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Paleomagnetic and rock magnetic results of upper mantle rocks recovered from the Newfoundland–Iberia rift margins

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The Newfoundland–Iberia margin is a non-volcanic rift that is an ideal location to examine questions about the structure and evolution of non-volcanic rifted margins. Ocean Drilling Program (ODP) Legs 149 and 173 drilled a west-to-east transect sites west of Portugal. At four of these sites (Sites 897 and 899 of Leg 149, and Sites 1068 and 1070 of Leg 173), a sequence of yellow-brown-colored and dark-colored serpentinized peridotites and associated mantle rocks were recovered from the basement. Leg 210, the final leg of the ODP, recovered similar serpentinized peridotites in the central Newfoundland Basin (Site 1277). We conducted a comparative experimental study of paleomagnetic and rock magentic measurements on samples chosen to be representative of cores from both the Iberia and Newfoundland margins in an effort to make an inter-basin correlation of the magnetic properties of the peridotite rocks. Stable components of magnetization are revealed in the results of thermal and alternating field demagnetization experiments on cores from both margins. Rock magnetic properties of Legs 210, 149, and 173 peridotites are generally characterized by relative strong natural remanent magnetization intensities (typical on the order of 4 A/m), suggesting that the peridotites could contribute to the magnetic anomaly significantly. Results from low-temperature measurements in the Magnetic Property Measurement System (high-field, 2.5 T) and Lakeshore (low-fields, 100-1000 A/m) susceptometers show that (titano)magnetites are present in the dark-colored peridotites, with a strong Verwey transition in the vicinity of 110 K, and with field- and frequency-dependent susceptibility curves that resemble those of synthetic TM55. These results are in good agreement with the thermomagnetic characteristics in which titanomagnetites, with Curie temperatures around 580ºC, were identified. The hysteresis ratios suggest that

the bulk magnetic grain size is in the pseudo-single-domain field. In contrast to the magnetic properties observed from the dark-colored peridotites, the low-temperature curves for the yellow-brown-colored peridotites did not show any Verwey transition. Thermomagnetic analysis also failed to show evidence for titanomagnetites. The remanent magnetization is carried by a thermally unstable mineral that breaks down at about 420ºC, probably maghemite. The field- and frequency-dependent relationships are also directly opposite to those darker peridotites, with no signs of titanomagnetite characteristics. Although the hysteresis ratios still fall in the pseudo-single-domain region, the cluster is centered towards the multidomain region. The similar features that we saw in Legs 149, 173, and 210 peridotite cores warrant additional studies to compare and ascertain whether or not the magnetic histories of the three ODP Leg sites are related. The magnetic signatures of the serpentinized peridotites recovered from both sides of the Newfoundland–Iberia rift appear not in conflict with the notion that conjugate margins will have generally similar crustal structure and evolution history.