QUANTIFYING THE BED-SCALE ARCHITECTURE OF SUBMARINE LOBE DEPOSITS, POINT LOMA FORMATION, CALIFORNIA

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ABSTRACT

Submarine lobe deposits form the largest sediment accumulations on Earth and host significant reservoirs for hydrocarbons. While many studies of modern and ancient lobe deposits describe facies changes (e.g., axis-to-fringe, proximal-to-distal), these facies relationships are rarely quantified. This study pairs traditional field methods and newly developed 3D geomodelling workflows to quantify lateral and vertical facies relationships in outcropping lobe deposits.

Submarine lobe strata of the Upper Cretaceous Point Loma Formation form coastal cliff exposures near San Diego, California. These fine-grained submarine lobes were deposited in a forearc basin setting, likely with a steep slope gradient. Laterally extensive exposures offer a rare opportunity to observe bed-scale architecture and facies changes over 2 km (1.25 miles) in turbidites and hybrid event beds. We characterize these lobe deposits using centimeter-scale measured sections, bed and bedset correlations, paleocurrent analysis, and measurements derived from a drone photogrammetry-based 3D outcrop model.

This analysis of the Point Loma Formation is merged with published bed-scale correlation panels from other outcropping lobe deposits. This combined dataset enables comparison of key facies parameters and relationships that control the lateral and vertical facies architecture of submarine lobe deposits. The global data compilation utilized here also allows for recognition of architectural similarities and differences within and between systems. These quantified facies trends provide a predictive framework for reservoirs hosted in submarine lobe deposits as well as quantitative inputs for fine-scale reservoir models. These models can be used to predict fine-scale flow, and then up-scaled accordingly into field-scale reservoir models.

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