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# The role of inheritance in the Mantle beneath the Iberia-Newfoundland rift system

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Iberia-Newfoundland exploration has dramatically improved our understanding of mantle processes related to the opening of embryonic ocean basins and the onset of (ultra)-slow seafloor spreading. Reconstructed to 120 Ma, the Iberia-Newfoundland margin exposes mantle peridotites over ˜120km, with very little volume of erupted basalt. We present mineral chemical composition, textural and lithological observations of these peridotites drilled by ODP (Legs 103, 149, 149 and 210) documenting three different mantle domains within the Iberia-Newfoundland conjugated margin system. The serpentinized spinel peridotites of the Newfoundland margin (Site 1277) have relic mineral compositions similar to the most depleted abyssal peridotites worldwide. Cr-rich spinels (Cr# 0.35-0.66) indicate a very high degree of melting. Contrasting mafic rocks drilled at Site 1277 have isotopic compositions and mineral major and trace element chemistry akin to North Atlantic MORB, precluding a simple "melt-restite" relationship between the ultramafic and mafic rocks. Instead the preservation of cm-wide, chemically enriched veins (zircon-, monazite- and rutile-bearing) within the highly depleted peridotite, suggest that high degree of melting predates upwelling and exhumation of Site 1277 peridotite. On the Iberian side, at site 1070, the spinel Cr# of peridotites show an extreme compositional variation ranging from 0.14 to 0.57 potentially due to highly variable degrees of melting. However, textural observations in conjunction with the mineral chemical compositions can best be explained by melt stagnation and crystallization of plagioclase. Therefore we tend to interpret the variability of Cr# as a result of reactive melt transport and/or melt stagnation superimposed on a previous depletion history. Further towards the Iberia continent peridotites from the Iberian margin (Sites 897, 899 and 1068) are, on average, less depleted than

at Site 1070 but also show large compositional variation and evidence for melt stagnation and crystallization of plagioclase. This can either be explained by an inherited, primary, Ca-richer composition of the Iberia peridotite, or by local melt impregnation and stagnation during continental rifting, and thus refertilizing previously depleted (arc-related) peridotite. A third domain located ˜100-200 km north of the Iberia Abyssal plain on the Galicia bank (Leg 103) is characterized by large compositional variation of partly metasomatic peridotites (lherzolites, harzburgites, websterites). The mineral chemistry documents a predominance of Na-rich, fertile compositions that closely resemble heterogeneous, ‘orogenic peridotite’. Our work documents different peridotite domains within the North Atlantic. The observed variation implies that the proposed simple relationship between crustal thickness and peridotite melting is invalid in magma-poor passive margins. We conclude that rafts of peridotites with inherited histories are the rule rather than the exception in systems evolving from rifting to ultra-slow seafloor spreading.