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Garnet compositions in Scottish and Norwegian basement terrains: a framework for interpretation of North Sea sandstone provenance

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Abstract

Detrital garnets have proved to be useful discriminators of North Sea sandstone provenance because they show a wide range of potential compositions and are relatively stable during burial diagenesis. It has been less easy to use garnet data to provide a direct link between sediment and source because of the lack of a comprehensive database of garnet compositions in basement terrains forming the North Sea hinterland. This paper presents garnet compositional data from river sediments sourced from northern Scotland and Norway, and demonstrates the presence of marked variations in garnet compositions from different regions related to fundamental differences in basement lithology. The value of the river sediment database is demonstrated by comparing it with garnet compositions in Paleocene sandstones from the North Sea and Møre basins, enabling the establishment of direct links between source and sediment. Paleocene sandstones in the Gannet Field area on the southwestern margin of the Central North Sea were derived from the Dalradian of the Grampian Highlands, those in the northern North Sea were derived from the Moine/Dalradian rocks of Shetland, and those along the Møre Basin margin were derived from western Norway. By contrast, Paleocene sandstones in the Nelson Field (central North Sea) and in the Beryl Embayment (northern North Sea) have a garnet component that cannot be readily traced back to any basement terrain in either Scotland or Norway. This component, which was ultimately derived from granulite-facies metasediments or charnockites, is interpreted as being recycled from Triassic sandstones, which were themselves derived from an exotic source, probably to the west of the British Isles.

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