

Exhumation of the southern segment of the Great Xing'an range since the Late Mesozoic

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During the late Mesozoic, the northeastern Asia (NE Asia) underwent a large-scale crustal extension. This extension led to the emplacement of numerous A-type granitoid magmatism and occurrence of metamorphic core complexes (MCCs). The emplacement time of the Cretaceous granite were dated by zircon U-Pb and the exhumation processes of MCCs were mainly constrained by zircon U-Pb and biotite Ar-Ar dating. However, the lower-temperature thermal history and later stage of exhumation process of NE Asia remain unclear. The southern segment of the Great Xing'an range is located in the southeast of Central Asian Orogenic Belt and north of North China Craton, and it is a vital region to provide constrain for the exhumation history of NE Asia.

In this work, we collected four Cretaceous granite samples (published zircon U-Pb ages range from 130 Ma to 142 Ma) in the southern segment of the Great Xing'an range and applied zircon (U-Th)/He (ZHe) and apatite (U-Th)/He (AHe) dating in order to constrain the exhumation process since the late Mesozoic. The AHe ages of four granite samples range from 92 Ma to 118 Ma, and the ZHe ages range from 110 Ma to 120 Ma.

The time-temperature history yielded by plotting ZHe, AHe and zircon U-Pb ages show that the samples underwent fast cooling during early Cretaceous, with cooling rate of 13-50 °C/Ma. All these four samples are medium-coarse grained texture, which indicates that the granite emplacement depth is more than 3 km. The cooling history of intrusions during the Early Cretaceous includes both magmatic and exhumation cooling. Since the Early Cretaceous, the cooling rate drops drastically to less than 1 °C/Ma. The slow exhumation process since the Early Cretaceous indicates that the southern segment of the Great Xing'an range was probably not affected by the Cenozoic reactivation of adjacent area.