



## **Continental break-up of the Newfoundland rifted margin (ODP Leg 210): L. Cretaceous seafloor formed by exhumation of subcontinental mantle lithosphere and the transition to seafloor spreading**

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The results of ODP Leg 210 shed light on the processes of final continental break-up to form oceanic crust. Drilling of the distal Newfoundland margin at Site 1277 recovered part of the transition between exhumed sub-continental mantle lithosphere and N-MORB volcanism related to the initiation of sea-floor spreading. Subcontinental mantle lithosphere was recovered near the crest of a basement high near magnetic anomaly M1 (late Albian?). Serpentinized spinel harzburgite, with subordinate dunite and minor gabbroic intrusives are capped by foliated gabbro cataclastite, interpreted as a seafloor extensional detachment. The serpentinised harzburgite represents depleted sub-continental mantle lithosphere, exhumed to create new seafloor within the ocean-continent transition. The detachment was eroded, producing multiple mass-flows, dominated by clasts of serpentinite and gabbro in a lithoclastic and calcareous matrix. Basaltic lavas were erupted spasmodically, mainly as sheet flows, with subordinate lava breccia, hyaloclastite and possible pillow lava. The sedimentary-volcanic succession and the exhumed mantle lithosphere experienced later-stage, high-angle extensional faulting. Chemical analysis of representative basalts (by XRF and ICPMS) reveals a N-MORB (normal-ocean ridge basalt) compositions. The MORB was produced by relatively high-degree-melting of a fertile mantle source. The basalts also exhibit a distinct negative Nb anomaly on MORB-normalized plots that possibly effects "contamination" sub-continental mantle lithosphere. Mantle lithosphere was exhumed to the seafloor, faulted to produce peridotite ridges, and then ruptured as large volumes of basaltic magma upwelled, initiating "normal" seafloor spreading. This interpretation takes account of drilling results from the Iberia/Galicia margins and the Jurassic

Alps/Apennines.