Research Advances

Discovery of the Early Devonian Sinistral Shear in the Jiangshan-Shaoxing Fault Zone and its Tectonic Significance

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The Jiangshan–Shaoxing fault zone (JSFZ) was formed by the amalgamation of the Yangtze and Cathaysia blocks in the Neoproterozoic. Since the Paleozoic, the JSFZ has experienced three episodes of tectonic activities: the Early Paleozoic ductile strike-slip shear, Early Mesozoic thrust, and the Late Mesozoic extension. The JSFZ activities have influenced the regional sedimentary environment, and also controlled the development and evolution of the Mesozoic–Cenozoic graben basins. Although the Late Paleozoic tectono-magmatism was reported previously,

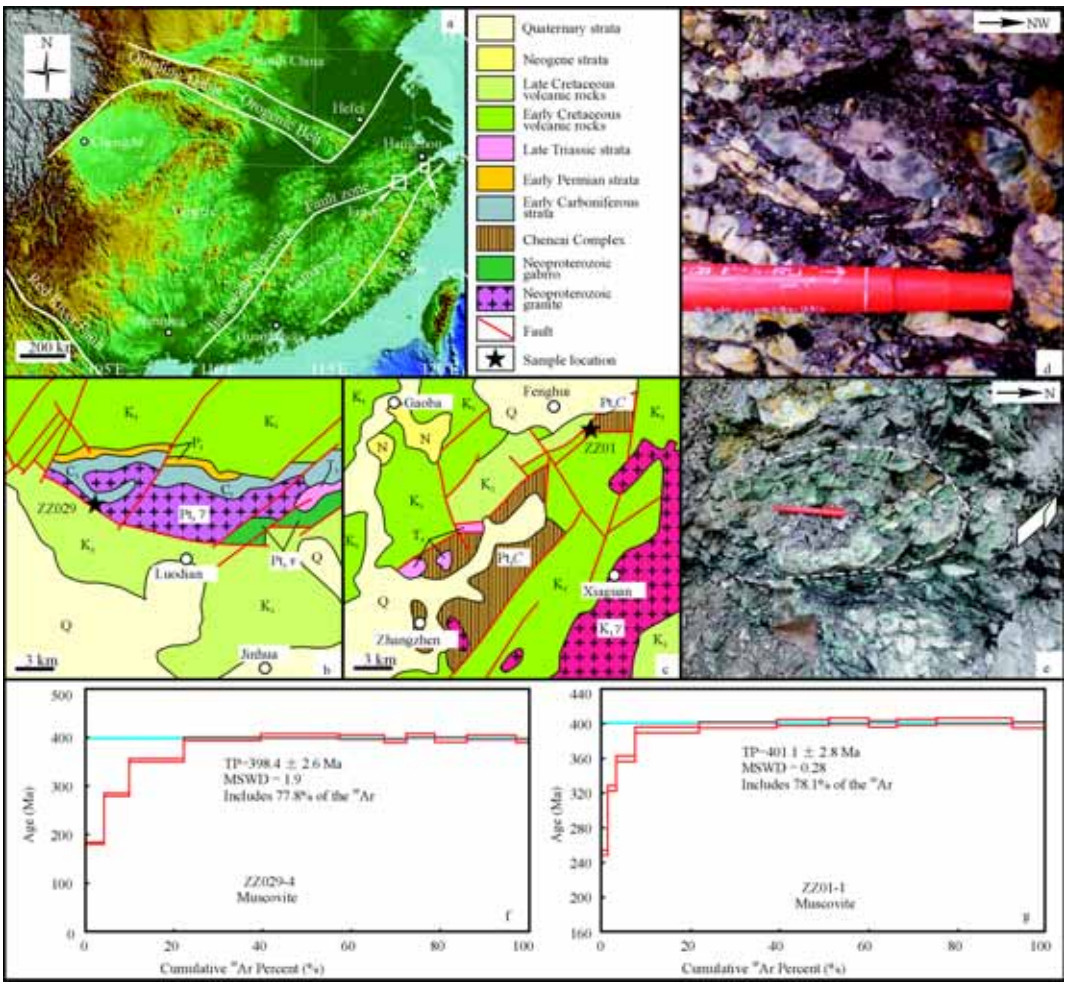

Fig. 1. (a), Sketched topography of South China, showing the tectonic setting of the study region; (b), Geological map of the Luodian (b) and Fenghui (c) regions, respectively; (d), Domino structure and (e) A-type fold indicating NW-SE shearing; (f), Muscovite $^{40}Ar/^{39}Ar$ ages of the Sample ZZ029-4 from the Neoproterozoic gneissic granite; (g), Muscovite $^{40}Ar/^{39}Ar$ ages of the Sample ZZ01-1 of the granitic gneiss from the Chencai Complex.

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little attention has been paid due to the lack of accurate geochronology data. This study carried out two $^{40}Ar/^{39}Ar$ step heating analyses of muscovite from the two newly-found shear belts, and determined the timing of the JSFZ sinistral shear in the Late Paleozoic. This may provide better constraints for the termination of the Late Paleozoic intracontinental orogeny of the South China.

The JSFZ, as a lithosphere-scale fault zone, stretches northeast across the Zhejiang Province (Fig. 1a). Two sinistral shear belts were recognized in the Luodian (middle part of JSFZ) and Fenghui (east part of JSFZ) regions, respectively (Figs. 1b, c). The shear belt in the Luodian region occurs within the Neoproterozoic gneissic granite, and its width is approximately 10–15 m, with a strike direction of 300°. Derived structures are abundant in this shear belt, including cleavage zone, domino structure, and A-type fold (Figs. 1d, e). Characteristics of the porphyroclast fragments inside domino structure indicate a NW–SE strike-slip shear. In the Fenghui region, the shear belt has developed in granitic gneiss from the Neoproterozoic Chencai Complex. That the asymmetry rotated porphyroclast system and A-type lineation are observed in this shear belt suggest it is dominated by NE–SW-oriented shear. Additionally, the appearance of muscovite along the foliation and its disappearance in the wall rocks imply that the muscovite is probably syntectonic. Based upon the $^{40}Ar/^{39}Ar$ step heating analyses of muscovite, we obtained the plateau ages of 401 and 398 Ma, indicating that the JSFZ experienced sinistral shear during the Early Devonian (Figs. 1f, g).

Early Paleozoic intracontinental orogeny of the South China resulted in the formation of syntectonic granites, compressional folds in pre-Devonian strata, and metamorphism. Previous studies showed that the retrograde cooling ages of the intracontinental orogeny ranged from 440 to 420 Ma. New $^{40}Ar/^{39}Ar$ dating indicates the sinistral shear in the JSFZ occurred around 401–398 Ma, and suggests the intracontinental orogeny of the South China may have continued until the early stage of Late Paleozoic.

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