AAPG Datapages/Search and Discovery Article #90295 ©2017 AAPG Asia Pacific Region GTW,
Influence of Volcanism and Associated Magmatic Processes on Petroleum Systems, Oamaru, New Zealand, March 14-16, 2017

Linking Rifting History and Magmatic Cyclicity West of Britain

Faye Walker[1], Nick Schofield[1], and Malcolm Hole[1]

[1]University of Aberdeen, UK

ABSTRACT

Volcanic rifted margins evolve by extension accompanied by voluminous intrusive and extrusive magmatism, typically over short periods of time preceding and during breakup. Current views of such systems are commonly based on regional and frequently margin-wide studies, which are often limited by availability of data and/or data types. However, a growing amount of high quality regional seismic data in the West of Britain area, combined with recent wells (e.g. Brugdan, Lagavulin, Anne-Marie) that have penetrated considerable thicknesses (km's) of Palaeogene-aged basalt subcrop, allows us, for the first time, to specifically understand and link the high resolution magmatic stratigraphy to rifting events and basin evolution. Although the North Atlantic Igneous Province has been well-studied, the tectonic and volcanic evolution of the basins west of Britain, and in particular the Rockall and NE Rockall Basins, has remained enigmatic. This region therefore represents a poorly-understood frontier exploration area with debated future potential. In terms of hydrocarbons, a limited number of wells have targeted the Rockall Trough, although discoveries (e.g. Benbecula) have indicated the existence of a petroleum system. With the recent success of exploration in close association with volcanic stratigraphy (e.g. the intra-lava Rosebank field) several oil companies are currently re-evaluating the Rockall Trough. However, without a detailed volcanic stratigraphic framework and understanding of its relationship to regional rifting, a major challenge in the regional correlation of strata still exists for exploration of this region. Importantly, recent work (Hole et al., 2015), based on regional geochemical and chronostratigraphic analysis, has indicated that the magmatism in the Rockall Trough and onshore is associated with at least two separate rifting events, during end-Cretaceous to Palaeocene times. Between each magmatic event a hiatus in activity occurs, starting at around sequence T36 (prechron 24; ~ 58.4 Ma) with re-establishment of magmatism at sequence T40 (~ 56.1 Ma). It is also apparent that there is a linked 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 2D and 3D seismic data, combined with a unique availability of detailed well control through basalt/lava subcrop west of Britain (an aspect often unavailable in rifting studies), accompanied with biostratigraphical and geochemical control throughout the province, will allow the detailed evolutionary history of the basin rifting and its incipient relationship to the magmatism to be linked and elucidated.