting took place in the enriched mantle, which resulted in the appearance of abundant mafic dikes, ultramafic dikes and contemporaneous volcanic rocks in Shandong Province. Moreover, in view of the speeds of collapse, extension and magmatic emplacement were so fast that no crustal contamination in magma.

3. The K-Ar and SHRIMP U-Pb zircon ages of mafic dikes vary between  $72.2 \pm 1.70$  Ma and  $204.2 \pm 5.4$  Ma, and mostly between 90 Ma and 144 Ma. Integrating the ages of the mafic dikes, and the available data of mafic dikes and volcanic rocks, at least, there existed four episodes Mesozoic crustal extension in Shandong Province, namely, 80 Ma, 100 Ma, 120 Ma and 140 Ma, which is similar to that of SC (South China), indicating that maybe the effect of the subduction of ancient Pacific plate (Izanaqi or Kula) under Eurasian on EC (east of China). Mesozoic crustal extension mainly was controlled by the different factors in Ludong and Luxi. In Ludong, the crustal extension may be attributed to the activities of delamination and mantle plume, while in Luxi, the crustal extension was owed to the left-lateral advection and extension of Tan-Lu faults.

4. The gold contents of the calc-alkaline lamprophyres in Jiaobei are high (average in 28 ppb), which is significant for the exploration in the future.

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