EGU21-6645
https://doi.org/10.5194/egusphere-egu21-6645
EGU General Assembly 2021

Geochronology of Himalayan shear zones: unravelling the timing of thrusting from structurally complex fault rocks

Igor M Villa[1,2] and Chiara Montemagni[1]
[1]Università di Milano Bicocca, Dipartimento di Scienze dell'Ambiente e della Terra, 20126 Milano, Italy (igor@geo.unibe.ch)
[2]Universität Bern, Institut für Geologie, 3012 Bern, Switzerland

Dating structurally complex fault rocks often results in internally inconsistent ages, as several mineral generations are intergrown at scales << 10 µm and almost always altered to various degrees. We describe here ^{39}Ar-^{40}Ar stepheating using the combination of two independent indicators that allow the discrimination of coexisting mica generations from each other and from the ubiquitous retrogression/alteration phases. A necessary first step is electron probe microanalysis to assess both inventory and spatial distribution of the mineral phases that need to be distinguished a posteriori by ^{39}Ar-^{40}Ar systematics. One indicator is based on mica stoichiometry, which can be proxied by the ^{39}Ar concentration in combination with the $^{37}Ar/^{39}Ar$ and $^{38}Ar/^{39}Ar$ (i.e. Ca/K and Cl/K) ratios. The other indicator is the furnace temperature, at which a degassing peak accompanying dehydration and structural collapse is observed. As dehydration rates depend on the average bond strength in the crystal structure, it is predicted (and indeed observed) that the temperature of the differential Ar release peak is variable among different minerals. As the Ca/Cl/K signatures of pure micas coincide with the Ar release peak, their combination identifies the isochemical steps that correspond to the degassing of pristine micas. Only these should be used to date the activity of shear zones.

This procedure should become routine in analysing polydeformed metamorphic rocks.