Structural Evolution of the Bayoot Field, Yemen, and Controls on Well Productivity

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Abstract

The Bayoot field is a fractured basement reservoir located in southeast Yemen. It is an unconventional and structurally complex field with multiple elements of heterogeneity. To explain this complexity, a structural evolution interpretation of the Bayoot field is presented through the integration of literature, seismic and image log data. The Bayoot field differs from other areas of southeast Yemen, as it did not experience Cretaceous rifting. Seismic evidence suggests local strike slip transpressional forces affected the Bayoot field during the Cretaceous, resulting in localized uplift in the form of strike slip inversion ‘flower structures’. The fracture patterns observed in the Bayoot basement have been categorized into four main groups based on the tectonic events responsible for their formation. The Nadj Strike Slip Fault System, Hercynian Orogeny, Jurassic rifting, Cretaceous/Cenozoic strike slip faulting and Oligocene normal faulting have all developed the fracture network of the Bayoot reservoir. The E-W fracture orientation encompasses all five major tectonic events and explains why the economic permeability is orientated E-W and ENE-WSW. This proves that Riedel fractures are critically stressed and a major contributor to hydrocarbon production. The correlation between the E-W open fracture pattern and the E-W primary and reactivated joint system indicates the joint network may play a larger role in providing permeability to the reservoir than previously thought.