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# Characterization of sills associated with the U reflection on the Newfoundland margin: Evidence for widespread early post-rift magmatism on a magma-poor rifted margin

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In this paper, we investigate post-rift magmatism that affected the magma-poor Newfoundland margin ∼10-15 m.y. after the onset of seafloor spreading, but which had no known expression on the conjugate Iberia margin. Two postrift sills (∼105.3 and ∼97.8 Ma) were sampled in deep sediments of the Newfoundland Basin <∼200 m above 'transitional' basement at Site 1276 on ODP Leg 210. These sills have been correlated with strong reflections in seismic reflection data by means of synthetic seismograms. The shallower of the two sills is generally coincident with the U reflection which is observed throughout the Newfoundland Basin. However, the lateral extent of the sills and their relation to the U reflection away from Site 1276 has not been documented. Likewise, the cause of the magmatism and the relationship between the sills and other contemporaneous magmatic features has been uncertain.

Using multichannel seismic reflection data, we investigated the magnitude and nature of the post-rift magmatism by mapping interpreted sills throughout the deep Newfoundland margin. Observed features that we interpret as sills are high-amplitude reflections that present geometries characteristic of intrusions, i.e., step-like geometries, abrupt endings and disruptions of sub-continuous segments, junctions between reflections, and finger-like geometries; we also observe sill-related venting features in overlying sediments. The sills occur over a large area of ∼80,000 km2 above transitional basement. Using synthetic seismograms, we estimate that intrusions comprise ∼26% of the sub-U high-reflectivity sequence, yielding a crude estimate of ∼5,800 km3 for the total volume of sills emplaced by post-rift magmatism. The source of magma for the sills is still uncertain. The Madeira plume, which the Newfoundland Basin passed over at about 95 Ma and which is thought to have formed the Newfoundland Seamounts, is one hypothesis. Alternatively, another explanation may be that asymmetric thermal and/or compositional variations across the rift may have preferentially stimulated magmatism on the Newfoundland margin.