Geophysical Research Abstracts
Vol. 15, EGU2013-7915, 2013
EGU General Assembly 2013

The structure of the Mesozoic Xingcheng-Taili ductile shear zone in the North China craton

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The Xingcheng-Taili area (western Liaoning Province in China), and is tectonically located in the eastern section of the northern margin of the North China craton (NCC). This area is dominantly comprised of various types of granitic rocks. Based on, formation age, texture and mineral assemblage, the granitic rocks can be divided into three main types, which reflect the evolutionary history during the geological history of the NCC.

Neoarchean granitic rocks with emplacement ages of ca. 2500 Ma, previously termed “Suizhong granite”, are mainly exposed in the middle part of the study area. The Neoarchean granitic rocks are composed of granitic gneiss, biotite-hornblende-plagioclase gneiss and leucosomes. The granitic gneiss exhibits gneissic texture and S-C fabrics and contains a large number of biotite-hornblende-plagioclase gneiss and leucosomes enclaves with a similar gneissosity and anatectic characteristics. The steep gneissosity and banded structures trend nearly E-W, consist with the regional structures of the NCC, and indicate a tectonic setting of the NCC deep crust.

Upper Triassic porphyritic granitic gneiss, granite aplite and quartz diorite with U-Pb zircon ages of ca. 220 Ma intruded Neoarchean gneisses. Their formation ages are considered to relate with the NCC destruction in the early Mesozoic times. A sinistral shear zone was developed within the porphyritic granitic gneiss and quartz diorite, with steep foliation, augen structure, and NE-ENE stretching lineation. Upper Triassic rocks have different deformation characteristics from the Neoarchean granitic rocks, which may indicate a deformation event in Late Triassic times, ductile deformation structures superimposed on Neoarchean granitic rocks.

Biotite adamellite with a $\sim$150 Ma-age is located in the north and south of the study area. These rocks show the massive structure in the south, a gneissic structure in the north. The Late Jurassic magmatism reflects apparent thinning of NCC continental crust. The strongly deformed biotite adamellite developed a gneissosity structure with S-C fabrics, sinistral shear zones with NE trending, and show the deformation characteristics of shallow crustal level reflecting decratonization of NCC continental crust. Neoarchean granitic rocks and Late Triassic rocks were deformed again, generated mylonitic fabric, previous deformation structures have been transformed.

The attitude of the foliation is ca. 316$\sim$357/88 with the stretching lineation of $\sim$240/5. The angle between S- and C-planes is between 10 and 20°. In strongly deformed portions, the two groups of foliation are almost parallel. The sharp angle between S- and C-foliation clearly indicates NE-NEE sinistral strike-slip characteristics of the ductile shear zone. Crystal preferred orientations of quartz determined by electron back scatter diffraction from three types of granitic rocks suggest sinistral strike-slipping and a deformation temperature at about 400°C. Quartz mainly shows low-temperature fabrics with dominant {0001}-slip system.

All of the structural characteristics indicate that the Xingcheng-Taili ductile shear zone represents a NE-ENE sinistral strike-slip ductile deformation event after intrusion of the Upper Jurassic biotite adamellite and transformed and superimposed previous deformation structures. This deformation event might have occurred in Early Cretaceous times related to the change of the motion direction from WNW to NNW of the West Pacific Izanagi plate, which obliquely subducted under the Eurasian plate.