Water content in the Early Cretaceous gabbros from East China: implications for the destruction of the North China Craton

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It has been suggested that the longevity of cratons is related in part to the low water content of their deep mantle roots, which lead to a much higher viscosity than their underlying asthenosphere. Consequently, the removal of cratonic roots is expected to be closely connected to the hydration of the lithospheric mantle. Here we present the whole-rock geochemistry and Sr-Nd-Pb isotope for the early Cretaceous mafic intrusions in the eastern China and calculate the water contents of corresponding primary melts. We also estimate the water contents and the voscosity of the lithosphere mantle that produced those melts. Twenty-two studied gabbros all exhibit geochemical characters of arc-like incompatible trace element and EM1-like Sr-Nd-Pb isotopic composition. The water contents of cpx pohenocrysts, which are measured by FTIR, vary from 99 to 291 ppm wt. The water contents of corresponding primary melts, which are calculated according to the water contents of cpx phenocrysts and the chemical-composition-dependent water partitioning coefficient [1], vary from 1.19 to 2.37 wt.%. Based on the degree of partial melting and the melt-peridotite partitioning coefficient, the enriched lithosphere mantle of the eastern North China Craton (NCC) cotains at least 600~1000 ppm of water, which is considerably higher than the Kappaval peridotite xenoliths. Under such water-riched condition, the viscosity of the lithosphere maybe similar to that of the astheonsphere hence the craton may lost its stability. Combined with previous research data, the lithosphere beneath the east block of NCC shows more character of hydrated than the west block, which indicates that the westward subduction of Paleo-Pacific plate may be the key factor causing the destruction of the NCC.

[1] Xia et al. (2013), *Earth Planet. Sci. Lett.* 361, 85-97.