Investigating the presence of boudinage structures offshore Newfoundland, Canada, using geophysical data

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The evolution of the passive margin off the coast of eastern Canada has been characterized by a series of rifting episodes that resulted in widespread extension of the crust and associated structural anomalies, some with the potential to be classified as boudinage structures. These features are segments within the subsurface formed during lithospheric stretching and rifting, which begin as pinch-and-swell structures among structurally competent layers of strata bound by incompetent layers, and later separate into discrete boudins. Crustal thinning of competent layers is often apparent in seismic sections or appears as repeating elongated anomalies in gravity and magnetic surveys.

In general, boudinage at the lithospheric scale develops undulation wavelengths approximately four times the competent layer thickness. Additionally, the presence of listric faults and Moho undulations is thought to be related to these regimes and such features have been identified in gravity, magnetic, and seismic surveys. By comparing the evolution of the Grand Banks to other examples of passive margins where boudinage has been suggested as a driving mechanism, it is reasonable to explore the potential of the same structures being present in the Newfoundland margin. Some useful analogues include the Greenland–Norway and Brazil–West Africa conjugate margins, the South China Sea, and the Basin and Range province in the western USA.

This investigation will supplement our knowledge of the aforementioned examples with a thorough investigation of seismic, gravity, and magnetic signatures, in order to determine if boudinage structures are evident in the context of the Grand Banks. The identification of boudinage in geophysical data from the Grand Banks is challenging because it is a more complex passive margin segment. However, the application of these methods to the Grand Banks is valuable due to the economic prospects and the potential for increasing geological knowledge of the area, as well as validating existing model results of extensional margin evolution.

Atlantic Geology, 2018, Volume 54
Conjugate Margins Conference 2018, August 19-22, 2018
doi: 10.4138/atlgeol.2018.014