

Provenance of the South Texas Paleocene-Eocene Wilcox Group, Western Gulf of Mexico Basin: Insights from Sandstone Modal Compositions and Detrital Zircon Geochronology

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Sandstone modal compositions and detrital zircon U-Pb analyses of the Paleocene-Eocene Wilcox Group of the southern Gulf Coast of Texas indicate long-distance sediment transport from primarily volcanic and basement sources to the west, northwest, and southwest.

The Wilcox Group of south Texas represents the earliest series of major post-Cretaceous pulses of sand deposition along the western margin of the Gulf of Mexico (GoM). Laramide basement uplifts have long been held to be the source of Wilcox sediment, implying that initiation of basement uplift was the driving factor for the transition from carbonate sedimentation to clastic deposition. To determine the provenance of the Wilcox Group and test this conventional hypothesis, Upper and Lower Wilcox samples were collected from 18 outcrop localities and 5 core sections along the southwestern Gulf Coast. Forty thin sections were point-counted using the Gazzi-Dickinson method to determine sandstone composition and 10 detrital zircon samples were analyzed by LA-ICP-MS to determine U-Pb age-spectra.

Modal data for sand grain populations suggest mixed sources including basement rocks, magmatic arc rocks, and subordinate sedimentary rocks. Zircon age-spectra for these sandstones reveal a complex grain assemblage derived from Laramide uplifted crystalline blocks of the central and southern Rocky Mountains, the Cordilleran arc of western North America, and arc-related extrusive and intrusive igneous rocks of northern Mexico. Zircon ages also suggest possible recycling of older sediment through uplift related to accretion of arc terranes along the westernmost North America, but that recycling of Cordilleran foreland basin sediment was not a major contributor. Comparison of Upper and Lower Wilcox zircon age-spectra indicate that Lower Wilcox sediment is richer in arc and volcanic material, whereas Upper Wilcox sediment is richer in basement material. Regional trends in detrital zircon age-spectra indicate that Upper Wilcox sediment is moderately homogeneous over the region studied, whereas the Lower Wilcox shows significant heterogeneity.

This study indicates that the drainage area for the Gulf of Mexico during the Paleocene-Eocene was larger than previously thought, encompassing not only the Laramide basement uplifts, but the volcanic province of northern Mexico and possibly Cordilleran tectonic regions along the westernmost North America.