The Donkey Bore Syncline, South Australia – an Outcrop Analogue of a Deepwater Sediment-Filled Salt-Withdraw Mini-Basin

Payenberg, Tobias H.D., Simon C. Lang, Mark, R.W. Reilly, Blaise Fernandes, Carmen Krapf, and Nathan Ceglar, University of Adelaide, Adelaide, Australia

Mini-basins filled with deepwater sediments are significant exploration targets around the world. Reservoir and seal facies distribution within such mini-basins are highly variable and often difficult to predict. As a result, many development programs face a higher degree of compartmentalization than originally anticipated, which often leads to higher development costs, and lowered reserves. Outcrop analogues are one way of gaining a better generic understanding of compartmentalization commonly encountered within sedimentary successions.

The Cambrian Donkey Bore Syncline, Flinders Ranges, South Australia is an outcropping analogue of a complete mini-basin fill. Next to the Wirrealpa Diapir over 400m of section are exposed in a doubly-folded syncline. The gently-dipping sediments within the syncline cover an area of approximately 20 km2. The mini-basin fill comprises basal shallow marine, cross-stratified carbonates including Archaeocyatha reef complexes. Towards the top of this limestone slumping occurs frequently, and reef complexes are found as allochthonous blocks. This mass wasting shows the re-initiation of the mini-basin.

Overlying the carbonates are massive densite and debrite beds separated by mudstone. These rocks form the initial clastic fill of the basin. Up section the densites and debrites decrease in thickness and frequency, and turbidite beds start occurring. This is interpreted as the result of a decreasing slope through filling of the mini-basin. The overall transgressive deepwater succession ends with thin turbidite and thick mudstone packages overlain by chloritic siltstones. Sandbody continuity within the basin is mainly dependent on the type of flow mechanism and the input location relative to the diapir.