Sand supply to a middle Carboniferous basin, western Ireland: implications for pre-Atlantic paleogeography

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This study investigates the provenance of deltaic sandstones of the middle Carboniferous Clare Basin, western Ireland. Provenance data from the basin fill are sparse and detailed paleogeographic reconstructions of the area are poorly constrained due to subsequent tectonism and rifting which culminated in the opening of the North Atlantic late in the Mesozoic. Potential sources, such as crystalline basement highs in the North Atlantic, have, up until recently, been poorly characterized, while other may be buried beneath Mesozoic sedimentary rocks or remotely located on the conjugate margin.

The Serpukhovian–Bashkirian (331–315 Ma) Clare Basin consists of a siliciclastic infill, representing deep-marine turbidites to shallow deltaic cyclothems. Previous studies, based on paleocurrent data, interpret contradictory basin infill histories with two competing models suggesting contrasting sediment input from the northwest or the southwest. Previous zircon Previous U–Pb geochronology was performed on three samples targeting the deep turbidites and two deltaic cyclothems. Results suggest a main age population of 500–700 Ma, associated with Avalonian sources which likely lay to the south of the basin. Younger (350–450 Ma) and older (>700 Ma) age populations occur in this study and could be derived from sources located north (Laurentian) or south (Avalonian) of the basin. However, in this study, the use of zircon dating alone does not help identify potentially recycled grains.

In this study, sandstones from the Tullig Cyclothem have been logged in detail and sampled at three locations. A prograding deltaic succession is observed at two of the locations with the third location interpreted as a transgressive shelf sand-body. Petrographic analyses indicate mineralogically and texturally mature sandstones. Heavy mineral analysis reveals clear changes in heavy mineral indices throughout the deposition, potentially indicating a change of source.

In order to investigate this further, zircon and apatite U– Pb geochronology will be performed. With such mature sandstones, this multi-proxy approach is necessary to decipher any recycling from older basins. These provenance data should help better understand the fluctuating heavy mineral indices as well as better constrain the ultimate sources of these sedimentary successions. This will, in turn, help constrain Carboniferous paleogeography of the prerift northeast Atlantic Margin.

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