Hf isotope constraints on the petrogenesis of the Paleozoic granites in Nalati, Northwestern China

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Paleozoic granitic magmatism strongly developed in the region of Nalati in West TianShan, China. The LA-ICPMS zircon U-Pb isotope data suggest that the formation ages of the granitic magmatism are mainly between ca.308Ma and 489Ma. Based on the geology, petrography and geochemical characteristics, the granites can be divided into two types: The first type has undergone strongly deformation and caused the development of the gneissic schistosity. Diorite - quartz diorite - granodiorite and monzogranite expose in this area, and formed between ca. 370Ma and 489Ma.This type which formed in a subduction setting mainly are dominantly calc-alkaline series with ANCK=0.93-1.02, being meta-aluminum and peraluminum granite. Values of εHf (t) of Zircon vary greatly (from 3.5 to -13), and T_{DM} is mainly from 1280Ma and 1593Ma with a few from 785 and 890Ma.This reflects that Mid-Proterozoic strata may be the source of the granite, and the Neoproterozoic ancient crust also is a possibility that can't be ruled out. The other type exit none-deformation basically, and the formation age is between ca.355Ma and 324Ma. Zircon εHf (t) vary little, mainly between 5 and 14, this show a strongly mantle material added or the partial melting of a newly formed continental crust. When εHf (t) is maximum (13~15) the T_{DM} of the Hf isotope is in agreement with the granite formation age, suggests that there exit a strongly depleted mantle material added. Basing on the frame of the granite formation age, petrographic and geochemical evidences, the first type granite is considered to be formed during the stage of the ocean-continent transition; the other type is the product of the continental extension after the stage of the ocean-continent transition. The ocean-continent transition may finish about 370Ma, the strongest continental extension may happen at 355Ma with abundant mantle material added.

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Thermo-tectonic destruction of the North China Craton: An overview

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The eastern North China Craton (NCC) is a classic example for removal of old lithospheirc mantle. Evidence for cratonic destruction in this area include decoupled crust and mantle components making up the present-day lithosphere; contrasting thermal gradient, composition and age of the lithospheric mantle sampled by Cenozoic basalts and Ordovician diamondiferous kimberlites [1-4]. Over the past 15 years, intensive, multiple-discipline studies have been carried out on the NCC with aims of characterizing the vertical/lateral extent, timing, and mechanism of this decratonization process. This paper summarizes some recent advances made on these aspects, in particular highlighting the Re-Os age spectrum obtained on peridotite xenoliths from various localities, role of melt-rock interaction in lithospheric transformation, significance of geochemical evolution of Mesozoic-Cenozoic magmatism with respect to lithospheric evolution, and formation of the North-South gravity lineament that cuts through the craton. All these data, integrated with geophysical images and basin analyses, will be used to reconstruct the temporal-spatial change of lithospheric architecture underneath the NCC and to determine whether this cratonic destruction was caused by 'top-down' rapid delamination (<5Ma) or 'bottom-up' more protracted thermal/chemical erosion (>100 Ma), and potential geodynamic triggers. Some pecularites are outlined for the NCC (e.g. small size, large-scale lithospheric structures/belts surrounding and cutting the craton, and stagnant slab in the mantle transition zone), in comparison with other typical cratons in the world, with hope of understanding why destruction happened to the NCC.

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