The timing of Variscan deformation: UV laser $^{40}Ar/^{39}Ar$ dating of syn\late-orogenic intrusions from SW Ireland

J-A. WARTHO[1] D. QUINN[2], AND P.A. MEERE[2]

[1] John de Laeter Centre of Mass Spectrometry, Curtin University, Perth; J-A.Wartho@curtin.edu.au
[2] Department of Geology, National University of Ireland, Cork; davequinn9@hotmail.com & p.meere@ucc.ie

The direct isotopic dating of deformation in orogenic forelands has always been restricted by the lack of suitable syn-kinematic low-grade mineral phases. The mix of detrital, metamorphic and alteration phases in low-grade sedimentary rocks makes the task of dating deformation of such rocks especially difficult. Dating minerals that formed or cooled during the peak thermal event may not necessarily represent the timing of deformation, as there can be significant temporal lags between these two events. Low-grade regional studies usually yield ages for cleavage development in a given orogenic event and are consequently limited in constraining the full temporal range of upper crustal deformation, including the late stage brittle deformation that is characteristic of foreland settings.

The indirect approach of constraining the timing of regional deformation events by dating igneous intrusions associated with the deformation is limited in orogenic forelands. To date, this has essentially involved dating un-deformed, orogenic collapse related, post-orogenic granites that provide an upper age boundary to a given event. Ideally, the use of high-level crustal intrusions requires that these intrusions span the full temporal range of deformation. This is the case in southern Ireland where it is possible to indirectly constrain the age of Variscan deformation by dating high-level crustal intrusions that are known to be intimately associated with the complete sequence of Variscan deformation. These intrusions, exposed in the Lower Palaeozoic rocks of the Blackball/Whiteball Heads area of SW Ireland, were emplaced as pipes, dykes and sills in both ductile and brittle deformational regimes. By adopting a multifaceted approach and combining these ages with existing chronostratigraphical constraints and observed field structural relationships, the temporal bracketing of Variscan deformation in southern Ireland is possible [1].

$^{40}Ar/^{39}Ar$ UV laser analyses of phlogopite crystals from these intrusions has yielded ages which, when combined with structural field relationships, help constrain the timing of Variscan deformation in southern Ireland. These ages include 314.4 ± 1.0 Ma for a penetratively deformed lamprophric pipe on Blackball Head, 302.0 ± 1.5 to 298.1 ± 0.6 Ma for dyke material associated with later stage brittle deformation and a date of 296.9 ± 0.6 Ma for an undeformed post orogenic dyke on Whiteball Head [1].

References

[1] Quinn, D., Meere, P.A. and Wartho, J-A. (2005) J. Struct. Geol. **27**, 1413-1425.