CHARACTERIZING FLUVIAL ARCHITECTURE FROM THE SALT WASH MEMBER OF THE MORRISON FORMATION, CENTRAL UTAH: ADVANCING METHODOLOGIES FOR CAPTURING OUTCROPS IN THREE-DIMENSIONS

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Abstract

Fluvial sandstones serve as important petroleum reservoirs, but these deposits can be difficult to characterize due to the complex three-dimensional arrangement of lithologies and sedimentary facies. Successful exploitation of these strata require a thorough understanding of sandbody compartmentalization. Outcrop analogues are commonly used to predict lithologic heterogeneities, however, such exposures are often limited to one- or two-dimensions (measured section; vertical stratigraphic succession, and the lateral variations). As a result, critical information on fluvial architecture is inaccessible, and changes in sandstone properties into- and out-of the outcrop plane are unknown.

The proposed research will involve mapping three-dimensional exposures of fluvial sandstones of the Salt Wash Member of the Morrison Formation (Jurassic) in central Utah and characterizing these deposits through aerial imagery, terrestrial laser scanning, facies mapping, and measured sections. High-resolution aerial imagery (3 cm) will be obtained using fixed-wing drones. Three-dimensional photo-realistic representations of the strata will be constructed using the latest structure-from-motion photogrammetry techniques. Simultaneously, terrestrial laser scanning (Leica ScanStation) will be used to collect ultra-high-density point clouds (< 1 cm resolution) of individual features such as barforms and sedimentary structures. The result will be a regional, georeferenced three-dimensional reconstruction of the strata, with detailed (<cm) characterization of specific fluvial features. This framework will be augmented with detailed outcrop observations and facies mapping. These data will provide quantitative geostatistical constraints for stochastic reservoirs models, which can in turn improve reservoir flow models and enhance recovery rates.

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