Emplacement, uplift and exhumation histories of Tibetan porphyry Cu-Mo-Au deposits

J.-F. XU[1], B.I.A. MCINNES[2], N.J. EVANS[2] AND W.L. GRIFFIN [3]

[1]Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, China, jifengxu@gig.ac.cn
[2] CSIRO Exploration and Mining, ARRC, Kensington WA, Australia, brent.mcinnes@csiro.au; noreen.evans@csiro.au
[3] GEMOC Key Centre, Earth & Planetary Sciences, Macquarie University, NSW, 2109, Australia, wgriffin@els.mq.edu.au

The Jiama, Nanmu and Lakang'e porphyry intrusions and associated Cu-Mo-Au deposits in the Lhasa terrane of southern Tibet were emplaced along north-trending extensional faults conjugate to the Yarlung-Zangbo suture zone during post-collisional magmatism. Using zircon U-Pb, zircon (U-Th)/He (Zr_{He}) and apatite (U-Th)/He (Ap_{He}) geochronology and inverse numerical modelling methods, we quantitatively constrain the thermal and exhumation history of Cu-Mo-Au mineralization in the context of continental collision and tectonic uplift processes.

The Jiama porphyry dykes have zircon U-Pb ages of 15.9 Ma, Zr_{He} ages ranging from 13.9-14.4 Ma, and Ap_{He} ages of 13.3-14.0 Ma. The Lakang'e porphyry has a zircon U-Pb age of 15.7 Ma, Zr_{He} age of 15.0 Ma and an Ap_{He} age of 14.6 Ma. The Nanmu porphyry has a zircon U-Pb age of 12.9 Ma, Zr_{He} age of 12.6 Ma and an Ap_{He} age of 11.9 Ma. The zircon U-Pb ages indicate that partial melting of the lower crust or/and subducted continental crust was occurring throughout the mid-Miocene. Numerical modeling of U-Pb-He data indicates that the dykes were rapidly cooled following emplacement 2.0 to 2.7 km below the paleosurface.

The Ap_{He} data from the intrusions indicates a minimum denudation rate of 130 m/my and maximum denudation rate of 230 m/my for the Lhasa terrane and the southern Tibetan plateau since intrusion emplacement in the mid-Miocene. This compares with previous minimum estimates by other workers of 100 m/my based on fission track data.