



Provenance of Upper Devonian Old Red Sandstone: evidence for Acadian recycling of the Lower Devonian in southern Ireland.

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The Upper Devonian Old Red Sandstone (ORS) clastic sedimentary rocks of the Munster Basin of southern Ireland can yield valuable information on the timing of Late Palaeozoic orogenic events in the region. The Munster Basin was an intra-continental half-graben extending from the Dingle Peninsula in the west to the Comeragh Mountains in the east with a maximum fill thickness of >7 kilometres at its north-western depocentre. Basin initiation is constrained as pre-385 Ma and the subsequent basin fill was dominated by continental siltstones and sandstones. Textural and modal analysis of the sequence indicates that they are mature to supermature, sub-litharenites to quartz arenites. Previous models for the Munster Basin describe it as a classic molasse deposit with the sediment derived from a Caledonian orogenic edifice to the north (Friend *et al.* 2000).

In this study we present two new potential models for sediment provenance in the Munster Basin based on the $^{40}\text{Ar}/^{39}\text{Ar}$ step-heating and $^{40}\text{Ar}/^{39}\text{Ar}$ Ultra Violet Laser Ablation (UVLA) of detrital white micas. The step-heating analysis of white mica separates yielded ages in the range of 404 ± 1.5 Ma to 388 ± 1.5 Ma, with an average age of 394 Ma. These ages are confirmed by the in situ UVLA analysis of individual mica grains which produced ages of between 405 – 385 Ma. This new geochronological information indicates that the Munster Basin succession was derived directly from

the Irish Caledonides and must have undergone a two-stage process of deposition and recycling. Deformation in the Irish Caledonides is thought to have ceased by the Late Silurian (Soper *et al.* 1992).

1. Acadian Resetting and Recycling Model: the Lower Devonian sequences (LORS) in Ireland were deformed and thermally reset between 405 – 385 Ma, contemporaneous with the Acadian event in the British Isles. These LORS basins were inverted and shed detritus southwards into the Munster Basin from Middle Devonian times.
2. Acadian Recycling Model: this model involves the Acadian recycling of LORS into the Munster Basin. This LORS must have been sourced from metamorphic orogenic belts which recorded deformation ages between 405 – 390 Ma, such as the Scandian Belt of Scandinavia.

Both of these models are based on the assumption that southern Ireland was blanketed in a considerable thickness of LORS which has since been shed southwards due to erosion, similar to the model of Soper and Woodcock (2003). A two-step model of sediment recycling is supported by the exceptional levels of sediment maturity in the Munster Basin.

Questions still remain over both potential models. Did Acadian deformation in southern Ireland exceed the temperature required for the complete thermal rejuvenation of argon in white mica in order to completely reset the mica population? Is Acadian recycling of originally Scandian material into the Munster Basin a possibility in light of the very tight range of age dates produced considering that Scandian deformation spans a much larger temporal range.

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