Foreland Depozone Variability: An Example from the Middle Cretaceous of the Western Interior

K. W. Rudolph[1], Makayla Jacobs Christensen[2], and Joel Saylor[3]

[1]University of Houston/Rice University
[2]PGS-Nopec
[3]University of British Columbia

Abstract

The Cenomanian through lower Coniacian stratigraphy of the Western Interior is characterized by a large scale (2nd order) progradational cycle of deposition with maximum flooding surfaces above and below. Grossly, there is a similarity in the stacking pattern regionally, with regressive shoreline systems culminating in the late Turonian to early Coniacian. However, there is significant variability along strike, based on geohistories, flexural models, isochores, paleogeography, and biostratigraphy. Four depositional provinces can be delimited, roughly corresponding to the Cardium, Frontier, Ferron, and Gallup sandstones, from north to south. The thickest foredeep deposits are in Wyoming-NE Utah province where Frontier strata reach over 1.5 km in thickness. Based on flexural models, load height reaches 2-4 km in the area of the Wyoming Salient. Moreover, the best evidence of a significant forebulge occurs distal to this area, with a facies omission and a 3-5 m.y. lacuna at the 91.5 Ma sequence boundary. This unconformity is likely associated with the initiation of the Crawford Thrust, based on the occurrence of wedge top conglomerates on this surface. In the Wyoming province, the late Turonian shoreline extends furthest east. The Ferron system is relatively conformable, has a thinner foredeep, and is associated with a regional reentrant in the shoreline. Structural elevation in the Sevier thrust belt is much lower here, consistent with the much lower modeled flexural loads (1-2 km). Finally, both the Cardium (Western Canada Basin) and Gallup (San Juan Basin) systems are slightly younger, with maximum regression occurring in the early Coniacian (89.5 Ma). Additionally, there is evidence of a 2-3 m.y. lacuna west of the San Juan Basin, in the Kaiparowits region; this is correlative with the Tocito unconformity. From the basin response, we posit variable relief/shortening and diachroneity in the distal thrust belt, generally consistent with published structural analyses.