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The Silurian Acacus Outcrop in Southern Libya - An Analogue to Jenein Sud?

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SUMMARY

Outcropping cliffs of the Silurian Acacus Formation in Southern Libya were laser-scanned, and based on field sections mapped for reservoir bodies to resolve reservoir architecture. Pseudo-wells were constructed along these sections based on Jenein Sud well logs. Utilising seismic wavelet extractions accounting for frequencies and hence resolution, synthetic seismic sections were constructed to test the limits of seismic resolution for mapping Acacus reservoirs.

Upper Silurian intertidal to shallow marine clastic sequences form major oil and gas reservoirs in North Africa covering a basin along the northern margin of Gondwana. They extend today in the subsurface over vast areas of Algeria, southern Tunisia, Libya and western Egypt.

The sedimentary sequences are represented by a diachronous Llandoveryan to Pridolian basin fill of northwards prograding sandstones and shales. In individual sub-basins the thickness of the Upper Silurian clastic sequences varies from 0 to 1100m dependent on the accommodation space and on the degree of erosion due to Caledonian and Hercynian uplifts.

A suitable area for outcrop studies is situated in southern Libya. The study area is characterized by a ca. 100 km long escarpment with cliff heights of up to 300m. The exposures show a gradual facies transition from underlying Lower Silurian Shales into Upper Silurian sandstones and shales up to 230m thick. The top section of the cliffs is marked by Devonian sandstones that rest unconformably on the Silurian succession.

Four escarpments showing intertidal progradations towards NW to N were imaged using a laser-scanner. These scans have resolutions of approximately one meter and were used to semi-quantitatively map individual sand bodies focusing on thickness variations of the sandstone units and internal unconformities. Based on these data pseudo-wells were constructed from Jenein Sud wells for synthetic sections using an extracted seismic wavelet to account for realistic frequencies with the objective to test realistic resolution of the Acacus reservoir architecture in Jenein Sud.