



Tectonothermal Evolution of the Fangshan pluton: Constraints from the (U-Th)/He Ages

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Abstract: The tectonothermal history of the Fangshan pluton is reconstructed by the zircon fission track, apatite (U-Th) /He and zircon (U-Th) /He structural thermochronology based on the high, middle and low-temperature geochronological data in this paper. According to the relationship between the temperature difference (ΔT) and the cooling age difference (Δt) of different minerals, this paper calculates the cooling rate at different stages of thermal history and analyzes the characteristics of the cooling rate changes and the characteristics of uplift process of the Fangshan pluton. The results reveal four phases of the tectonothermal history of the Fangshan pluton: (1) the crystallization and consolidation stage of emplaced magma during 130-120 Ma at the average cooling rate of 60.75 K/Ma; (2) the first slow cooling stage of the Fangshan pluton during 120-58 Ma at the average cooling rate of 0.65 K/Ma and the average uplift rate of 25.8 m/Ma; (3) the fast cooling stage of the Fangshan pluton during 58-34 Ma at the average cooling rate of 6.88 K/Ma and the average uplift rate of 275.2 m/Ma; (4) the second slow cooling stage of the Fangshan pluton since 34 Ma at the average cooling rate of 0.44 K/Ma and the average uplift rate of 17.6 m/Ma. The tectonic activity tends to be stable. The possible kinetic causes of thermal history of the Fangshan pluton are analyzed based on regional tectonic dynamics. The differential uplift-cooling may be associated with the subduction of the eastern Pacific plate of the North China Craton, the intracontinental subduction orogeny on the south and north sides, India-Eurasia collision in the southwestern China and the tectonic uplift of the Qinghai-Tibet Plateau. The formation and the fast cooling stage of the Fangshan pluton are respectively corresponding to two important uplift erosion processes in the North China Craton.

Key word: the Fangshan pluton; (U-Th)/He; tectonothermal evolution; the North China Craton