



0.0.1 The geometry of lobe elements in basin-floor Fan 4, Permian Skoorsteenberg Formation, Tanqua-Karoo Basin, South Africa

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Lobes form the down-dip depositional record of sediment transported through channel systems on the slope in deep-marine settings and the upper part of the submarine fan and can form important hydrocarbon reservoirs. The Permian Skoorsteenberg Formation in the Tanqua-Karoo Basin (Western Cape Province, South Africa) offers unique outcrops to study the architecture of the lobes and the hierarchy of their elements, particularly characteristics such as lateral and vertical variations of facies types, connectivity and the geometry of the lobe elements, which in oil fields are generally below seismic resolution. The LOBE project aims to investigate these important internal features and in this study, as part of the LOBE project, the goal is to analyze and quantify in detail the uppermost basin floor fan, Fan 4, in an area of particularly well-exposed 3-D outcrops and a research wellbore nearby containing a full suite of state-of-the-art well logs.

Lobes consist of alternating intervals of sand-rich and silt-rich intervals, with the sand-rich intervals referred to as lobe elements. Through detailed fieldwork, individual lobe elements were tracked for their lateral extents and features such as bed amalgamations, palaeocurrent indicators, permeability barriers and lateral changes in composition and facies. Gradual and abrupt thinning trends in the lobe elements were recognised and found to be at variance with the simple sheet-like sandstone geometries descriptions from previous work. Analysis of the field data resulted in estimates on the width,

length and thickness range of the sandbodies in the lobe elements. Statistical evaluation of the bed lengths and percentage of amalgamation on two outcrops resulted in bed lengths for the lower stratigraphic part ranging between 1000 m and 2600 m with a low percentage of amalgamation between 0 and 5 %. In the upper stratigraphic part higher percentages of up to 96 % of amalgamation were observed within the elements. Here bed widths range from 200 m till 900 m and are shorter than the bed lengths, ranging from 500 m till 2400 m. Cumulative thickness distribution curves of the upper and lower stratigraphic part of Fan 4 led to the conclusion that these curves differ because of increased amalgamation in the youngest exposed stratigraphy of the lobe. Isopach maps constructed for individual beds, groups of beds and lobe elements strongly suggest compensational stacking patterns at different scales.