

Identification of New Stratigraphic Plays in Salt-Related Mini-Basin Settings: Unlocking New Paleozoic Play Opportunities in the Supra-Salt Section of the South Oman Salt Basin

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ABSTRACT

Salt mobility has been shown to have had a profound effect on syn-sedimentary deposition and structural styles in numerous prospective basins. The aim of this presentation is to draw upon field and subsurface exemplars from the Paradox Basin, Utah and the North Sea Basin and to combine these observations with those in the South Oman Salt Basin (SOSB) in order to demonstrate how an understanding of the key processes unlock new stratigraphic plays in areas that had previously been written off.

Several key elements can be identified that control the nature of deposition and structural styles in the Upper Triassic (Chinle Formation) of the Paradox Basin (Matthews et al., 2007), the Triassic (Smith Bank and Skaggerak formations) and Upper Jurassic (Fulmar Formation) of the Central North Sea and the Triassic (Bunter Sandstone Formation) of the Southern North Sea (Underhill, 2009). These include the development of pods, the level of asymmetry and faulting that they show, whether they ground and weld to the sub-salt subcrop thus permitting access to charge, into the core or flanks of the resultant turtle back structures, or rotated fault blocks that result from the deformation.

In Oman, recent advances in high resolution seismic technology and advanced de-multiple processing, has vastly improved the imaging of the various Paleozoic post-salt mini-basins in the SOSB. A new understanding of the tectonic and stratigraphic evolution of these pods has been integrated with well data (e.g. FIS, dipmeter, heavy mineral analysis, biostratigraphic data) and combined with insights gained from the above analogues in the Paradox and North Sea Basins.

Until recently a large area of the post-salt successions in the SOSB was seen as having a significant risk for charge access due to the underlying salt seal presence. However, with the latest integrated understanding, focus has been on the complex migration pathways from the pre-salt source-rock, through the salt windows/welds (e.g. Heward, 1992), and allowed for improved sweet spotting of areas for greater charge likelihood.

This “follow the molecule” mindset has the potential to unlock new plays in the SOSB, expand prospective fairways and extend the life of this heartland basin. Understanding the migration pathways has challenged the existing paradigms around large dry structures, with focus now on the possibility to charge only parts of the structure (e.g. stratigraphic trapped along the rims) and may convert ‘dry core’ structures into ‘prospective Paleozoic halos’.