

Tectonic implications of Mesozoic–Cenozoic magmatism on the Newfoundland–Ireland–Iberian margins

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Successful breakup between the Newfoundland, Ireland, and Iberian passive margins resulted in the separation of the Grand Banks from Iberia, and northern Newfoundland from Ireland, whilst Ireland also separated from East Greenland. Multiple, discrete rift events have been identified prior to lithospheric breakup. Breakup resulted in the formation of a complex oceanic fracture zone, the Charlie-Gibbs Fracture Zone (CGFZ), surrounded by both ‘magma-rich’ and ‘magma-poor’ passive margins. Previous work demonstrates the importance of studying both conjugate margins to fully comprehend rift and breakup processes. In the southern North Atlantic, it is essential therefore to compile observations from all surrounding margins to gain a better understanding of the processes governing rifting and breakup.

One aspect of passive margin development that can provide insights into the evolution of rifting and subsequent breakup is the magmatic evolution. The timing, volume, composition, and manifestation of magmatic events may vary significantly between passive margins, including conjugate pairs. As such significant information regarding rift evolution can be discerned from the series of magmatic rocks, and their spatio-temporal distribution within the rift cycle.

Location and geochronological data from magmatic rocks were compiled, and two distinct groups of volcanic rocks identified. Mesozoic–Cenozoic rocks are documented on- and offshore Newfoundland, Ireland, and Iberia cotemporaneous with rifting and breakup. In addition, a younger post-breakup magmatic event was also identified. These data were imported into GPlates for visualization within a plate tectonic context to investigate their spatial and temporal distribution. Furthermore, models of crustal thickness and regional strain evolution were compiled from previous studies. This allowed us to investigate both the viability of competing plate tectonic reconstructions and the relationship between strain, crustal thickness, and magmatism.

Results indicate that the spatio-temporal distribution of magmatism during the Mesozoic–Cenozoic development of the Newfoundland–Ireland–Iberian margins is highly variable, even between conjugate margins, and that even margins typically considered to be ‘magma-poor’ may host spatially, temporally, and volumetrically widespread magmatism.