

PROVENANCE OF ATOKA SANDSTONES AND MUDROCKS FROM OUACHITA TROUGH, SE OKLAHOMA: IMPLICATION FOR LATE CARBONIFEROUS RHEIC OCEAN CLOSURE

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Abstract

The tectonostratigraphic evolution of the Ouachita trough can be studied from the analysis of the Paleozoic sediment dispersal system in the southern margin of Laurentia. Mid-Pennsylvanian Atoka Formation is considered for the research because of its deposition during the final stage of the Rheic Ocean closure with the preservation of the final ocean closure tectonic signature.

This research combines the sandstone petrography with the mudrock geochemistry, heavy mineral geochemistry, and detrital zircon geochronology to understand the Atoka provenance and to constrain the plate tectonic settings. Current research results, from sandstone framework composition and mudrock geochemistry, suggest the derivation of Atoka sediments from the collisional uplift of the continental margin sediments and the accretionary prism related to the south-directed subduction zone. Mudrock geochemistry identifies the influence of the mafic and intermediate source rocks, which is unidentified in the sandstone petrography. This research at present supports the hypothesis suggesting the southward subduction of the oceanic lithosphere under the accretionary prism bearing arc-continent or microcontinent. However, further verification is warranted from studies of geochronology and heavy mineral geochemistry to discriminate the rock types in provenance terranes and to understand the terrane ages.

Heavy mineral geochemistry (i.e., garnet, tourmaline, and chromite) will help to understand the provenance's magmatic and metamorphic history, and accretionary tectonism by identifying the oceanic crustal rocks involved in collision. Detrital zircon geochronology will help to understand the geologic age of the terrane contributing sediments and volcanic activity related to the subduction zone.