Geophysical Research Abstracts
Vol. 15, EGU2013-13701, 2013
EGU General Assembly 2013

Re-Os molybdenite, pyrite and chalcopyrite geochronology, Lupa Goldfield, SW Tanzania: Implications for metallogenic time scales and shear zone reactivation

Christopher Lawley (1,2), David Selby (2), and Jonathan Imber (1)

(1) Department of Earth Sciences, Durham University, UK, (2) Natural Resources Canada, Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario, K1A 0E8, Canada

Fault zone reactivation is a well-documented deformation processes that is related, in part, to long-term fault weakening induced by fluid-rock interaction. However, the dearth of suitable geochronometers means very little data has been available to constrain the absolute timing of fault reactivation. Thus the time scales of fault processes remain unclear for most ancient fault networks. Gold occurrences in the western portion of the Lupa goldfield, SW Tanzania are associated with pyrite $\pm$ chalcopyrite $\pm$ molybdenite bearing quartz veins and a brittle-ductile shear zone network at the Tanzanian cratonic margin. The laminated appearance of auriferous quartz veins records evidence for a complex hydrothermal history which, coupled with complex relative-timing relationships between brittle and ductile deformation mechanisms within the mylonitic shear zones, suggests that these gold occurrences are best interpreted within a progressive deformation context characterized by repeated shear zone reactivation events. As a result, Au occurrences from the western Lupa goldfield are typical of the orogenic gold deposit type and represent an ideal natural laboratory to investigate the time scale of metallogenesis and shear zone processes operating at mid-crustal levels.

Re-Os molybdenite, pyrite and chalcopyrite ages from five gold occurrences record a protracted hydrothermal history (1.95–1.87 Ga) comprising at least three temporally distinct sulphidation events (ca. 1.95, 1.94 and 1.88 Ga), which are each represented in detail by a complex vein history that occurred at a time scale less than the resolution of the Re-Os method. Together these Re-Os ages provide the first constraints on the absolute age of mineralization for gold occurrences in the western Lupa goldfield and also record a broad period of deformation and mineralization spanning ca. 70 Myr. This time period is also concurrent with felsic-mafic magmatic activity (1.96–1.88 Ga) and suggests mineralization, deformation and magmatism were all broadly contemporaneous during the 2.1–1.8 Ubendian Orogeny at the Tanzanian cratonic margin. Our results highlight the long-lived, but episodic nature of orogenic gold style mineralization and also provide a natural example of long-term fault weakening of a mid-crustal shear zone network that persisted for at least ca. 70 Myr.