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Sand provenance in Triassic basins along the NE Atlantic margin - implications for Pangaean drainage evolution and reservoir sandstone distribution.

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Sandstone provenance techniques enable the recognition of likely sediment source areas and can help constrain palaeogeography, drainage scales and the sediment routing. These insights are important to predicting both sandstone distribution and reservoir quality in the subsurface. Recent studies have demonstrated the utility of the Pb isotopic composition of detrital K-feldspar as a regional sand provenance tool. Common Pb isotopes vary in the crust on a sub-orogenic scale and it has been shown that detrital K-feldspar retains the signature of its source despite erosion, transport and diagenesis. The Pb isotopic signature of individual K-feldspar sand grains can be analysed in-situ using laser ablation multi-collector inductively coupled plasma mass spectrometry (LA-MC-ICPMS). Imaging prior to analysis highlights heterogeneities which then can be avoided during laser ablation. Furthermore, as detrital K-feldspar is unlikely to survive more than one sedimentary cycle, grains can be tracked back directly to their basement source.

The Lower Triassic Sherwood Sandstone Group and its equivalents form a regionally extensive sand-rich succession that is encountered in a number of NW European sedimentary basins where it locally forms important hydrocarbon reservoirs and aquifers. The sandstones were deposited in the northern Pangaean interior and represent both

large-scale and ephemeral fluvial systems, together with sub-ordinate aeolian, lacustrine and sand-flat facies. The distribution and depositional style are well understood in the Paris and North Sea basins and the onshore UK, where the Variscan Uplands in central Europe appear to have exerted a strong control on drainage, resulting in large-scale, south-to-north flowing rivers (i.e. the 'Budleighensis' river system). Although the Triassic succession further to the west is known to host hydrocarbon reservoirs (e.g. the Corrib and Strathmore fields), the nature, origin and pattern of Triassic drainage in the peripheral and under-explored NE Atlantic basins remain poorly constrained.

In this study, K-feldspar Pb isotopic data have been obtained from Triassic sandstones in basins along ~1300 km of the NE Atlantic Margin, from the Slyne Basin, offshore western Ireland, northward to the northern Viking Graben, offshore Norway. These new data highlight previously unrecognised Triassic drainage pathways, and demonstrate the important role played by uplifted Archaean and Proterozoic basement blocks in controlling Triassic drainage evolution. No Variscan sand grains have been found in the sampled basins, indicating that the Variscan Uplands exert limited, if any, influence on the developing drainage system in these peripheral areas.