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Sequence Stratigraphic Controls on Reservoir Productivity: Ursa Field, Gulf of Mexico

The Upper Miocene reservoirs of Ursa Field in Mississippi Canyon Blocks 809, 810, 853 and 854 of the Gulf of Mexico provide an excellent opportunity to study the stratigraphic controls on deep-water reservoir productivity at a range of scales from third-order sequences to channels. Operated by Shell with partners ExxonMobil, BP and ConocoPhillips, Ursa has an excellent suite of subsurface data including three years of production data.

A sequence stratigraphic framework for the mini-basin in which the field sits was constructed by mapping major erosion surfaces (third-order sequence boundaries) and tying these surfaces to wells where ages could be constrained by biostratigraphic data. This analysis showed that while thick, deep-water sands occur above third-order sequence boundaries they are usually wet or reservoir minor hydrocarbon volumes. In contrast, major hydrocarbon reservoirs in Ursa occur within the middle and upper part of third-order sequences.

At a higher stratigraphic order, channel complexes and in some cases channels were defined from seismic mapping and well log interpretations. Pressure data and material balance calculations showed that these channel complexes were well connected laterally, but that mass-transport complexes and some overbank/abandonment muds have acted as significant pressure baffles.

This study suggests that, for the submarine channel reservoirs of Ursa field, connectivity is good within channels and channel complexes. Significant vertical flow baffles and barriers occur in association with lower-order stratigraphic features (i.e., between channel complexes).

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