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The Impact of Igneous Intrusions on the Petroleum System: Implications for Reservoir, Source Rock and Exploration

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ABSTRACT

Hydrocarbon exploration in basins with intrusive volcanism associated with their development, face challenges related to reservoir quality, source rock maturation, compartmentalisation and drilling issues. Igneous intrusions and their impact on host rock sediments have been studied in detail and subsurface mapping of igneous intrusions has led to greater understanding of magma plumbing systems (Schofield et al., 2015). Despite this, there is still limited understanding of how the effects of igneous intrusions directly influence elements of the petroleum system; in particular, how the alteration of host rock sediments can be made applicable to hydrocarbon exploration. The abundance of well and seismic data also highlights the issues arising from encountering pervasive igneous intrusions whilst drilling wells, due to their close spatial relation to exploration targets. Through a combination of fieldwork, seismic interpretation and well analysis, this work illustrates the impact of igneous intrusions on host rock sediments and the potential drilling issues. The subsurface data was from the Faroe-Shetland Basin, a volcanic rifted margin, where there is an extensive suite of igneous intrusions.