Detrital zircon provenance of the Hartselle Sandstone, Southeastern USA: Insights into sediment source and paleogeography

J.N. GIFFORD[1]* M.H.M. AL HARTHY [1] B.F. PLATT[1]

[1]University of Mississippi, 120A Carrier Hall, University, MS 38677; (*correspondance: jngiffor@olemiss.edu)

The Hartselle Sandstone is a light-colored, thick-bedded to massive, quartzose sandstone, that is widespread across an area spanning from Georgia to Mississippi (MS), and from Alabama (AL) to Kentucky. Formation thickness ranges up to more than 150 feet and the unit is Middle-Late Mississippian in age. The current hypothesis of formation suggests that the sandstone unit represents the remains of barrier islands located in the Rheic ocean basin between Gondwana and Laurentia. According to this interpretation, wave action and longshore currents concentrated sand into a set of northwest to southeast trending barrier islands. Transgression-regression events shifted the islands landward and basinward, resulting in the large areal extent of the unit. However, recent paleocurrent studies do not explain the geographical position of the Hartselle Sandstone because it is not parallel to the ancient shoreline. Another mystery is the source of the sand; some believe the source was from the south (Gondwana) and others argue that the sediment was sourced from the north (Laurentia).

Samples were collected from outcrops in MS and AL for thin-section analysis. Preliminary petrographic analyses show variation in porosity, carbonate content, and sorting, but indicate a craton interior or recycled clastic provenance.

Detrital zircon provenance analysis from this study shows that the Hartselle Sandstone has a range of sediment sources, most seemingly from Laurentia. Samples from both MS and AL show a primary age peak at ~1.2 Ga to 1 Ga, which corresponds with a Grenville source. Samples also show an age peak of ~1.8 Ga, which indicates sediment possibly from the Yavapai-Mazatzal or Trans-Hudson orogeny of central Laurentia. MS samples show age peaks at ~1.4 Ga, ~2.5 Ga, and ~2.8 Ga, which indicate erosion from sources such as the southwestern Appalachians and from older cratonic sources such as the Wyoming craton. AL samples show an age peak of ~500 Ma, which MS samples lack, indicating possible contributions of sediment from the northeastern Appalachians.

All data currently gathered from the Hartselle indicate that paleodrainage in the Middle to Late Mississippian was predominantly north to south, draining the continental interior of northern Laurentia.