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Joint 55th Annual North-Central / 55th Annual South-Central Section Meeting - 2021

Paper No. 4-7

Presentation Time: 3:20 PM

SEDIMENTOLOGY AND GEOCHEMISTRY OF A LOWER CRETACEOUS DINOSAUR TRACK SITE AT THE MAYAN RANCH, BANDERA, TEXAS: IMPLICATIONS FOR ENVIRONMENTS AND PRESERVATION OF A SAUROPOD MANUS DOMINANT TRACKWAY

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Dinosaur tracks are common in marginal marine strata of the Lower Cretaceous Glen Rose Fm. of central Texas. Sauropod manus dominant trackways at the Mayan Ranch were originally interpreted by R.T. Bird (1954) to represent swimming sauropod behavior. We conducted a detailed sedimentologic and geochemical analysis of the Mayan Ranch site to evaluate the paleoenvironment and conditions of track preservation.

The track pavement is an extensively bioturbated packstone with a diverse stenohaline biota of fragmented bivalves, oysters, and echinoderms capped by a thin veneer of symmetrically rippled oolitic-peloidal grainstone. Sharp-walled burrows with skeletal grains truncated along their margins and borings in the upper surface of the skeletal packstone bed indicate early marine lithification. Linear symmetrical ripples, with a secondary nearly perpendicular set and an average wavelength of 6.5 cm, indicate wave agitation in shallow waters less than one meter deep. Microbial laminite with desiccation cracks occur 5 cm above the track surface indicating shoaling and subaerial emergence on a tidal flat.

Depositional evidence for exceedingly shallow water environments recorded in the track pavement provides strong evidence against the swimming sauropod hypothesis. Observations support the alternative hypothesis that the tracks are preserved as undertracks below the original track surface that was subsequently stripped away by erosion. The manus impressions were recorded at a greater depth below the original track surface because the sauropod carried a greater weight over the manus which produced a greater registration force per unit area on the substrate. We interpret that the shallow depth of the tracks in comparison with those of other sauropod tracks reflects partial marine lithification of the substrate.

Geochemical results show evidence of elevated proxies for siliciclastics (Al, Ti, Si) and nutrients (Ba, Ni, Cu, Fe) in calcareous mudrock intervals indicating nutrient flux from land. $\delta^{13}\text{C}$ values ranging from +2.74 to +4.17‰ reflect marine conditions. A slight negative shift in $\delta^{18}\text{O}$ to -2.38‰ in the track horizon may indicate subaerial diagenesis. Chemical index of alteration (CIA) values ranging from 74-85 indicate intense silicate weathering during the Cretaceous greenhouse climate.

Session No. 4

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