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Dating microstructures by the 40Ar/39Ar step-heating technique: implications for the evoution of plate margins

M. Beltrando (1), G. Lister (1), G. Fraser (2), M. Forster (1)

(1) Research School of Earth Sciences, Australian National University, Canberra, Australia,
(2) Geoscience Australia, Canberra, Australia

White micas from the Penninic units of the Western Alps have been dated by the $^{40}Ar/^{39}Ar$ step-heating method in order to understand the time scales involved with the evolution of the Alpine orogen. Structural studies have shown that the Western Alps underwent two shortening-extension cycles in the Eocene-Oligocene . Crystallization of phengitic mica in eclogite facies conditions during an early shortening event took place at 50-44 Ma. A major deformation-recrystallization event in greenschist facies conditions (D_2) culminated in the formation of muscovitic mica at ca. 42-40 Ma. Muscovites are found along shear fabrics associated with extensional shear zones that accommodated fast exhumation and cooling of the studied units. Folding of the shear-related structures during renewed shortening deformation (D_3) resulted in the formation of pervasive axial planar cleavage in micaschists after ca. 36.5 ± 0.5 Ma. Therefore, the evolution of the Western Alps, which are located along the Africa-Europe convergent margin, was characterized by multiple episodes of shortening and extensional deformation. A duration of less that 5 Myr can be postulated for each of those episodes.