Geophysical Research Abstracts
Vol. 20, EGU2018-2835-1, 2018
EGU General Assembly 2018

Rift-related magmatism on magma-poor margins: Structural, petrological and potential field analyses of the Mesozoic Notre Dame Bay intrusions, onshore Newfoundland, Canada

Alexander L. Peace (1), J. Kim Welford (1), Meixia Geng (1), Brant D. Gaetz (1), Sarah S. Ryan (1), Greg Dunning (1), and Hamish Sandeman (2)

(1) Memorial University of Newfoundland, Earth Sciences, St. John's, NL, Canada (alpeace@mun.ca), (2) Department of Natural Resources – Geological Survey, Government of Newfoundland and Labrador, St. John's, NL, Canada

Globally, passive margins are typically classified as either magma-rich or magma-poor. Despite this simple classification, magma-poor margins such as Newfoundland, do exhibit evidence of localized magmatism, as magmatism to some extent invariably accompanies all continental breakup. The magma-poor Newfoundland margin in Eastern Canada formed after a period of stretching and rifting, followed by continental breakup resulting in separation of the Grand Banks from Iberia, and Northern Newfoundland from Ireland. A sequence of Mesozoic-Cenozoic magmatic rocks have been documented on- and offshore Newfoundland that are claimed to be cotemporaneous with rifting and breakup, with further magmatism also occurring offshore post-breakup. One such occurrence of potentially early rift-related igneous rocks are the Jurassic-Cretaceous intrusions that comprise the Notre Dame Bay Magmatic Province (NDBMP). Here, at least one gabbroic body, known as the Budgell Harbour Stock (BHS), is surrounded by multiple sets of lamprophyre dykes, in addition to the nearby, potentially related, Dildo Pond Intrusion (DPI) and Leading Tickles Stock (LTS).

Although the BHS is penetrated by several shallow mineral exploration wells, it is poorly exposed at the surface, such that its deeper structure, magmatic evolution, and relationship to pre-existing structures remain unknown. Here, the results of field-based geological mapping and petrological analysis, in addition to inversion of Full Tensor Gradiometry (FTG) and aeromagnetic data are presented to examine the deeper structure.

Our results show that lamprophyre dykes, with highly variable mineralogy and texture, are located in clusters at the surface termination of density anomalies, interpreted to be lobe-like magmatic conduits. This is contrary to earlier interpretations of the dykes as simply radiating out from the BHS. Furthermore, the analysis demonstrates the irregular geometry and south-westward-dipping nature of the BHS, in addition to the presence of multiple, near surface anomalies that may correspond to dyke clusters or other related igneous bodies. The subsurface geometry of the BHS suggests that its emplacement was strongly controlled by pre-existing regional faults. Structural analysis indicates that the dykes have both interacted with the pre-existing geology and have probably been deformed post-intrusion, potentially via the reactivation of pre-rift faults. In addition, the potential field investigations and lineation data from dyke margins indicate that multiple dyke sources and bodies similar to the BHS may also exist in the area. Finally, this study demonstrates that margins that are considered to be non-volcanic, such as the Newfoundland margin, may host significant rift-related magmatic provinces, challenging the concept of a simple distinction between volcanic and non-volcanic margins and rifts.