Deformation Associated with Continental Normal Faults, Western Grand Canyon, Arizona: Implications for Hydrocarbon Trapping

By
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The western Grand Canyon provides a rare opportunity to directly observe normal faults and associated structures over large vertical cross sections with nearly complete exposure. Detailed mapping and mechanical modeling of these structures will improve our understanding of deformation associated with normal faults and thereby improve our ability to infer hydrocarbon migration pathways and to predict the occurrence of hydrocarbon traps in regions of continental extension.

Geophysical observations of subsurface normal faults suggest that deformation associated with these faults is localized in the hanging wall while the footwall block remains relatively undeformed. The mechanics of this process, however, is still poorly understood. Most explanations for these structures are purely kinematic and include the a priori assumption that only the hanging wall deforms.

In this study I propose to map the fault surface and hanging wall and footwall structures associated with the Froggy Fault exposed in Lone Mountain and Whitmore Point. This area affords the opportunity to map a fault with ~200 m of offset over a vertical section of more than 1,000 m. Mapping will involve modern quantitative techniques including GPS surveying of deformed strata and GIS integration of digital elevation model, aerial photography, and field data in order to build a high-resolution 3-dimensional map of the normal faults and associated structures exposed in the Lone Mountain area. The results of this field study will form the basis of numerical models to better understand the mechanics associated with normal faulting and the formation of secondary structures.