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Analysis of an apparent age spectrum from a pebble within the Indus Formation: a record of exhumation and inversion at the margin of a Himalayan metamorphic core complex

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In this paper we utilise a carefully designed step-heating experiment on irradiated white mica to constrain the thermal history of a single pebble using 40Ar/39Ar geochronology. We suggest that the muscovite microstructure involves the feathering of fast diffusion pathways and that the results of the step-heating experiment can therefore be interpreted utilising multi-domain fractal diffusion theory in a similar way as has been attemped with K-feldspar. Our conclusion is that part of the Indus Formation is a molasse that formed as an apron at the margins of the Ladakh core complex, after its final Miocene exhumation once the lower plate was exposed. Later inversion resulted in back-thrusting of the Indus Formation, forming recumbent folds overprinted by tight upright folds. Pervasive axial plane fabrics developed during this later folding, overprinting earlier formed structures. Our data can be taken to indicate that the pebble was eroded from the Ladakh Batholith during its extensional exhumation, some time after 22 Ma, and incorporated in the molasse. The upright folding during inversion of the core complex therefore took place at a later time, i.e. mid-Miocene or younger.