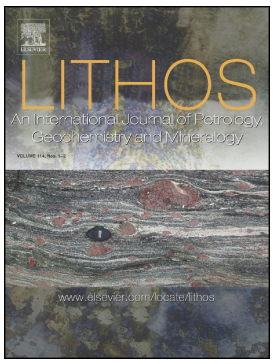

A combined geochronological approach to investigating long lived granite magmatism, the Shap granite, UK

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A combined geochronological approach to investigating long lived granite magmatism, the Shap granite, UK

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Abstract

With the advent of more precise dating methods, it has become apparent that zircon dates from granite plutons frequently indicate older emplacement ages than other dating methods. Here we attempt to reconcile a number of dating methods from the *c*. 5 km^2 Caledonian Shap granite, Northern England. The results reveal a more complex and protracted evolution than indicated by application of any single dating method. Zircon U-Pb dates give a weighted mean age of 415.6 ± 1.4 (2σ) Ma. A mafic enclave, dated at 412 ± 2 (2σ) Ma (revised Rb-Sr feldspar age from Davidson et al., 2005), contains resorbed K-feldspar and zircon crystals scavenged from the host crystal mush. These ages are at odds with field relations in the thermal aureole that suggest final emplacement at approximately 404 Ma or later during Acadian deformation. Previously reported Re-Os ages on molybdenites associated with magmatic fluids, have given ages of 405.2 ± 1.8 (2σ) Ma (Selby et al., 2008) and confirm the overlap of at least some magmatic activity with Acadian deformation. A similar emplacement age is supported by Rb-Sr whole-rock-mineral and biotite K-Ar dates when adjusted for revised decay constants (402 ± 3 Ma and 401 ± 7 Ma, respectively, Wadge et al., 1978). The lower closure temperatures of these systems relative to the U-Pb system in zircon means that they are more likely to record the timing of final granite emplacement. These data suggest that most zircons grew before final granite emplacement, by about 10 Ma on average. We