Detailed structure of a magma-poor continent-ocean transition offshore northeastern Nova Scotia, Canada based on an along-strike wide-angle seismic profile (OCTOPUS)

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Along-strike variations within the continent-ocean transition (COT) are typically poorly constrained due to uncertainties when observed only along dip profiles. For example, across the northeastern Scotian margin previous wide-angle seismic studies of profiles OETR-2009 and SMART-1 indicate continental crustal thinning in a magma-poor setting, which leads to mantle serpentinization within the COT. However, although the two profiles are only 100 km apart, exhumed serpentinized mantle is interpreted along the SMART-1 (upper transitional crust) but not along the other profile. To further investigate the implied along-strike variability of mantle exhumation and test the different interpretations of the transitional crust, we acquired OCTOPUS wide-angle seismic data in 2010 along a 240-km long profile. This is coincident with the eastern end of the MCS profile GXT-5100, intersecting perpendicularly with OETR-2009, and SMART-1 within the COT.

Analyses of data from 19 ocean-bottom seismometers deployed at 10-km spacing and supported by the coincident MCS reflection section resulted in a detailed *P*-wave velocity model. This model shows a mostly laterally uniform sedimentary section except for the Valanginian–Hauterivian turbiditic channels which pinch-out northeastward. The crustal structures underneath are, however, highly variable forming three distinctive velocity patterns. *Pattern I*, modelled at 25–15 km southwest of profile OETR-2009, is interpreted as exhumed serpentinized mantle with velocities of 5.5–7.5 km/s and an extraordinarily high vertical gradient (~1.1 /s) above a slightly serpentinized mantle layer of reduced mantle velocities (7.5–8.0 km/s) down to 3.5 km beneath the basement top. In *Pattern II* at 0–25 km northeast of SMART-1, a very thin (1–2 km) upper crustal layer with velocity of ~5.2 km/s is modelled above a thick (~6 km) layer of moderately to slightly serpentinized mantle layer (velocity ~6.4–7.9 km/s). For the rest of the transitional crust, we modelled *Pattern III* where a lower crust (~0.7–3.0 km thick and with velocity of 6.1–6.6 km/s) is modelled and interpreted as lower crustal gabbroic Layer 3 found between the upper crust and a slightly serpentinized mantle layer. The Moho discontinuity modelled using the wide-angle data coincides with strong reflections in the MCS section. Therefore, serpentinized mantle seems to be distributed regionally under the thin crust, but mantle exhumation appears to be of much more limited extent.

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