Kinematics and timings of two NNE-trending ductile shear zones from the Yanshan intraplate orogen, North China Craton

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Localized regions of large magnitude extensional strain typified by metamorphic core complexes are prominent geologic and physiographic features of the Yanshan intraplate orogen, North China Craton. Compared to the typical metamorphic core complexes defined in the Basin and Range Province, one exceptional, phenomenal structural feature is the coexistence of seemingly incompatible earlier strike-slip ductile shear zone and later normal fault in metamorphic core complexes within the Yanshan intraplate orogen. Two such important extensional structures are the Louzidian ductile shear zone and the related Louzidian normal fault in the Kalaqin metamorphic core complex, Inner Mongolia, and the Waziyu ductile shear zone and the related marginal normal fault of Fuxin basin in the Yiwuluhan metamorphic core complex, Western Liaoning.

Structural analyses reveal that these ductile shear zones were genetically related to sinistral strike-slips and extensional faulting and formed under greenschist facies conditions. Two samples from the Louzidian ductile shear zone yield a $^{40}Ar/^{39}Ar$ biotite plateau age of 133 Ma and a K-feldspar age of 126 Ma, whereas three synkinematic biotites from the Waziyu ductile zone give a $^{40}Ar/^{39}Ar$ plateau age span of 130-116 Ma. These plateau ages record the time of ductile deformation and mylonitization with sinistral strike-slip and extensional movement along the Louzidian and the Waziyu ductile shear zones, and thus establish an Early Cretaceous age for such structures. The temporal proximity of these ages to the times when regional strike-slip event represented by the Tan-Lu fault zone occurred and large-scale gold metallogenesis in Eastern China lasted imply that, these ages not only provide important constraints on the first-phase unroofing of the metamorphic core complexes within the Yanshan intraplate orogen, but also suggest strong genetic links between these structural phenomena and important metallogenic events.

Silicon isotope compositions of Proterozoic sedimentary siliceous rocks in Shisanling area, Beijing, China

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The evolution trend of the chemical and isotopic composition of the oceans is an important topic of oceanic geological and geochemical studies. The Proterozoic is an important transition period in the evolution of the earth in which biological activity increased and precipitation of carbonate become common, reflecting important changes in the conditions in the world oceans. In this study, a systematic investigation on Si and O isotope compositions of chert bands and nodules in the Middle Proterozoic (1.9~1.0Ga) carbonate rocks in the Shisanling area, Beijing was undertaken to gain better understanding of the geochemical conditions of coeval oceanic water.

It was found that the $\delta^{18}O$ values of 14 samples vary in the range of 14.1~25.8 ‰, but most of them show the value of 23.4~24.8‰, reflecting their biological sedimentary origin. The $\delta^{30}Si$ values of 18 samples vary in the range of 0.9~3.4 ‰, mostly in the range of 2.0~2.7‰. The highest value of 3.4 ‰ has reached the upper limit of silicon isotope variation observed in terrestrial sample so far. It was found that almost all chert bands and nodules in carbonate rocks display positive $\delta^{30}Si$ values (Ding et al, 1996). However, the average $\delta^{30}Si$ value of chert bands and nodules in carbonate of Proterozoic strata (2.49‰) is significantly higher than those from various period of the Phanerozoic Era (0.52~1.02‰). This may be caused by higher silicon content and more positive $\delta^{30}Si$ value in the Proterozoic ocean.

Similar to the results reported by Song et al. (1990), It was also observed that the siliceous bands and nodules formed in upper tidal zone show higher $\delta^{30}Si$ value than those formed in subtidal zone. This may indicate that the sea water near the coast, which has higher portion of water from the riverine system, has higher $\delta^{30}Si$ value than that far from the coast.

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Reference:

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