



Magmatic history of a volcanic passive margin: a case study of the Hatton Basin, western offshore Ireland

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The Hatton Basin is located next to the continent-ocean boundary in the Irish offshore, east of the Hatton passive volcanic Continental Margin. It is bounded by the Rockall Bank to the east and by the Hatton High to the west. Little is known about its structure and evolution within the context of the North Atlantic opening, given the lack of modern geophysical data.

Here we use modern multichannel seismic (MCS) data acquired with a 10km-long streamer, together with DSDP data and potential field data to explore the formation processes of this basin. The MCS and DSDP data suggest the presence of five sedimentary megasequences bounded by regional unconformities, ranging from possibly Cretaceous to Holocene in age. The seismic data indicates that one major syn-breakup, and some minor post-breakup magmatic phases influenced the evolution of the Hatton Basin. Evidence of magmatic activity in the basin consist of multiphase sill intrusions, formation of paleo-volcanic cones at different stratigraphic levels and deformation of post-breakup strata above some volcanoes observed in the MCS lines.

Both magnetic and gravity data show NE-SW trending lineaments of positive anomalies, extending from the center of the basin towards the southern end. The locations of the mapped paleo-volcanoes in the basin are spatially coincident to these anomalies. The connection between the paleo-volcanoes and the potential field anomalies potentially reflect areas with stronger magmatic influence, with the lineament-like anomalies possibly representing intrusions in the middle and upper crust. The parallel nature and orientation of these intrusions suggest that they emerged through pre-existing weak zones of the crust that were present mostly in the southern part of the basin; causing along-axis variation in magmatic activity during the basin formation.

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