

Contrasting regional denudation patterns in southeastern Australia from apatite fission-track imaging

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Approximately 700 fission-track analyses on apatites from mostly granitic rocks across the states of Victoria, New South Wales and Tasmania in southeastern Australia provide a detailed low-temperature thermochronology of surface rocks across this region. In addition a number of deep drill holes and vertical sampling profiles in areas of high surface relief reveal the vertical structure of the apatite fission-track data across this region. In addition, dredge samples from the foundered continental blocks of the South Tasman Rise to the southwest of Tasmania have also been analysed, as have samples from the conjugate rifted margin of Northern Victoria Land in Antarctica.

Reconstruction of the low-temperature cooling histories of these apatites based on modelling of the fission-track age and track length data show significant variations across the region. These enable a number of distinct crustal blocks showing contrasting behaviour to be identified. Images of the evolution of these crustal blocks can be constructed by interpolation of the fission-track parameters and modelled palaeo-temperatures. Several episodes of rapid cooling can be identified in these thermal histories over the past several hundred Ma. These are reinforced by observations of significant intervals of essentially constant apatite fission-track age in many of the vertical profiles.

Assuming that the dominant control on these low-temperature cooling histories is the transport of the samples towards the surface, then quantitative reconstructions of the surface denudation history can also be obtained. These estimates can in turn be back-stacked onto the present topography and isostatically adjusted to provide reconstructions of the evolution of the landsurface through time. Analysed in this way the low-temperature fission-track thermochronology can provide estimates of sediment volumes arising from the surface denudation enabling new mass-balance calculations with sedimentary accumulations in adjacent depocentres.

The different thermal histories of the various crustal blocks in southeastern Australia are therefore interpreted as revealing contrasting denudation histories before, during and after Mesozoic to early Tertiary continental breakup in the region. No single area displays all of the denudation episodes identified.

Calibrating eolian dust accumulation rates in the central North Pacific pelagic clay province

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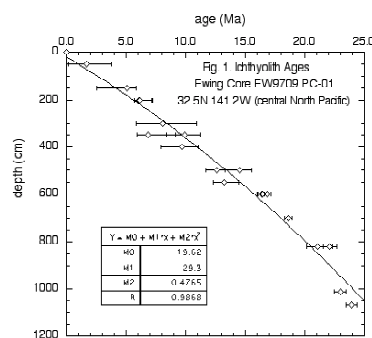


Figure 1. Age-depth curve for PC-01 red clay core, produced from ichthyolith Sr isotopic compositions.