

# **Monsoonal Megafans and Large-Scale Late Cretaceous Stratal Architecture in the Southern Cordilleran Foreland Basin, United States**

**Tim Lawton<sup>1</sup>**

<sup>1</sup>Universidad Autonoma de Mexico, Queretaro, Mexico

## **Abstract**

Campanian strata in the Cordilleran foreland basin in southern and central Utah consist of two megacycles 300-400 m thick. The cycles consist of upward-coarsening fluvial-deltaic successions deposited initially by axial systems that drained sources south of the basin and were displaced laterally from the foredeep by compositionally mature transverse fluvial megafan systems that prograded eastward from the Sevier orogenic belt. The two cycles include the Coniencian-lower Campanian Smoky Hollow and Drip Tank members of the Straight Cliffs Formation and the middle Campanian Wahweap Formation and correlative strata. The upper cycle is the more massive and correlates with the well-known Blackhawk-Castlegate interval in central Utah.

The sand-rich megafans have been previously interpreted as lowstand deposits formed by downstream changes in sea level, but I propose that the megacycles resulted from interaction of a seasonal, wet monsoonal climate and topography created by repeated thrusting along the front of the Sevier orogen.

The monsoon developed upon connection of the Gulf of Mexico and the Western Interior Seaway near the end of Early Cretaceous time and grew in intensity through the first half of the Late Cretaceous. Moisture was delivered into the Western Interior by northward atmospheric flow during the three summer months and intercepted by the topographic front of the Sevier orogenic belt. The frontal thrust system (twice) uplifted erodible Jurassic eolianites, which contributed voluminous, compositionally mature and sand rich detritus to the megafans.

A confluence of factors—approach of thrust uplift toward the seaway, monsoonal climate, and easily erodible rocks in the frontal thrust sheets—resulted in a culmination of fluvial competence in middle Campanian time, such that the Wahweap and Castlegate megafans were volumetrically larger than the earliest Campanian fluvial fans. The monsoon then waned as influent moisture was blocked by rising Laramide topography in southern New Mexico, where intermontane lacustrine basins flanked by synorogenic conglomerate attest to arrival of significant topographic relief by late middle Campanian time (~76 Ma).