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Integrated Interpretation Identifies Unconventional Basement Reservoirs in the Sabatayn Basin, Yemen

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Abstract

Basements rarely form hydrocarbon reservoirs; and consequently are rarely considered as hydrocarbon exploration targets. The few basement reservoirs are classified as unconventional reservoirs.

In addition to the usual uncertainties in hydrocarbon exploration, three additional components are necessary for the success in basement reservoir exploration; (1) Time lag between the peak time of hydrocarbon generation and tectonic movement that create fracture systems in the basement, (2) contact area between source rocks and basement surface and (3) limited migration paths.

In the Sabatayn basin, Yemen, the Jurassic Kimmeridgian Madbi shale is the source rock and regional evaporites seal the entrapped hydrocarbons. The shale expelled the hydrocarbons during early Cretaceous into previously fractured Pre-Cambrian basement.

Integrated interpretation of gravity and 2D seismic data defined the poorly imaged basement highs in the basin. This work provided a cost-effective evaluation method for identifying basement highs forming the hydrocarbon reservoirs.