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The Development of the Antler Foredeep and Its Impact on the Facies Architecture of a Prograding Carbonate Fill, the Lower Mississippian Madison Group, Southwest and Central Montana

Conceptual models of carbonate ramp development along flexure-dominated, cratonward foreland basin margins show homoclinal ramps which backstep as emplacement of the orogenic wedge and concomitant foreland basin subsidence occur. Early Mississippian subsidence in the Antler foreland basin and Central Montana trough and relative sea level rise should have led to retrogradational stacking patterns along the cratonic margin. What is observed is in direct opposition to this conceptual model. At the level of the third-order sequence, the smallest scale stratigraphic unit which can be regionally correlated, the Madison ramp exhibits overall progradational stacking, with aggradational and only subtly retrogradational patterns observed in the transgressive systems tracts (TSTs).

Transects across the Antler foreland margin and through the Central Montana trough in southwestern and central Montana were examined in order to look at sedimentary response to disparate subsidence histories. On both margins, the highstand systems tracts (HSTs) are almost exclusively composed of stacked cycles of thick (30-50 m), regionally extensive (> 18,000 km^2) intertidal to shallow subtidal oolitic and skeletal grainstones. During the progradation of these packages, sediment supply must have outpaced relative sea level rise. In order to assess the role of tectonics and eustasy in relative sea level change, we compared our sequence stratigraphic interpretations with the Mississippian coastal onlap curve (Ross and Ross, 1987). Although eustatic sea level change explains part of the observed relative sea level signal, discrepancies remain. We attribute these relative sea level falls to tectonic quiescence and slowed subsidence. Conversely, pulses of tectonism are interpreted to drive accommodation creation and subsequent transgressions.