Table S2 Thermal history model input table modified from Flowers et al. (2015) [1].

1. Thermochronological data	
Samples and data used in simulations	
Zuogong plateau	
ZHe data: CD272, CD274, CD276	
AHe date: CD272, CD273, CD274, CD275, CD276, CD277, CD279, CD280, CD282	
AFT ages and lengths: CD272, CD273, CD274, CD275, CD276, CD277, CD279, CD280, CD282	
Markam plateau	
AHe data: CD260	
AFT ages and lengths: CD260	
Weixi plateau	
ZHe data[a]: CD252, WX11_03*, WX11_07*, WX11_08*, WX11_10*	
AHe data[a]: CD253, CD255, WX11_03*, WX11_07*, WX11_08*, WX11_10*	
AFT ages and lengths: CD252, CD253, CD254	
Data treatment, uncertainties, and other relevant constraints for all samples	
Treatment: the individual crystals of the samples collected from the low-relief surfaces as input for bulk constraints in QTQt.	
He data (Ma): Mean uncorrected He dates of each sample.	
Fission-track annealing and He diffusion algorithms are from Ketcham et al. (2007) [2] and Gautheron et al. (2009) [3], respectively.	
For zircons with potential radiation damage (cf., having negative eU and age relationship), the diffusion model is from Guenthner et al. (2013) [4].	
Error (Ma) applied in modeling: The 1σ sample standard deviation of each sample was applied.	
Grain dimensions (μm): Mean length and width of apatite crystals were used (Dataset S1).	
Rs (μm): Mean equivalent spherical radius of zircon crystals for each sample (Dataset S2).	
2. Additional geological information	
Assumption	*Explanation and data source*
At present temperature of 10±10 ℃ by 0 Ma	Modern annual ground surface temperature in eastern Tibet from National Climate Center of China Meteorological Administration (CMA)

	(http://www.nmic.cn/).
Simulations begin at near surface temperatures of 20 ± 10 °C at 35 ± 5 Ma for the Markam plateau	The sampled rocks must be exhumed to the surface because volcanic rocks were in angular contact with the underlying Mesozoic sediments around ~35 Ma (Su et al., 2018 [5]; Dataset S4).
Simulations begin at peak temperatures of 750 ± 50 °C at 210 ± 10 Ma for the Zuogong plateau	Based on the intrusion ages of the Zuogong batholith ranging from 214 ± 3 to 216 ± 2 Ma dated by zircon U-Pb (Dataset S4).
Simulations begin at peak temperatures of 750 ± 50 °C at 230 ± 10 Ma for the Weixi plateau	Based on the intrusion ages of the Weixi batholith ranging from 232 ± 9 Ma dated by zircon U-Pb (Dataset S4).
3. System- and model-specific parameters	
Modeling code	QTQt 5.5.0
Number of burn-in and post-burn-in iterations attempted	Each 1,000,000 for all simulations
Reheating allowed or not.	No reheating for simulations of Zuogong, Weixi and Markam samples

Data source:

* Liu-Zeng et al. (2018)[6], see Table S1.

References

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