
Provenance and paleodrainage patterns of Late Jurassic to Early Cretaceous synrift sandstones in the Flemish Pass Basin, offshore Newfoundland

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Syn-rift sandstone from two industry exploratory wells in the Flemish Pass Basin, offshore Newfoundland, was studied for provenance analysis. The sandstone units were deposited during the Late Jurassic to Early Cretaceous (Tithonian and Neocomian) North Atlantic rifting stage, during which rifting intensified between Iberia and the Grand Banks, culminating in seafloor spreading between these continental blocks.

The major sources of first-cycle detritus, based on U-Pb geochronology of detrital zircon, qualitative analysis of detrital zircons and chemical discrimination of detrital tourmalines, include the Late Neoproterozoic (650–600 Ma) arc-phase igneous rocks of the Avalon Zone as well as the Ordovician to Early Devonian (400–460 Ma) Taconic and Acadian magmatic rocks and metasedimentary rocks present in the Central Mobile Belt. Also, a large component of the source material is interpreted to be recycled, as indicated by significant populations of rounded detrital zircons and enrichment of refractory detrital phases in the heavy mineral assemblages. Early and Late Paleozoic cover sequences are interpreted as sources of recycled material, particularly >1Ga detrital zircons. These provenance signatures would require uplifted source areas to include parts of the Bonavista Platform, Interior Newfoundland, Northeastern Newfoundland Shelf, and potentially parts of the Porcupine Bank. Thus, paleodrainage orientations were predominantly from the west during this time, and most of the studied syn-rift sandstones are interpreted to have entered the Flemish Pass Basin from the west and northwest. There is no evidence to support sourcing from the Iberian margin or the Flemish Cap-Galicia Bank continental fragment to the east, and material from these areas is instead interpreted to have been shed into the incipient Atlantic Ocean or Bay of Biscay. Mesozoic detrital zircons are present in two samples, implying the presence of syn-rift magmatic rocks somewhere in the source area; however, they do not appear to have been a major source overall.