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Deterministic High-Resolution Seismic Reservoir Characterization

Reservoir characterization is a prerequisite for oil field development. The current state-of-the-art are volume visualization and geobody analysis. The major drawbacks are lithologic ambiguities, and yet too much detail for direct use in reservoir modeling. In this project, we drive these approaches to their limit and investigate how to overcome these problems.

Our study focuses on the stratigraphy, lithology and petrophysics of the clastic Temblor (Miocene) reservoir in Coalinga, California. The field is close to the San Andreas Fault and contains four unconformable surfaces representing incised-fill to sub-tidal depositional environments which render the reservoir highly heterogeneous. In addition, cementation often masks original lithology and petrophysics. Coalinga field has produced heavy oil since 1887 and is presently under tertiary development. Current production methods include steaming which results in a tremendous well density.

We use seismic volume visualization, geobody segmentation, and attribute analysis to construct a deterministic reservoir model of the highest resolution. We resolve ambiguities by utilizing the high well density. We will demonstrate various lithological signatures on 3-D-seismic data constrained and validated by wireline data. We assemble all this data into one deterministic, high-resolution reservoir model. If necessary, short-scale petrophysical heterogeneities are included in the model by populating the geobodies with petrophysical realizations compatible with seismic data, attributes, and wireline data. The final result will be a petrophysical reservoir model of the highest-possible resolution to demonstrate the deterministic limit and serve as benchmark for other reservoir characterization and modeling techniques.
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