Late Cretaceous Fluvial-Megafan and Axial-River Systems In the Southern Cordilleran Foreland Basin: Drip Tank Member of Straight Cliffs Formation and Adjacent Strata, Southern Utah, U.S.A

Timothy F. Lawton, William L. Schellenbach, Amy E. Nugent
DOI: https://doi.org/10.2110/jsr.2014.33
Published: May 01, 2014

Abstract:

The Upper Cretaceous (lower Campanian) Drip Tank Member of the Straight Cliffs Formation in the Grand Staircase region of southern Utah is an upward-coarsening, sandstone-rich, low-sinuosity fluvial deposit in the Cordilleran foreland basin. The Drip Tank Member thins from 75 m to 30 m eastward across the basin foredeep, approximately parallel to its dominant eastward sediment-dispersal direction, and thins southward along the foredeep to as little as 17 m near its southern outcrop extent along modern cliff lines. It overlies and underlies mudstone-rich fluvial strata of the John Henry Member of the Straight Cliffs Formation and lower member of the Wahweap Formation, respectively, both of which were deposited by northeast-flowing rivers. The John Henry–Drip Tank contact lies in an interfingering, progradational stratigraphic transition from medium-grained lenticular sandstone bodies to tabular coarse-grained amalgamated sandstone bodies. The contact with the overlying Wahweap Formation is locally a prominent surface of erosion or sediment reworking.

Sandstone petrography and detrital-zircon age populations of the strata indicate detrital sources in basement south of the foreland basin, thrust sheets to the west, and magmatic arc rocks to the southwest. The uppermost part of the John Henry Member contains as much as 10% feldspar and abundant ∼ 1.84–1.60 Ga detrital zircons derived from Yavapai–Mazatzal basement rocks in the Mogollon Highlands. The Drip Tank Member ranges from quartzarenite to chert-bearing sub litharenite with Grenville (∼ 1.2–1.1 Ga), Neoproterozoic and early Paleozoic detrital zircons derived from Proterozoic through Jurassic strata exposed in the Sevier orogenic belt. Lower member Wahweap litharenites contain abundant thrust-belt-derived detrital carbonate grains absent from compositionally mature Drip Tank sandstones, as well as a broad range of zircon ages.
The Drip Tank Member constitutes deposits of a sand-rich, fluvial megafan, or distributive fluvial system, that displaced a subjacent, but partly time-equivalent axial-fluvial system eastward as the megafan, driven in part by seasonally high discharge fed by monsoonal precipitation, prograded across the basin foredeep. A thick, amalgamated fan-axis succession present in northern exposures contrasts with a thinner fan-flank succession in southern localities. Tabular sixth–order lithosomes, each containing channels on the order of 7 m deep, define three individual fluvial fans or fan lobes in the megafan system. Younger Wahweap fluvial channels eroded uppermost Drip Tank deposits of the fan axis and fan flank. Transverse fan progradation across the foredeep recorded falling accommodation/sediment supply in an aggradational to progradational systems tract. Erosion and reworking of the upper fan surface record decreased accommodation, sediment bypass, and erosion prior to reoccupation of the foredeep by the Wahweap axial-fluvial system. The upper contact of the Drip Tank Member is thus the primary sequence boundary in this multi-component fluvial system, and the lower Wahweap represents transitional systems-tract deposits accumulated as accommodation/sediment supply increased.