

ABSTRACT

PROVENANCE OF THE DIFUNTA GROUP (MAASTRICHTIAN-PALEOGENE)
AS DETERMINED BY PETROGRAPHY AND DETRITAL ZIRCON U-PB
GEOCHRONOLOGY, LA POPA and PARRAS BASINS,
NUEVO LEON, MEXICO

BY

IRA A. BRADFORD, B.S.

Master of Science

New Mexico State University

Las Cruces, New Mexico, 2007

Dr. Timothy F. Lawton, Chair

The Cuchilla Tongue of the Potrerillos Formation in La Popa basin represents a stratigraphic wedge of coastal plain, nearshore marine and offshore marine clastic deposits. It contains three progradational parasequences separated from a fourth retrogradational parasequence by a sequence boundary. Depositional environments, petrology, outcrop geometry, and detrital-zircon geochronology indicate that the

Cuchilla Tongue and time-correlative Upper Sandstone Member of the Canon del Tule Formation and Las Imagenes Formation of the Parras basin formed as a single depositional system that spanned both sedimentary basins and was subsequently eroded over the crest of the Laramide La Gavia anticline. Sandstone composition and detrital zircon geochronology indicate the Parras basin formations were dominated by sediment from the Sierra Madre Oriental to the south, whereas the Cuchilla tongue was more heavily influenced by western igneous source terrains.

Detrital zircon U-PB geochronology data from six sandstone units of the Difunta Group in La Popa basin show that five magmatic terranes supplied the bulk of the detritus. These terranes include the Peninsular Ranges batholith, Alisitos magmatic arc, Cordilleran magmatic arc, East Mexican arc and Gondwanan arc. Proterozoic zircons from the Grenville, Mazatal and Yavapai provinces of the southwest United States are also present in the Difunta Group samples. Paleocene zircons first appear in strata formerly correlated with the Delgado Sandstone Member of the Potrerillos Formation in the Delgado syncline, but are not present again until the upper part of the Upper Sandstone Member of the Potrerillos Formation and remain present in all younger Difunta Group strata. The young zircons in the former Delgado Sandstone Member are interpreted as reworked tuff grains that yield a Paleogene depositional age for the strata formerly regarded as uppermost Cretaceous. The subsequent stratigraphic gap in young zircons records a 10 Ma time lag between the eruptive event and arrival of zircons in the basin via drainage systems transporting them from the source area. Three geochronology samples from verifiable Delgado

Sandstone strata that include the ejecta-bearing tsunami deposit at the Cretaceous/Tertiary boundary have a typical Difunta Group detrital zircon signature, indicating that the tsunami event simply reworked the detritus already in the basin.

The drainages that brought sediment into the La Popa and Parras basins originated in the southwest United States and flowed southeast parallel to the Sierra Madre Oriental. These river systems were joined by smaller streams and rivers flowing north and east that drained the igneous and sedimentary rocks in western Mexico and the Sierra Madre Oriental.