

**Paper No. 190-7**

**Presentation Time:** 8:00 AM-12:00 PM

## **TOURMALINE AS AN INDICATOR FOR PROVENANCE IN ARKOMA FORELAND BASIN DELTAIC DEPOSITS, ARKANSAS**

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The Arkoma Basin is one of several foreland basins formed in association with the Ouachita orogeny. The Arkoma Basin has been studied in depth with regard to stratigraphy, depositional environments, structure and its relationship to the Appalachian-Ouachita orogenic event. One major controversy that still remains is the source direction of the sediment that formed the shallow marine deposits. Two possible source directions have been proposed: 1) a northeastern source from the Illinois Basin via the Reelfoot Rift and 2) an eastern source via an axial drainage system associated with the migrating Appalachian-Ouachita suture belt.

Traditionally, provenance in the Arkoma Basin was determined using quartz-feldspar-lithic (QFL) percentages, reinforced by paleoflow indicators. QFL data in this system is relatively unreliable because of the long system coupled with a hot, humid climate, similar to the current Orinoco Basin. It is also believed that the Arkoma deltaic system was river-dominated and comparable to the modern Mississippi River deltaic complex. Determination of flow directions of the modern Mississippi delta is extremely variable, ranging from almost due north to due south. As such, flow indicators in river-dominated deltaic systems are an unreliable means to determine ultimate provenance direction.

The crystal chemistry of ultrastable, chemically-complex detrital tourmaline provides an alternative indicator of the provenance source. A suite of detrital tourmaline ranging from angular to subrounded in grain shape and from multiple shades of brown to green and blue in color were analyzed from sandstone samples. The detrital tourmalines are primarily intermediate schorl-dravite with  $X(\text{Mg})=xx-yy$  and variable amounts of Ti, Ca and Al. A comparison of these data with Al-Fe-Mg tourmaline environmental diagrams indicates a few distinct high grade metamorphic and igneous sources: Li-poor granitoids; and  $\text{Fe}^{3+}$ -rich quartz-tourmaline calc-silicate rocks. These data suggests that an Appalachian source is more likely than the Illinois Basin as the primary source.

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