

# **The Meers Fault: A Prominent Holocene Scarp in Southern Oklahoma with a History of Repeated Movement**

Hamed Al-Refae and G. Randy Keller

*ConocoPhillips School of Geology and Geophysics Oklahoma Geological Survey, University of Oklahoma, Norman, OK*

The Meers Fault is the only documented Holocene fault scarp east of Colorado. It is the southernmost element of the complex and massive (>10 km of throw) frontal fault zone that forms the boundary between the Anadarko basin, which is the deepest intra-continental basin in the United States, and the uplifted igneous rocks of the Wichita Mountains. The most recent movement occurred 1100-1300 years ago with an earlier movement 2,000-2,900 years ago. There is as much as 5 m vertical and probably appreciably more left-lateral strike slip displacement on the fault. Motion on the Meers Fault represents continued activity on one of the largest structural features in North America. The Wichita uplift and the Anadarko basin, which are separated by the Meers Fault and related sub parallel fault strands, indicate significant intra-plate deformation along the trend of the Southern Oklahoma aulacogen, which is a classic example of a failed and massively inverted rift.

In addition to the tectonic significance of these structures in Oklahoma, two well dated, late Holocene events occurred on the Meers Fault and another in the middle-Pleistocene. As such, this fault represents one of the highest potential seismic hazards in the central/eastern United States. However, its relative seismic quiescence is in contrast with the fact that Oklahoma has a well-documented history of seismicity elsewhere with more than 600 events being located in 2010, including a 4.7 Mblg event in October that was felt from Kansas City to Dallas.