Linking Rifting History and Magmatic Cyclicity West of Britain

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ABSTRACT

Volcanic rifted margins are characterized by voluminous intrusive and extrusive magmatism, typically emplaced over a short period of time preceding and during rifting. Current views of such systems are commonly based on regional studies, which are often limited by the availability of data. However, an increasing amount of high quality seismic data in the West of Britain area, combined with recent wells (e.g. Brugdan, Lagavulin) that have penetrated several km of Palaeogene-aged basalt, allow us, for the first time, to study the link between magmatic stratigraphy and basin evolution. Although the North Atlantic Igneous Province has been well-studied, the basins west of Britain (particularly the Rockall Basin) are relatively under-studied, and thus their evolution has remained enigmatic. This region therefore represents a poorly-understood frontier exploration province with debated potential. In terms of hydrocarbons, only a few wells have targeted the Rockall Basin, although discoveries (e.g. Benbecula) have indicated the existence of a petroleum system. The recent success of exploration in close association with volcanic stratigraphy (e.g. the intra-lava Rosebank field in the Faeroe-Shetland Basin), the exploration potential of the Rockall Basin is currently being re-evaluated. However, without a detailed volcanic stratigraphic framework and an understanding of how the relates to rifting, a major challenge in the regional correlation of strata still exists. Importantly, recent work (Hole et al., 2015), based on geochemical and chronostratigraphic analysis, has indicated that magmatism in the Rockall Trough and onshore is associated with at least two separate rifting events. A hiatus occurs between these events, starting around sequence T36 (~ 58.4 Ma) with resumption of magmatism at sequence T40 (~ 56.1 Ma). There is also apparent cyclicity in the style, composition and duration of magmatic activity associated with each rifting event, suggesting a possible underlying genetic control which may, or may not, be plume related. These two rifting events should be manifested in the lava field stratigraphy. Using regional high quality seismic data, combined with a unique availability of detailed well control through basalt/lava subcrop west of Britain, accompanied by biostratigraphic and geochemical control, will allow the detailed evolutionary history of the basin rifting and its relationship to the magmatism to be linked and understood.