

Cenozoic exhumation history of the Oman margin of Arabia based on low-T thermochronology

D.R. GRAY¹, B.P. KOHN¹, R.T. GREGORY² AND A. RAZA¹

¹ School of Earth Sciences, The University of Melbourne, Melbourne, Australia; drgray@unimelb.edu.au; bkohn@unimelb.edu.au; asaf@unimelb.edu.au

² Department of Geological Sciences, Southern Methodist University, Dallas, USA; bgregory@smu.edu

Combined fluorapatite (U-Th)/He (AHe) and fission track (AFT) thermochronology provide a more rigorous assessment of the Cenozoic exhumation history of the 700 km long Oman Mountains. Margin stability by ~67 Ma evidenced by a major Maastrichtian unconformity, reflects erosion syn- to post-isostatic adjustment subsequent to Samail ophiolite obduction-overthrusting from 90-80 Ma [1] and margin back-thrusting/back-folding from 76-70 Ma [2]. The timing of Cenozoic folding and flexure of the margin with subduction beneath the Makran are indicated by new AHe data from the Bani Hamid metamorphic sole (BHms) in northern Oman and the high-P rocks at As Sifah (AS) in the southeast near Muscat. These are interpreted as erosional cooling of the Oman margin through ~70°-60°C at ~20-21 Ma. AFT data from the BHms indicates rapid cooling at 25±2 Ma from temperatures >110°C, whereas at AS AFT data ranging from ~46 to 63 Ma suggest cooling from a shallower crustal level ~70°C. Our combined approach refines the AFT-based two-stage cooling history model of [3] from the central Oman Mountains in terms of timing of initial cooling and subsequent cooling rate. Further, it strongly argues against the complex cooling history of [4] involving post-metamorphic cooling ~63 to 53 Ma, stable T (<60°C) up to ~19 Ma, reheating to 70-80°C at ~7-4 Ma, followed by final cooling to T<60°C. We consider the last cooling phase to be an artefact of the modelling approach used and is not supported by our AHe data. Our data indicate a Late Oligocene-Early Miocene timing for onset of shortening and formation of the Oman Mountains associated with the collision of Arabia and Eurasia. They also suggest that exhumation decreased from north to south, possibly indicating different plate flexural behaviour.

References

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