Lithospheric Evolution of the North China Craton: Evidence from high-Mg adakitic rocks and their entrained xenoliths

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The eastern block of the North China Craton (NCC) is perhaps the best example of an Archaean craton that has lost its lower crust and lithospheric mantle keel [1]. Late Triassic (222 Ma) to Early Cretaceous (116 Ma) high-Mg intermediate-felsic volcanic and intrusive rocks with adakitic affinities are widespread in Eastern China. They are characterized by high Mg (Mg# up to 73), Cr (up to 670 ppm), Sr (up to 1800 ppm), and low Yb (<1.8 ppm) with fractionated REE (La_N/Yb_N up to 45). Many of the voclanic rocks from the NCC contain chromite and reversely zoned pyroxene. Early Creatceous high-Mg diorites from the Xu-Huai area contain eclogite and garnet clinopyroxenite xenoliths, while those from the Laiwu area contain peridotite xenoliths. The eclogites and garnet clinopyroxenites formed at >1.5 GPa and 800 to 1060°C and 220 Ma [2]. They have major and trace element compositions complementary to their host high-Mg diorites. The peridotite xenoliths are mantle-derived, as inidicated by their very low CaO content of olivine (≤0.06wt%). Three least metasomatized peridotites have Archean Re-depletion model ages of 2.6-2.7 Ga, which are identitcal to those of peridoite xenoliths from the Ordovician kimberlites. Taken together, these results further support removal of the Archean lithospheric mantle and recyclying of the lower crust in the NCC by foundering. The high-Mg rocks formed via melting of foundered eclogite, followed by melt-peridotite interaction. The foundering was triggered by north-westward subduction of the Yangtze Craton beneath the North China Craton and/or the southward subduction of the Mongolian plate beneath the North China Craton, both of which occurred in the Late Triassic.

References

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