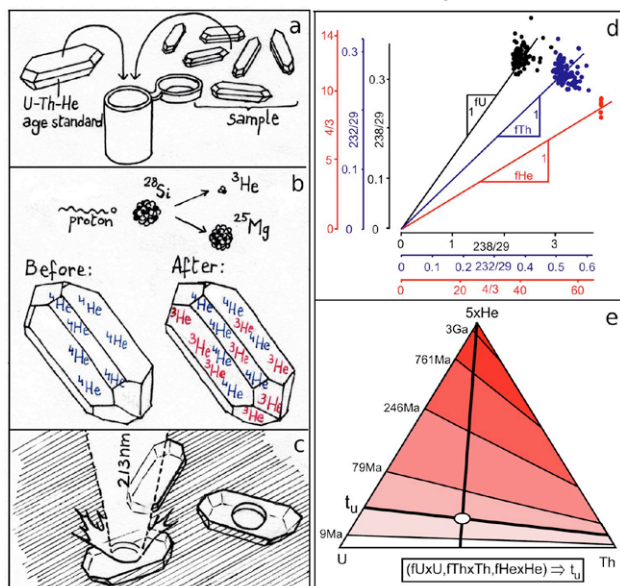


In situ U-Th-He dating by $^4\text{He}/^3\text{He}$ laser microprobe analysis

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We have developed a rapid, flexible and robust method for in-situ U-Th-He dating, in which (a) multiple zircons from the sample are packed together with a standard of known U-Th-He age, (b) these are proton-irradiated to produce spallogenic ^3He , (c) the grains are ablated with a UV laser once to measure the $^4\text{He}/^3\text{He}$ ratios on a noble gas mass spectrometer, and a second time to measure the $^{232}\text{Th}/^{29}\text{Si}$ and $^{238}\text{U}/^{29}\text{Si}$ ratios by ICP-MS. The age of the sample is calculated by comparing the measured isotope ratios of the sample to those of the standard (d), and multiplying the resulting 'scaling factors' (fU, fTh, and fHe) with the normalised (U, Th, He) composition of the standard (e), which can be calculated from the measured U/Th ratio and its age. This method removes the need to know any absolute concentrations or pit volumes and is immune to ICP-MS matrix effects and collateral laser melting.



Thermal history of a Neoproterozoic orogen and A-type leucogranites formation (Yenisey Ridge, Western margin of the Siberian Craton)

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Integrated geochemical, petrological and numerical modeling investigations allowed to understand the sequence of thermal events that took place during the formation of Neoproterozoic A-type leucogranites located in the structure of the Yenisey Ridge orogen, south-western framing of the Siberian craton (Vernikovskiy *et al.*, 2011; Vernikovskaya *et al.*, 2013). Two stages of leucogranite formation were distinguished: 1) 750–720 Ma, and 2) 710–630 Ma. The early stage A-type leucogranite plutons are enriched in potassium and were emplaced (≥ 10 km) in the Central Angara terrane during the final phase of its collision with the Siberian craton. This collision was followed by the subsequent accretion of the Yenisey island arc to the Siberian craton in an active continental margin setting during 710–630 Ma. At this time the second stage leucogranite plutons were formed at a shallower emplacement depth (≥ 7 km) within the Tatarka-Ishimba suture zone that was characterized by an elevated heat flow. These leucogranites associate with carbonatites and are characterized by niobium enrichment. The thermal history of the orogen was conditioned by radiogenic heat from the intrusions and their overlapping thermal fields, as well as by elevated heat flow in the suture zone.

Vernikovskiy V.A., Vernikovskaya A.E., Polyansky O.P. *et al.*, (2011), Russian Geology and Geophysics, 52, 1, 24–39.
Vernikovskaya A.E., Datsenko V.M., Vernikovskiy V.A. *et al.*, Doklady Earth Sciences, (2013), 448, 2, 161–167.