Crustal components in pyroxenite xenoliths from eastern North China craton: implications for lithospheric modification invoked by continental subduction

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Pyroxenite xenoliths entrained in a late Cretaceous basaltic dike from the eastern North China craton provide important constrains on the compositional modification of the lithophere during the Mesozoic. Two types of pyroxenites, namely websterite and garnet pyroxenite were identified on the basis of their mineral assemblages. Their equilibrium temperature, falling within the temperature range of the lower crustal xenoliths entrapped in the same dike suggest that they were derived from the lower crust rather than from the lithospheric mantle. The convex upward REE patterns exhibited by the websterites, along with their lower concentrations of highly incompatible elements indicate that they were high pressure cumulates, the compositional features of the garnet pyroxenites also suggest their cumulative origin. The extremely unradiogenic Nd and radiogenic Sr isotopic compositions of the websterites imply the contribution of crustal materials to their sources, we propose that the precursor melts of websterites were derived from a mantle source which had been modified by the subducted continental crust of the Yangtze craton following the collision with the North China craton in the Trassic. The Sr and Nd isotopic compositions of the garnet pyroxenites are consisitent with the suggestion that their precursor melts were derived from an mantle source which had been metasomatized by melts released from the Proto-Tethyan oceanic crust which was subducted into the mantle prior to the subduction of continental crust of Yangtze craton. The occurrence of pyroxenite at the depth of lower crust provide solid evidence that the lithospheric mantle of the the North China craton had been severely modified by the recycled oceanic and continental crust resulted from the collision between the Yangtze craton and the North China craton. This work is financially supported by the National Natural Science Foundation of China (grant: 91214203).