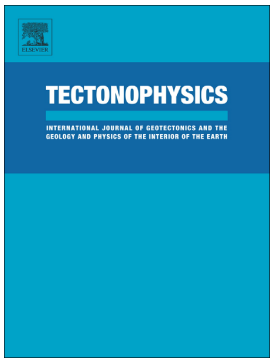

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Rift-related magmatism on magma-poor margins: Structural and potential-field analysis of the Mesozoic Notre Dame Bay intrusions, Newfoundland, Canada and their link to North Atlantic Opening

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Abstract

The magma-poor Newfoundland margin formed following lithospheric stretching, rifting and breakup resulting in the separation of the Grand Banks from Iberia, and northern Newfoundland from Ireland. Mesozoic igneous rocks contemporaneous with rifting have been documented on- and offshore Newfoundland, with later offshore magmatism occurring post-breakup. The Notre Dame Bay Magmatic Province (NDBMP) is a Jurassic-Cretaceous, potentially rift-related occurrence of igneous rocks onshore Newfoundland that includes the gabbroic Budgell Harbour Stock (BHS) and marginal lamprophyre dykes, in addition to the nearby, potentially related, Dildo Pond Intrusion (DPI) and Leading Tickles Stock (LTS). Although the BHS is penetrated by wells, it is poorly exposed at surface, and the deeper structure remained unknown. Here, results of field-based mapping combined with inversion of Full Tensor Gradiometry (FTG) and aeromagnetic data covering the BHS are presented. Although the FTG data are of a higher resolution than the magnetic data, comparable results were obtained from these independent datasets. We found that the dykes form clusters at the ends of density and susceptibility anomalies, interpreted to be lobe-like magmatic conduits. Furthermore, potential-field analysis has revealed the irregular geometry and southward-dipping nature of the BHS, in addition to the presence of multiple, near surface anomalies that may correspond to dyke clusters or other igneous bodies. Structural analysis indicates that emplacement of the dykes was controlled by pre-existing geological structures and that they have probably been deformed post-intrusion, potentially via the reactivation of pre-rift faults. The potential-field investigations and observations of dyke margin lineations from field-based structural analysis indicate that multiple dyke sources and bodies similar to the BHS may also exist. Finally, this study demonstrates that magma-poor margins, such as the Newfoundland margin, may host significant