Accepted Manuscript

Full length Article

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Chenyue Liang, Yongjiang Liu, Franz Neubauer, Wei Jin, Weimin Li, Bianca Heberer, Quanbo Wen, Jing Li, Li Zhang

PII: S1367-9120(17)30006-8
DOI: http://dx.doi.org/10.1016/j.jseaes.2017.01.013
Reference: JAES 2931

To appear in: *Journal of Asian Earth Sciences*

Received Date: 10 September 2016
Revised Date: 9 January 2017
Accepted Date: 10 January 2017

Please cite this article as: Liang, C., Liu, Y., Neubauer, F., Jin, W., Li, W., Heberer, B., Wen, Q., Li, J., Zhang, L., Structural and rheological analysis of the western Liaoning metamorphic core complex corridor: Indications of an extensional Late Mesozoic tectonic setting of the eastern North China Craton, *Journal of Asian Earth Sciences* (2017), doi: http://dx.doi.org/10.1016/j.jseaes.2017.01.013

Structural and rheological analysis of the western Liaoning metamorphic core complex corridor: Indications of an extensional Late Mesozoic tectonic setting of the eastern North China Craton

Chenyue Liang [a, b], Yongjiang Liu [a *], Franz Neubauer [b], Wei Jin [a], Weimin Li [a], Bianca Heberer [b], Quanbo Wen [a], Jing Li [a], Li Zhang [c]

[a] College of Earth Sciences, Jilin University, Jianshe Str. 2199, 130061 Changchun, Jilin, China

[b] Department of Geography and Geology, University of Salzburg, Hellbrunner Str. 34, A-5020 Salzburg, Austria

[c] Shenyang Geological Survey Center, China Geological Survey, 100034 Shenyang, Liaoning, China

[*] Corresponding author. E-mail: yongjiang@jlu.edu.cn

Abstract

The Xingcheng-Taili ductile shear zone and Yiwulüshan metamorphic core complex formed during crustal extension of the eastern North China Craton. The ENE-trending Xingchegn-Taili sinistral ductile shear zone developed along the margins of the western Liaoning metamorphic core complex corridor within upper greenschist to lower amphibolite facies-grade metamorphic conditions. Shearing was associated with two different ductile deformation events in the Yiwulüshan metamorphic core complex, i.e. (1) an earlier dextral shearing and (2) later sinistral shearing. The earlier dextral ductile shear zone is mainly characterized by simple-shear dominated general shear with L=S and LS tectonites under upper greenschist to lower amphibolite facies conditions. The orientation and fabrics of L=S tectonites indicate that the later ductile deformation consists of almost equally simple and pure shear and constrains a low-middle-temperature sinistral shear within upper greenschist facies-grade conditions. The estimation of rock rheological parameters from dynamically recrystallized grain sizes of quartz indicates that the high-temperature shear zone has formed under lower stress conditions and higher strain rates, while opposite features exist in the lower temperature shear zone. The initiation of deformation of the western Liaoning metamorphic core complex corridor might have started between 136 Ma and 120 Ma and its termination time was at ca. 100 Ma. The NE-ENE strike-slip ductile deformation in the western Liaoning metamorphic core complex corridor, within the Eastern Block of the North China Craton, was resulted from roll-back of the subducting Pacific plate beneath the North China Craton along the eastern Asian margin during Early Cretaceous times.

Keywords:

Deformation structures; EBSD analysis; Finite-strain determination; Kinematic vorticity; Rheological analysis; Xingcheng-Taili ductile shear zone; Yiwulüshan metamorphic core complex; North China Craton