

Description of Additional Supplementary Files

File Name: Supplementary Data 1

Description: U-Pb zircon crystallization ages.

File Name: Supplementary Data 2

Description: Extended $^{40}\text{Ar}/^{39}\text{Ar}$ data for dating of sanidine and plagioclase feldspar crystals

File Name: Supplementary Data 3

Description: Recalculated (U-Th)/He data from Mucek *et al.*¹⁰.

File Name: Supplementary Data 4

Description: Calculations of modeled T_{max} and T_{min} values and calculations of thermal stagnation duration (based on approach explained in Supplementary Notes 5 and Supplementary Fig. 2).