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Integration of Borehole Image Logs, Cores and Outcrop Data to Interpret Sedimentary Genetic Types in a Fluvial Environment

Borehole image logs such as the Fullbore Formation MicroImager (FMI) log yield detailed 1-D information about the vertical distribution of sedimentary structures. To interpret three-dimensional sedimentary genetic types from the FMI images, we need to calibrate the image with real rock. Normally, the only real rocks available are cores, which also provides one-dimensional information.

In this paper we describe the interpretation of fluvial genetic types from FMI logs by direct comparison with outcrops. We established an outcrop-based 3-D deterministic sedimentary architecture model of a low net-to-gross fluvial succession in continuous cliff exposures. The outcrop lithofacies characteristics yielded four fluvial genetic types: (1) mixed-load meandering river sandstone-siltstone beds, (2) bedload meandering river sandstone, (3) braided river sandstone, and (4) crevasse splay sandstone-siltstone sheets. We established the (variation in) sedimentary structures and paleocurrents, and the shape and size distribution of each fluvial genetic type. The spatial distribution of the genetic types was placed in a sequence stratigraphical framework.

Two shallow, 200-m-deep wells were drilled behind the cliff faces. One well was cored to a depth of 150 m and FMI logs were recorded in both wells. The wells were tied into the outcrop-based sedimentary architecture model, and thus we could interpret the genetic type of each sandstone interval in the wells, and label the corresponding FMI images. The FMI picture catalogue of point bar successions, trough cross bedding, braided bars, scour marks and climbing ripples helps to interpret fluvial reservoir units from borehole image logs.