Analytical Methods: Apatite and zircon separates were prepared from the 100–150 μm fraction of each rock and analysed for fission tracks at Donelick Analytical Inc. The fission track ages presented here are pooled ages with 1-sigma errors (Table DR1). There is no systematic variation in apatite composition, all are F-rich apatite and etch pits are generally of uniform size (0.45 ± 0.05 μm). Where greater than 100 tracks were counted, track length distributions are relatively uniform, with mean track lengths ranging from 13.8 to 14.4 μm, with standard deviations of 1.5-1.9 μm (Table DR1). The sample in which less than 25 tracks were counted yielded a lower mean track length of 13.2 ± 1.8 μm.

Apatite He age determinations follow the procedure established by Balestrieri et al. (2005). From the apatite separates prepared for fission track analyses, inclusion-free apatites were picked using a binocular microscope for (U-Th)/He age determinations. For each sample between three and nine prismatic grains varying in diameter from 75 to 200 μm were loaded into re-usable stainless steel capsules. A single inclusion-free zircon crystal from sample KHARS 3921 was loaded into a platinum tube and packed into a stainless steel capsule. Each capsule was heated in a resistance furnace at 950°C (apatite) and 1190°C (zircon) for 30 minutes. The remaining zircon samples were packed into Pt tubes and heated using an 808 nm diode laser following established protocols (Foeken et al. in press). ^{4}He concentrations were measured relative to a 99.9% pure ^{3}He spike in a Hiden HAL3F quadrupole mass spectrometer equipped with an electron multiplier detector at the Scottish Universities Environmental Research Centre. After each measurement samples were reheated to ensure complete degassing. Following analysis sample capsules were retrieved and the apatites dissolved in ^{235}U- and ^{230}Th-spiked nitric acid. The retrieved Pt-enclosed zircon was

spiked with ^{235}U and ^{230}Th before being dissolved in a Parr™ bomb dissolution vessel. The ion exchange column chemistry of Luo et al. (1997) was used to remove the Pt and separate the U and Th. U and Th concentrations were measured on a VG PlasmaQuad 2 ICPMS. Correction for helium recoil loss was made using the procedure of Farley et al. (1996) and Hourigan et al. (2005). Zoning of the apatites was checked using the fission track distribution. The majority of apatites are unzoned or show minor zoning. Analytical uncertainty for each sample is 3–6%.

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TABLE DR1. FISSION TRACK ANALYSES FOR THE LADAKH BATHOLITH

Sample	ρ_s (10^6 tracks cm^{-2})	N_s (tracks)	ρ_I (10^6 tracks cm^{-2})	N_i (tracks)	ρ_d (10^6 tracks cm^{-2})	N_d (tracks)	Grains	Dpar (μm)	Age (Ma)	Tracks	Mean length (μm)	Standard deviation (μm)
Khars 3921	0.257	61	2.401	570	3.602	4215	17	1.73	21.9 ±3.0	12	13.2	1.9
Khars 4110	0.324	157	2.779	1348	3.524	4215	22	1.85	23.3 ±2.1	125	13.9	1.7
Khars 4349	0.238	211	2.954	2624	3.929	4025	24	1.82	18.0 ±1.4	110	14.3	1.8
Khars 4552	0.304	151	2.956	1468	3.505	4215	24	1.74	20.5 ±1.9	100	13.8	1.8
Khars 5132	0.401	296	4.493	3318	3.929	4025	23	1.85	19.9 ±1.3	110	14.4	1.9
Khars 5245	0.305	224	3.110	2287	3.929	4025	23	1.77	21.9 ±1.7	110	14.0	1.7
Khars 5245	*3.499*	*477*	*5.201*	*709*	*0.578*	*4072*	*20*	*N.A*.*	*26.2 ±1.8*	*N.A.*	*N.A.*	*N.A.*

Note: Zircon analysis in italics.
*N.A. not applicable.

TABLE DR2. U, Th, He DATA FROM SELECTED SAMPLES FROM THE LADAKH BATHOLITH

Sample		Elevation (m)	^{238}U (ng)	^{232}Th (ng)	^{4}He (cc)	No. crystals	He age (Ma)	Ft correction	Corrected He age (Ma)
Khars 4349	(i)	4349	1.43	4.95	3.11E-09	9	9.9	0.76	13.0
	(ii)		0.26	0.88	5.51E-10	4	9.6	0.64	14.9
Khars 5132	(i)	5132	1.27	3.19	2.62E-09	5	10.6	0.79	13.4
	(ii)		0.24	0.48	3.28E-10	3	7.7	0.63	12.2
Khars 5245	(i)	5245	0.97	2.30	2.83E-09	6	15.5	0.67	20.7
	(ii)		0.39	0.76	7.32E-10	5	10.4	0.67	15.5
Khars 3921	*(i)*	*3921*	*3.42*	*3.81*	*6.65E-09*	*1*	*12.8*	*0.62*	*20.7*
	(ii)		*8.81*	*11.07*	*1.54E-08*	*5*	*11.2*	*0.48*	*23.4*
Khars 4552	*(i)*	*4552*	*5.75*	*4.05*	*1.23E-08*	*3*	*15.3*	*0.79*	*19.3*
	(ii)		*3.31*	*1.51*	*6.60E-09*	*4*	*15.3*	*0.74*	*20.7*
Khars 5245	*(i)*	*5245*	*3.29*	*4.11*	*8.24E-09*	*5*	*16.4*	*0.67*	*24.3*
	(ii)								

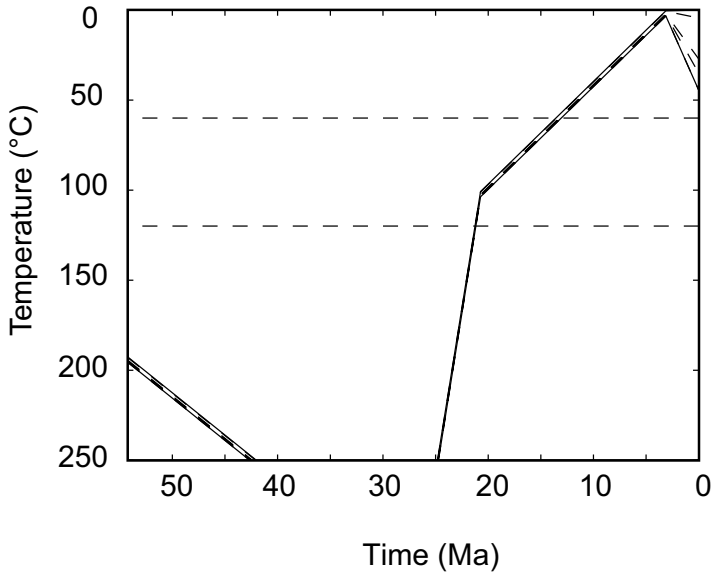
Note: Zircon He data in italics.

TABLE DR3. LOCATION OF LADAKH SAMPLES.

Sample	Longitude (°E)	Latitude (°N)
Khars 3921	77.611	34.202
Khars 4110	77.619	34.212
Khars 4349	77.616	34.226
Khars 4552	77.617	34.241
Khars 5132	77.622	34.269
Khars 5245	77.605	34.279

Figure DR1. Model solutions from (a) Markov Chain Monte Carlo approach (Gallagher et al., 2005). Log likelihood for the constant offset (15 μm) model is -2714.329 (11 parameters) and is favoured by the Bayesian Information Criterion. Rapid cooling in the Early Miocene is evident. (b) Best fit solutions for AFTSolve modeling, again rapid cooling in the Early Miocene is apparent.

(a)



(b)