



Parallel Extension Tectonics (PET): Early Cretaceous tectonic extension of the Eastern Eurasian continent

Junlai Liu (1), Mo Ji (1,2), Jinlong Ni (1,3), Huimei Guan (1,4), Liang Shen (1,5)

(1) State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences, Beijing 100083, China, (2) CNOOC Research Institute, Beijing 100027, China, (3) Shandong University of Science and Technology, Qingdao 266510, China, (4) Geological Publishing House, Beijing 100083, China, (5) Editorial Office, Geological Bulletin of China, Beijing 100037, China

The present study reports progress of our recent studies on the extensional structures in eastern North China craton and contiguous areas. We focus on characterizing and timing the formation/exhumation of the extensional structures, the Liaonan metamorphic core complex (mcc) and the Dayingzi basin from the Liaodong peninsula, the Queshan mcc, the Wulian mcc and the Zhucheng basin from the Jiaodong peninsula, and the Dashan magmatic dome within the Sulu orogenic belt.

Magmatic rocks (either volcanic or plutonic) are ubiquitous in association with the tectonic extension (both syn- and post-kinematic). Evidence for crustal-mantle magma mixing are popular in many syn-kinematic intrusions. Geochemical analysis reveals that basaltic, andesitic to rhyolitic magmas were generated during the tectonic extension. Sr-Nd isotopes of the syn-kinematic magmatic rocks suggest that they were dominantly originated from ancient or juvenile crust partly with mantle signatures. Post-kinematic mafic intrusions with ages from ca. 121 Ma to Cenozoic, however, are of characteristic oceanic island basalts (OIB)-like trace element distribution patterns and relatively depleted radiogenic Sr-Nd isotope compositions.

Integrated studies on the extensional structures, geochemical signatures of syn-kinematic magmatic rocks (mostly of granitic) and the tectono-magmatic relationships suggest that extension of the crust and the mantle lithosphere triggered the magmatism from both the crust and the mantle. The Early Cretaceous tectono-magmatic evolution of the eastern Eurasian continent is governed by the PET in which the tectonic processes is subdivided into two stages, i.e. an early stage of tectonic extension, and a late stage of collapse of the extended lithosphere and transformation of lithospheric mantle. During the early stage, tectonic extension of the lithosphere led to detachment faulting in both the crust and mantle, resulted in the loss of some of the subcontinental roots, gave rise to the exhumation of the mccs, and triggered plutonic emplacement and volcanic eruptions of hybrid magmas. During the late stage, the nature of mantle lithosphere in North China was changed from the ancient SCLM to the juvenile SCLM.

Extensional structures in eastern Eurasian continent provide a general architecture of the extensional tectonics of a rifted continent. Progressive extension resulted a sudden collapse of the crust (lithosphere) at ca. 130 to 120 Ma, associated with exhumation of mcc's and giant syn-kinematic magmatism, and post-kinematic magmatism. Parallel extension of both the crust and the mantle resulted in detachment faulting and magmatism, and also contributed to inhomogeneous thinning of the NCC lithosphere. Paleo-Pacific plate subduction and roll-back of the subducting oceanic plate contributed to the PET tectonic processes.