ZHAI Mingguo, HU Bo, ZHAO Taiping, PENG Peng and MENG Qingren, 2016. Late Paleoproterozoic-Neoproterozoic Multi-rifting Events Accompanied by Four Stages of Magmatism in the North China Craton and Their Geological Significance. *Acta Geologica Sinica* (English Edition), 90(supp. 1): 48.

Late Paleoproterozoic-Neoproterozoic Multi-rifting Events Accompanied by Four Stages of Magmatism in the North China Craton and Their Geological Significance

ZHAI Mingguo[1, 2, *], HU Bo[3], ZHAO Taiping[4], PENG Peng[5] and MENG Qingren[6]

1 *Key Laboratory of Mineral Resources, Institute of Geology and geophysics, Chinese Academy of Sciences, Beijing, China*
2 *State Key Laboratory of Continental Geodynamics, Northwest University, Xi'an, China*
3 *College of Earth Science and Resources, Chang'an University, Xi'an, China*
4 *Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Guangzhou, China*
5 *State Key Laboratory of Lithosphere Evolution, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing*
6 *Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing*

An important Paleoproterozoic mobile belt event took place in the North China Craton (NCC), termed the Hutuo Movement. This has been interpreted as a cratonic reworking event with rifting-subduction-collision processes, after which the NCC evolved into a stable platform or para-platform tectonic setting in Earth's middle age period extending longer than ~1.0 Ga. Vast and thick Late Proterozoic–Neoproterozoic sedimentary sequences were extensively deposited on the early metamorphic basement. The major sedimentary basins are the Xiong'er aulacogen system in the south-central NCC, the Yan-Liao aulacogen system in the north-central NCC, the Northern marginal rift system in the northwestern NCC and the Eastern marginal rift system in the eastern NCC.

Four stages of magmatism are recognized in the NCC during the Late Paleoproterozoic- Neoproterozoic: (1) ~1800−1780 Ma mafic dyke swarm and the Xiong'er igneous province; (2) ~1720−1620 Ma anorogenic magmatism; (3) ~1350−1320 Ma diabase sill swarm; (4) ~900 Ma mafic dyke swarm and bimodal volcanism. The first and fourth magmatic events were possibly the result of mantle plume, whereas the second-stage anorogenic magmatism was likely related to a thermal mantle. The third-stage diabase sills could be generated by partial melting of a depleted asthenosphere mantle coupled with slight crustal assimilation. It is thus proposed that the NCC lithosphere should be stable and underlain by a warmer mantle in Earth's middle age. The persistent warmer state of the mantle is believed to have led to multi-stage partial melting of both the mantle and lower crust, and triggered rift development. Late Paleo- and Neoproterozoic mineralization is also obvious in the NCC. Main ore-deposits include magmatic Fe-Ti-P deposit associated with anorthosites and gabbro intrusions, Meso- and Neoproterozoic SEDEX-type Pb-Zn-Cu deposits, REE-Fe-Nb deposits related to Mesoproterozoic rifting and mantle upwelling, and Mesoproterozoic sedimentary GIF (hematite) deposit. All the deposits clearly bore on continental rifting and extension-related magmatism.

Any evidence of the Grenville or other orogenic event is not recorded in the NCC. It is possible that the Proterozoic NCC was located at a remote edge of the Nuna supercontinent if such a supercontinent existed. Or, there is another case, i.e. the Earth's middle age represents a particular tectonic evolution period, during which the Earth had a stable lithosphere with underlying secular warm mantle that resulted in multi-magmatism and rifting from Late Paleoproterozoic to Neoproterozoic.

The authors suggest that the Erath experienced an evaluative tectonic process, from non-plate tectonics via primitive plate tectonics to modern plate tectonics, and in the distant future modern plate tectonics should be replaced by another tectonics. The Earth's primitive plate tectonics operated since Paleoproterozoic (2.1-1.9 Ga), the end of Earth's middle age marks the starting of the modern plate tectonics.

* Corresponding author. E-mail: mgzhai@mail.iggcas.ac.cn