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TITLE: Transition from magma dominant to magma poor rifting along the Nova Scotia Continental Margin

PRESENTATION TYPE: Poster Requested

CURRENT SECTION/FOCUS GROUP: Tectonophysics (T)

CURRENT SESSION: T43. Rift-to-drift Geology of the Atlantic: Insights from the US East-coast

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ABSTRACT BODY: Passive margins have been characterized as magma-dominant (volcanic) or magma-poor (non-volcanic). However, the conditions under which margins might switch states are not well understood as they typically have been studied as end member examples in isolation to each other. The Nova Scotia (NS) continental margin, however, offers an opportunity to study the nature of such a transition between the magma-dominant US East Coast margin to the south and the magma-poor Newfoundland margin to the north within a single rift segment. This transition is evidenced by a clear along-strike reduction in features characteristic of syn-rift volcanism from south-to-north along the NS margin, such as the weakening of the East Coast Magnetic Anomaly (ECMA) and the coincident disappearance of seaward dipping reflector sequences (SDRS) on multichannel seismic (MCS) reflection profiles. Results from recent industry MCS profiles along and across the margin suggest a potentially narrow magma-dominant to magma-poor along-strike transition between the southern and the central NS margin. Such a transition is broadly consistent with results of several widely-spaced, across-strike ocean bottom seismometer (OBS) wide-angle profiles. In the southern region, the crustal structure exhibits a narrow (~120-km wide) ocean-continent transition (OCT) with a high velocity (7.2 km/s) lower crust, interpreted as a gabbro-rich underplated melt, beneath the SDRS and the ECMA, similar to crustal models across the US East Coast. In contrast, profiles across the central and northern margin contain a much wider OCT (150-200-km wide) underlain by a low velocity mantle layer (7.3-7.9 km/s), interpreted as partially serpentinized olivine, which is similar to the magma-poor Newfoundland margin to the north. However, the central-to-northern OBS profiles also exhibit significant variations within the OCT and the along-strike continuity of these OCT structures is not yet clear. In November 2010, we acquired, in the OCTOPUS survey, wide-angle seismic data along a 240-km-long margin parallel profile extending from the central to the northern margin segments along an existing industry MCS profile (Ion/GX Technology NovaSPAN 5100). Twenty OBSs at 10-km spacing were analysed. A preliminary p-wave velocity model along the profile indicates that the cross-strike structures are continuous within the OCT. However, a substantial anisotropy in velocity (~8% lower parallel to the margin) is observed within the OCT. This result is consistent with an interpretation of partially serpentinized mantle that flowed perpendicular to the margin during its

extension. In addition, along strike variations are also observed along the profile, which suggest a higher degree of volcanism and a thinner layer of serpentinized mantle to the southwest. These results provide a framework for future studies to the southwest to further investigate the transition to a magma-dominant regime towards the US East Coast.

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INDEX TERMS: [8105] TECTONOPHYSICS / Continental margins: divergent, [8109] TECTONOPHYSICS / Continental tectonics: extensional, [8178] TECTONOPHYSICS / Tectonics and magmatism.
