ABSTRACT

THE DEPOSTIONAL SYSTEM, STRATIGRAPHY, AND PETROLOGY OF THE MAASTRICHTIAN MUERTO FORMATION, LA POPA BASIN, MEXICO: IMPLICATIONS FOR DIAPIRISM AND FORELAND EVOLUTION

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The Muerto Formation represents the first, coarse-grained synorogenic deposits of the 5.6 km thick Difunta Group in the La Popa basin of northeastern Mexico. Data from eight measured sections of the Maastrichtian Muerto Formation reveal that lithofacies relationships and sequence stratigraphic evolution were controlled locally by halokinesis associated with the development of the El Gordo evaporite diapir. On a regional scale, the sequence stratigraphic evolution and petrologic evolution are controlled by eustacy and tectonism associated with the development of the Hidalgoan orogen. Twenty-four lithofacies comprise four depositional facies assemblages: 1) shoreface; 2) tidal; 3) lagoonal, and 4) lower delta plain. These facies assemblages comprise the Muerto delta,

a tidally influenced barrier-island system resembling the modern Niger River delta. The Muerto Formation is composed of three complete third-order sequences and one partial sequence, with the basal contact produced by an eustatic sea level drop at approximately 75 Ma. Stratigraphic geometries within the Muerto Formation adjacent to the EL Gordo diapir are a function of the rate of diapir rise (R_{net}) and the rate of sedimentation accumulation (A_{sed}). During rapid rises in sea level, R_{net} is greater than A_{sed}, and the locus of deposition shifts away from the diapir, such that onlapping geometries are produced during development of a transgressive systems tracts. With the onset of deposition of the highstand systems tract, A_{sed} greatly exceeds R_{net}, and accommodation space is created by erosion of the previously deposited transgressive systems tract in the diapir-proximal and intermediate zones.

The Muerto Formation is composed of subequal proportions of quartz, feldspar, and lithic grains. The abundance of plagioclase and lathwork volcanic lithic grains and the presence of albite are consistent with derivation from the accreted Guerrero/Arperos composite terrane and minor contemporaneous volcanism. Vertical compositional variations indicate that initiation of foreland deformation uplifted the Guerrero/Arperos composite terrane; subsequent propagation of the incipient Sierra Madre Oriental introduced sedimentary lithic fragments into the basin, with a subordinate amount of detritus still being derived from the Guerrero/Arperos source. Continued hinterland denudation and thrusting produced alternating influxes of Guerrero/Arperos-derived sediment and Sierra Madre Oriental-derived sediment.