Geophysical Research Abstracts, Vol. 9, 06926, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06926

Channelised exhumation in the core of a transpressional shear system

Martin Hand

Geology and Geophysics, School of Earth and Environmental Sciences

University of Adelaide, South Australia 5005

Australia

martin.hand@adelaide.edu.au

Principally the motion of material in transpressional systems is governed by the interplay between the degree of obliquity of the convergent boundaries and the evolving material properties within the orogen, while the velocity of the material and the duration of the collision largely control the thermal evolution. Although many obliquely convergent systems are characterised by significant structural complexity, the thermal structure, which in part is recorded by metamorphic field gradients and the metamorphic history is generally simpler, and may provide additional insights into the way in which transpressional orogens operate.

In terms of generalised boundary conditions, it makes sense to describe transpressional deformation in terms of the degree of collisional obliquity. In systems with low angles of obliquity ($\alpha < \sim 30^{\circ}$) strain is typically partitioned into steeply dipping dip-slip and strike slip domains. These systems may show dramatic across-strike variations in the magnitude of exhumation, which is linked to patterns of kinematic partitioning. In the Proterozoic Kimban Orogen in southern Australia, the core of a c. 8 km wide subvertical 300+ km long strike-slip shear zone within the orogen contains granulite-grade shear fabrics exhumed from depths of around 35-40 km, with exhumation near-isothermal to the mid-crust. Within the strike-slip corridor, exhumation depth increases in the lineation plunge direction, implying that material was transported along the strike slip shear zone in a manner akin to longitudinal (orogen parallel) extrusion. In contrast the flanking comparatively low-strain dip-slip dominated domains exhibit much smaller degrees of exhumation ($\sim$ 20-10 km), with large baric gradients (around 0.5km zx^{-1}) across the interface between the two domains. Thus the strike slip domain effectively defines a narrow exhumation channel within the orogen, with the steep baric gradient on the flanks of the shear zone pointing to significant decoupling of material paths between the strike-slip and dip-slip domains. Despite dramatic differences in the degree of exhumation across the orogen, temperature field gradients are comparatively small, suggesting that the residence time of material within the strike slip domain was insufficient to allow substantial conductive readjustment.