Abstract: The thermal history of the Awulale area is significant to understanding the tectono-thermal evolution and final formation of the central Tianshan in China. The age data of K-feldspar $^{40}$Ar/$^{39}$Ar and apatite (U–Th)/He revealed at least four Mesozoic–Cenozoic tectono-thermal events in the east Awulale area, which were in the Middle–Late Triassic (244.4–216.5 Ma), Early Jurassic (ca. 180.3 Ma), Early Cretaceous (99.1–98.1 Ma), and early Miocene (18.6–13.7 Ma). This thermal history is consistent with that throughout the Tianshan orogenic belt and surrounding areas. Modeling of the thermal history shows that

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intrusive rocks in the east Awulale area have experienced four stages of cooling in the Mesozoic–Cenozoic. Stage I occurred from ca. 310 to 230 Ma, after magma emplacement, and resulted in cooling to the $^{40}$Ar/$^{39}$Ar closure temperatures of K-feldspar (200–180°C). During this time, tectonism in the central Tianshan was not intense and the rapid cooling was largely due to thermal exchange, with a maximum cooling rate of ~7.1 °C/Myr. Stage II occurred from ca. 230 to 150 Ma. Influenced by the collision between the Qiangtang microcontinent and the Eurasia continental margin, active tectonism was taking place in the central Tianshan, and cooling was caused mainly by tectonic uplift, with a maximum uplift height of the intrusive rocks exceeding 2.7km. Stage III occurred from ca. 150 to 40 Ma, when regional tectonism was weak and cooling was gradual. During this stage, the cooling rate of syenite-porphyry decreased to ~0.1°C/Myr, and the apatites of which remained in the He partial retention zone for a long time. Which indicate that the far-field influence of the two collisions (Lassa and Karakoram-Pamir) at the southern margin of Eurasia during this stage had a weak impact on the central Tianshan. Stage IV occurred from 40 Ma through to the present-day, and was related to the far-field influence of the middle–late Himalayan Orogeny, during which tectonism in the central Tianshan became more intense. In this final stage, many types of intrusive rock were exhumed at the surface, with the maximum uplift exceeding 1 km. Furthermore, the cooling history and regional structural characteristics indicate that since the Mesozoic, under the action of tectonic compression, there has been differential uplift on the northern and southern sides of the east Awulale area. The cooling and exhumation rates of intrusive rocks on the northern side were significantly faster than the southern side.

**Key words:** Central Tianshan, Awulale igneous belt, Thermal modeling, $^{40}$Ar/$^{39}$Ar dating, (U–Th)/He dating

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