AAPG Annual Convention
Salt Lake City, Utah
May 11-14, 2003

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Crestal Fault Patterns Above Turtle Structures in the Lower Congo Basin, Gabon: The Influence of Trap Timing

Turtle structure anticlines are a premier trap type in deep water, and delineation of crestal fault patterns is important in their evaluation. Fault patterns above arched strata tend to be controlled by the shape of the arch, so folds that look alike should develop similar fault patterns. Here we compare crestal fault patterns above two adjacent, very well imaged turtle structures in the deep-water Lower Congo Basin, Gabon.

The two structures are similar in profile but have very different geologic histories. The flanks of Turtle Structure A subsided sequentially, during different stress regimes. First, the north flank subsided as a rollover into a west-striking normal fault. Next, the east flank formed as a rollover into a northwest-striking normal fault. Finally, the south and east flanks subsided by salt withdrawal. Each episode of flank subsidence formed an independent set of crestal faults, which cut across one another in map view but which are indistinguishable in profile.

In contrast, all of the flanks of Turtle Structure B subsided simultaneously during an episode of extension and salt withdrawal. Most of the deformation over the crest of Turtle B is accommodated by a single fault system, which curves to accommodate subsidence on the two highest relief flanks.

This study illustrates how dramatically different fault patterns can form above turtle structure anticlines that are geometrically very similar. Kinematic history may therefore be much more important than fold geometry in controlling crestal faulting.