



## **Early Cretaceous structural deformation and evolution of the northern segment of the Sulu orogenic belt : a case study of the Rizhao ductile shear zones, eastern Jiaodong**

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Located between the North China and the Yangtze plates, the Sulu orogenic belt became part of the Eurasian plate in Late Mesozoic. The structural deformation, evolution and denudation of the UHP rocks in the orogenic belt in the Early Cretaceous has been extensively debated in the last decades. Middle-upper crustal shear zones are widely distributed in the Rizhao-Wulian area that is located in the northern segment of the Sulu orogenic belt. Our detailed study on the structural, microstructural and fabric characteristics of the shear zones may help to clarify the debates. Middle-upper crustal shear zones are inhomogeneously localized within and along the north margin of the Sulu orogenic belt. They extend generally in NE-SW direction, but locally change to E-W in Rizhao region. Mylonitic foliations in the shear zones generally have varying dipping directions and generally shallow dip angles, but stretching lineations on the foliations consistently plunge E-W. Microstructural and fabric analysis suggest that mylonitic rocks along a section from Sanzhuang (west) to Rizhao (east), across the orogenic belt, show prograde trend, i.e. from upper greenschist facies to upper amphibolites facies. In any case, top-to-the-West or -WNW shear sense is shown by mesoscopic and microscopic shear indicators, e.g., S-C fabrics,  $\sigma$ - and  $\delta$ - type mantled feldspar porphyroclasts, and mica fish etc., which is consistent with that from the Wulian detachment shear zone. A mylonitized granitic pegmatite vein with zircon U-Pb age of  $134.4 \pm 3.0$  Ma and the undeformed Kuaijishan granitic pluton with zircon U-Pb age of  $119.5 \pm 2.0$  Ma near Rizhao imply that the shearing started at or after ca. 135 and ceased before ca. 120 at the southwestern part of the Sulu orogenic belt. This age span is in accordance with the results from the Wulian detachment fault zone along the western margin of the Sulu belt. We therefore propose that shearing in both the Rizhao and the Wulian areas are the product of the identical Early Cretaceous event as a result of regional tectonic extension. Lower crustal flow accompanying middle-upper crustal doming may best explain the consistent top-to-the west shearing across the Sulu UHP orogenic belt. The scenario complies well with the parallel extension tectonics model (PET) of continental extension driven by Palaeopacific–Eurasian plate interaction.

**Key words:** eastern Asia, Sulu orogenic belt, Cretaceous lithosphere extension, the ductile shear zone, structural deformation