Spatial-temporal extent of the influence of the Mongol-Okhotsk tectonic regime on China during Mesozoic: Evidence from Mesozoic igneous rocks

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It has been a controversal issue whether the southward subduction of the Mongol-Okhotsk oceanic plate happen during Mesozoic. The spatial-temporal distributions of the Mesozoic igneous rocks in NE China provide a contraints on this question. Zircon U-Pb dating results indicate that the Mesozoic magmatisms in the Argun Massif adjacent to the Mongol-Okhotsk suture can be subdivided into the following stages: ~245 Ma, ~220 Ma, ~200 Ma, ~185 Ma, ~162 Ma, ~142 Ma, and ~125 Ma. The Early Mesozoic igneous rocks (~245 Ma, ~220 Ma, ~200 Ma, and ~185 Ma) consist of a suite of calc-alkaline basalt, basalt-andesite, diorite, and granodiorite. Together with the coeval porphyry Cu-Mo deposits, they reveal the subduction of the Mongol-Okhotsk plate beneath the Argun Massif. The ~162 Ma igneous rocks are composed of trachy-basalt, basaltic trachyandesite, and trachyandesite which display a transitional type between alkaline and subalkaline series, and only occur in the Great Xing'an Range and northern Hebei-western Liaoning provinces. Similarly, ~142 Ma magmatism also only occur in the same area as ~162 Ma igneous rocks and consist of alkaline ryholite, implying an extensional environment. Taken together, it is suggested that the ~162 Ma and ~142 Ma magmatisms could be related the evolution of the Mongol-Okhotsk tectonic regime and could be generated by the collapse and/or delamination of the thickened lower crust in the Great Xing'an Range and northern Hebei-western Liaoning provinces, which is also supported by two regional disconformability (beneath the Haifanggou Formation and overlying the Tuchengzi Formation, respectively). From north to south, the beginning time of ~162 Ma and ~142 Ma magmatisms gradually become younger, further implying that their formations should be attributed to the evolution of the Mongol-Okhotsk tectonic regime. The ~125 Ma igneous rocks are widely distributed in NE China and consist of bimodal ignepus rocks in the Great Xing'an Range and Songliao basin as well as a calc-alkaline volcanic rocks in the eastern Heilongjiang-Jinlin provinces, suggesting that the later could be formed under the subduction of the Paleo-pacific plate beneath the Eurasian continent, whereas the former could be generated by the delamination of the thickened lower crust and/or the subduction of the Paleo-pacific plate. This work is supported by 973 program (2013CB429803) and NSFC (41272077).

Tectonic implications for Mid-late-Neoproterozoic rift-related volcanic rocks in China

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Mid-late-Neoproterozoic rift-related volcanic rocks which had aggregated to form part of the Rodinia Supercontinet by ca. 900 Ma are widespread on several Precambrian in China. These volcanic rocks, which mainly consist of huge volumes of basic rocks and variable amounts of silicic volcanics, with small amounts or absence of intermediate rocks displaying a compositional bimodality, have attracted a number of recent studies. Several lines of evidence show most of these volcanics have a compositional bimodality, and formed in an intra-continental rift setting which may be genetically linked with mantle plumes activities.

On the basis of petrogeochemical data, these basic lavas can be classified into two major types: High Ti/Y and Low Ti/Y types, both of which can be further divided into two subtypes by different Nb/La ratios, respectively. The lavas (Nb/La <0.85) can be accounted for by lithospheric contamination of asthenospnere- (or plume-) derived magmas during their ascent, but parental magmas of others (Nb/La>0.85) may have not undergone such a process.

The rift-related volcanism at end of mid-Neoproterozoic and early-Cambrian coincided temporally with the separating between Australia–East Antarctica, South China and Laurentia and between Australia and Tarim, respectively. The mid-late-Neoproterozoic volcanism in China is the geologic record of broken-up of the supercontinent Rodinia.(This research is supported by Land and Resources Survey Project of China, Grant No. 1212011220649 and the National Natural Science Foundation of China, Grant No. 40872061)

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