



Three cycles of sedimentation in ancient sedimentary basins of southern Ireland: insights from detrital zircon U-Pb ages

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Previous work has shown that sedimentary rocks from the Lower Devonian Dingle Basin were uplifted and recycled by Acadian orogenic activity into the Upper Devonian Munster Basin. This is particularly applicable for sediments deposited in the western part of the Munster Basin. In the present study, a new dataset of U-Pb ages for detrital zircons has been established that spans a large geographic area which includes the Dingle and Munster basins as well as the offshore Mesozoic North Celtic Sea, South Celtic Sea, 'Goban Spur' and Fastnet basins. The study is the first of its kind in any of these sedimentary basins. The aim is to investigate whether sediments deposited in the offshore basins during the Mesozoic reflect three erosion-deposition cycles. Detritus that has undergone three sedimentary cycles would yield super-mature sediments suitable for hydrocarbon storage. Detrital zircon age spectra for Lower Devonian Dingle Basin samples indicate strong sediment input from Avalonian (~600 Ma) and Laurentian (~1.7 Ga and ~1.1 Ga) sources with some input from Caledonian orogenic sources (400-480 Ma). Detrital zircon age spectra in the western Munster Basin largely reflect input from Caledonian-aged igneous crustal input (400-480 Ma) and Laurentian sources. An Avalonian component is not detected in any of the samples from the western Munster Basin. In the central and eastern parts of the Munster Basin, detrital zircon age spectra indicate that the dominant sources of detritus are derived from Laurentia and from Caledonian igneous rocks. In contrast to the western part of the basin, age components around 600 Ma are present in some samples and represent an Avalonian source. These signals are echoed, at varying degrees, in detrital age spectra from Jurassic and Cretaceous samples of the central North Celtic Sea Basin. These age spectra also indicate a significant contribution of detritus from Avalonian terrane. The Avalonian signature is completely absent from Jurassic Goban Spur sedimentary rocks and cannot be linked to time-equivalent sedimentary rocks in the North Celtic Sea and Fastnet basins. Detrital zircon age spectra in the North Celtic Sea Basin reflect a mixture of sources. It is reasonable to conclude that broad-scale recycling of Munster Basin sediments into the North Celtic Sea Basin was taking place during the Jurassic and Cretaceous. This was likely to be driven by inversion of the Munster Basin as a result of Variscan orogenic activity. Sediments in the North Celtic Sea Basin, however, represent a mixed signal which includes a large Avalonian component.

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